Revista
DOR
Pesquisa, Clínica e Terapêutica

**Revista da
Sociedade Brasileira
para o Estudo da Dor**

Volumen 18 – nº 4
October to December, 2017
Trimestral Publication

**Sociedade Brasileira
para o Estudo da Dor**
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Quotations of Revista Dor, Pesquisa, Clínica e Terapêutica shall be abbreviated **to Rev Dor**

Rev Dor is not responsible whatosever by opinions.

Advertisements published in this edition do no generate conflict of intestests.

Indexada na SciELO | Indexada na LILACS | Indexada na Latindex

Publication edited and produced by
MWS Design – Phone: (055) 11 3399-3038

Journalist In Charge
Marcelo Sassine - Mtb 22.869

Art Editor
Anete Salviano

SUMMARY

Submitted to articles online:
http://www.sgponline.com.br/dor/sgp/.

Rev Dor. São Paulo, 2017 oct-dec;18(4):289-90

EDITORIAL

Ropivacaine: the newest anesthetic agent celebrates 20 years

Ropivacaína: o mais novo anestésico local completa 20 anos

DOI 10.5935/1806-0013.20170117

On February 22, 1997, the first European Symposium on Ropivacaine was held in Stockholm, Sweden, with the participation of 554 anesthesiologists from 22 countries, including 11 from Brazil. In the same year, Astra Laboratory launched a new local anesthetic for clinical use in 14 countries: United Kingdom, Ireland, Germany, Austria, Canada, Italy, France, Belgium, Norway, Switzerland, South Africa, BRAZIL, Argentina, and Portugal.

Ropivacaine's development was part of an effort to increase safety in the use of local anesthetics with regard to systemic toxicity without changing the nerve blockage quality.

Local anesthetics can be administered by several routes: neuroaxial (epidural and subarachnoid), nervous plexuses, large and small nerves, infiltration and venous. The injection site determines the blockage distribution, but several other factors influence the degree and its quality. On the other hand, the injection site influences the speed with which the drug penetrates the nerve and especially how it is removed to the systemic circulation.

Local anesthetics may cause systemic toxic reactions due to two basic mechanisms: overdose or accidental intravascular injection with the massive absorption of large amounts of the drug. In both cases, high blood concentrations are established, which trigger undesirable effects on the cardiovascular system and the central nervous system.

These dose-dependent drugs delay the impulses transmission, through the cardiac conduction system, due to its action on the sodium channels. The blockage of these channels develops during systole and dissipates during diastole. This dissociation is slow with bupivacaine, such that recovery during diastole at physiological frequencies is insufficient for the recovery of all sodium channels, leading to blockage accumulation. The clinical result is the development of dysrhythmia, bradycardia and even cardiac arrest, difficult to recover. Several studies have demonstrated a faster dissociation of sodium channels with ropivacaine in relation to bupivacaine, resulting in a lower blockade accumulation of these channels at physiological frequencies and, therefore, lower cardiotoxicity[1,2].

It is known that the systemic toxicity is more related to the dextrorotatory isomer of the local anesthetic, being smaller with the levorotatory, hence the attempt to decrease the toxicity of racemic bupivacaine by replacing it with levobupivacaine. Ropivacaine is prepared in the levorotatory form: would this be the only explanation for its lower cardiotoxicity? Experimental studies have shown that no: the lower cardiodepressor effect of ropivacaine over bupivacaine is not due solely to a greater levorotatory stereoselectivity than dextrorotatory but to a change in its chemical formula with the replacement of the butyl radical (bupivacaine) by propyl (ropivacaine) on the aromatic ring[3].

Corroborating these results, other studies have demonstrated that the three local anesthetics should thus be grouped in decreasing order of cardiotoxicity: bupivacaine - levobupivacaine - ropivacaine[4].

Similarly to cardiotoxicity, toxicity to the central nervous system (manifested by dizziness, drowsiness, hearing tinnitus, slurred speech, inability to articulate words, and finally seizures) is greater with bupivacaine than with ropivacaine[5,6]. When systemic reactions occur with ropivacaine, seizures precede cardiac events and are a warning sign, unlike bupivacaine, with which cardiac events develop without premonitory signals to the central nervous system side, and with which cardiac arrest is difficult to recover and often irreversible[4].

Concern over quality and safety has made ropivacaine in these 20 years a local anesthetic widely used in the most varied techniques of anesthesia and local analgesia, epidural, plexus blockage, nerve blockage, ophthalmic blockage, surgical wound infiltration, regional venous (Bier), spinal anesthesia. By the results in all these areas, its long life can be foreseen.

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Correlation between preoperative anxiety and acute postoperative pain in elderly patients submitted to transvesical prostatectomy

Correlação da ansiedade pré-operatória com a dor pós-operatória aguda em idosos submetidos à prostatectomia transvesical

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DOI 10.5935/1806-0013.20170118

ABSTRACT

BACKGROUND AND OBJECTIVES: The objective of this study was to correlate the level of anxiety presented in the preoperative period with the intensity of pain reported by elderly in the immediate postoperative period of transvesical prostatectomy.
METHODS: Sixty-four elderly patients submitted to transvesical prostatectomy were studied, using the following instruments: the numeric pain scale and Hamilton anxiety rating scale in the preoperative; and the short-form McGill pain questionnaire (Portuguese version adapted) in the immediate postoperative period. The elderly divided into four groups, according to the level of anxiety presented in the preoperative period: absent, mild, moderate and intense. The Spearman correlation was established between preoperative anxiety levels and postoperative pain intensity.
RESULTS: There was a significant positive correlation between the level of preoperative anxiety and pain intensity in the immediate postoperative period. The pain curves (sensitive and affective) presented a significant increase at moments 6, 18 and 24h in all groups. These curves were significantly higher in the elderly with moderate and intense anxiety than in those without anxiety and mild anxiety. The pain peak was recorded at 18h after surgery in all groups.
CONCLUSION: In the elderly, the level of anxiety presented in the preoperative period was positively correlated with the pain response in the immediate postoperative of transvesical prostatectomy. The use of preoperative measures that reduce anxiety can improve analgesia in the immediate postoperative period of this surgery and, therefore, reduce the amount of analgesics used in this period. There was also a need for intervention with adequate analgesia at the postoperative pain peak which occurred 18h after surgery.
Keywords: Elderly, Postoperative pain, Preoperative anxiety, Prostatectomy, Prostate hyperplasia.

RESUMO

JUSTIFICATIVA E OBJETIVOS: O estudo, realizado em idosos, objetivou correlacionar o nível de ansiedade apresentado no período pré-operatório com a intensidade da dor no pós-operatório imediato de prostatectomia transvesical.
MÉTODOS: Foram estudados 64 idosos submetidos à prostatectomia transvesical, aplicando-se os seguintes instrumentos: escala numérica de dor e escala de ansiedade de Hamilton, no pré-operatório; e questionário reduzido de dor de McGill (versão adaptada para a língua portuguesa), no pós-operatório imediato. Os idosos foram divididos em quatro grupos, segundo o nível de ansiedade apresentado no pré-operatório: ausente, leve, moderado e intenso. Foi realizada correlação de Spearman entre os níveis de ansiedade pré-operatória e a intensidade da dor pós-operatória.
RESULTADOS: Houve correlação positiva significativa entre o nível de ansiedade pré-operatória e a intensidade da dor no pós-operatório imediato. As curvas de dor (sensitiva e afetiva) apresentaram aumento significativo nos momentos 6, 18 e 24h em todos os grupos. Essas curvas foram significativamente maiores nos idosos com ansiedade moderada e intensa do que naqueles sem ansiedade e com ansiedade leve. Foi registrado pico de dor no momento 18h no pós-operatório em todos os grupos.
CONCLUSÃO: Em idosos, o nível de ansiedade apresentado no pré-operatório correlacionou-se positivamente com a resposta álgica no pós-operatório imediato de prostatectomia transvesical. A utilização de mensurações pré-operatórias redutoras da ansiedade pode melhorar a analgesia no pós-operatório imediato dessa cirurgia e, assim, diminuir a quantidade de analgésicos utilizados nesse período. Verificou-se, também, necessidade de intervenção com analgesia adequada no momento do pico de dor 18h do pós-operatório.
Descritores: Ansiedade pré-operatória, Dor pós-operatória, Hiperplasia prostática, Idoso, Prostatectomia.

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Submitted in June 03, 2016.
Accepted for publication in October 09, 2017.
Conflict of interests: none – Sponsoring sources: none.

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INTRODUCTION

The elderly population is submitted four times more to the number of surgeries than the non-elderly, and this number has been increasing progressively[1]. In the future, with the accelerated increase in the elderly number, the majority of surgical patients will be over 65 years old and many of them over 80 years old[2].
Benign prostatic hyperplasia (BPH) is one of the most common morbid processes in the elderly. In those older than 80 years,

90% have histological evidence of this condition, 81% have symptoms related to the disease and 10% develop acute urinary retention. One of the BPH's treatments is transvesical prostatectomy (TVP)[3].

Pain is subjective, encompassing all symptoms described by the patient as such. The existence of several pain types can be understood by identifying nociception, painful perception, suffering and painful behavior, identifying anatomical, physiological and psychological substrates underlying these clinical situations[4,5]. Acute perioperative pain is related to the nociceptive stimulation produced by an injury resulting from the surgical act, resulting in sensory, cognitive and emotional experiences associated with autonomic and behavioral responses and high anxiety index[6,7].

Although pain is produced as an affective response to the perception of stress that surrounds the somatic, motor, and cognitive systems, understanding the pain's psychology remains challenging for health professionals. It demands the transcendent of the objective event dimension and the particularities of each patient must be considered, i.e., the pain impact in their life and in the sociocultural context in which they are inserted[8,9].

The stressful factors presence can modify psychosocial impact, vulnerability, and tolerance to pain[10.] The anxiety level found in the elderly, who will undergo the surgical procedure, may influence his evolution in the postoperative period (PO)[11,12]. Relations between preoperative anxiety and acute postoperative pain are reported in individuals submitted to different surgical procedures, including elective abdominal hysterectomy[13], radical mastectomy[14], breast cancer surgery[15], and colorectal surgery[16]. In addition, preoperative anxiety, measured as the anticipatory specific anxiety of surgery versus general anxiety measurement, is a significant independent predictor of intense pain in the PO (measurement in the visual analog scale >7/10) in subjects undergoing several surgical procedures (ophthalmic, laparoscopic, abdominal surgery and orthopedic)[17].

The direct correlation between the preoperative anxiety level and the pain degree referred to in the PO is expressed in the higher amount of analgesics used in the PO in individuals who present a higher anxiety level in the preoperative period[13,18]. In the elderly population, it is important to highlight that pain postpones hospital discharge, with a consequent increase in costs and greater probability of complications[19].

This study aimed to evaluate the pain in the immediate PO of the elderly undergoing TVP, correlating their degree with the anxiety level found in the preoperative period.

METHODS

This is a qualitative-quantitative research, with an observational, analytical, prospective cohort study. Elderly patients aged 60 and over, belonging to social classes 1 to 5, submitted to TVP in the Urology Service of *Hospital Regional da Asa Norte*, which belongs to *Fundação Hospitalar do Distrito Federal*, in the period of May 2009 to May 2010 were included.

78 elderly patients undergoing TVP surgery were studied. Sample calculation was performed using the following formula[20]: n=Z2alfa/2. p.q/E2. Being: n=sampling number; Z a/2=critical value that corresponds to the desired degree of confidence; the p=population proportion of subjects studied with anxiety; the q=population proportion of individuals who do not belong to the studied category (without anxiety) (q=1-p); E=estimated maximum error.

Inclusion criteria were: elderly ≥60 years; submitted to TVP in the service studied and during the study period; signing the Free and Informed Consent Form (FICF), after providing the appropriate clarifications and settled any doubts.

Exclusion criteria were: severe status, physical status ASA III (or above), that is, in a state of clinical decompensation[21]; cognitive deficit, evaluated with the Mini Mental State Examination (MMSE)[22]; chronic pain[4], pain index above 3 on the numerical pain scale (NPS)[23], in usual use of drugs or assisted in an outpatient clinic of pain; depression or anxiety diagnosed by a physician, using an antidepressant or permanent anxiolytic drug, or attending a psychiatric outpatient clinic for anxiety or depression treatment; anesthesia different from that used in the research protocol.

Surgical procedure technique and the teams involved during the research period were the most similar possible. The anesthetic technique, used in all patients, consisted of simple hyperbaric spinal anesthesia with a 25G needle, via median, between the 3rd and 4th or between the 3rd and 4th lumbar inter-area (L2-L3 or L3-L4), using hyperbaric bupivacaine at 0.5% (15mg), associated with 0.08mg of morphine. The latter was used in all patients since TVP is a surgical procedure described with a high degree of pain in the immediate postoperative period[24]. Anxiolytics were not used as an intraoperative rescue. In the immediate PO, drugs that could affect the cognition of the patient, such as ketamine, promethazine, and droperidol, were avoided[25].

Initially, patients completed the questionnaire with their sociodemographic and clinical profile (name, age, gender, schooling, marital status, occupation, weight (in kg), tobacco and alcohol consumption, and comorbidities).

At the routine preanesthetic visit, performed the day before the day of surgery, the patients were explained in detail about the procedures to be performed, and their questions and doubts were answered. Then the following instruments are applied in the order indicated: MMSE[22], NPS[23] and Hamilton's anxiety scale (Ham-A)[26]. MMSE[22] was applied so that patients with cognition disorders were excluded.

NPS[23] was used in the self-assessment of the acute pain intensity present in the preoperative period. This scale consists of a 10cm long straight, presenting in the left end the number zero, which indicates absence of pain; 1, 2 and 3 indicating mild pain; 4, 5 and 6, moderate pain; 7, 8 and 9, severe pain; and 10, which is the worst pain, unbearable, inserted on the line's right side. Patients with a pain index above 3 were excluded.

Ham-A[26] is an instrument designed to access and quantify the severity of the anxiety. It consists of 14 items. Each item has a score of five points on a Likert type scale, from zero to four, and higher scores indicate more intense anxiety. Ham-A is composed of two subscales: psychic and somatic. Psychic subscale (items 1-6 and 14) is directed toward more subjective, cognitive, and af-

fective anxiety complaints (such as anxious mood, tension, fears, difficulties in concentrating), and is particularly useful in the severity of generalized anxiety disorder. Somatic component (items 1-13) emphasizes characteristics of generalized anxiety disorder, such as autonomic excitement, respiratory, gastrointestinal and cardiovascular symptoms.

After the NPS and Ham-A application, the standard pre-anesthetic medication, which consisted of oral midazolam (5mg), was prescribed.

In the perioperative period, blood pressure, pulse, heart rate, arrhythmias, hydration and peripheral oxygen saturation were monitored. After the surgical procedure, the patients were referred to the recovery room at post-anesthesia (PARR), being evaluated sequentially according to the modified Aldrete scale, until a score of 9 or 10 was obtained for PARR's discharge[27].

They were then referred to the infirmary, where the pain assessment was performed in the immediate PO at 6, 18, 24 and 30h after the anesthesia beginning, with the application of the McGill Reduced Pain Questionnaire (QR-MPQ)[28], also observing in this period the total consumption of analgesics.

McGill Questionnaire (MPQ)[28] is a useful instrument for measuring pain, having been translated into Portuguese and validated in Brazil[29]. In the current research, its abbreviated form (QR-MPQ) was used, consisting of 15 representative words of sensory (n=11) and affective (n=4) pain. For each descriptor, there is a number indicating its intensity, in ascending order, from zero to three[28,29].

The following measurements were made using the QR-MPQ: number of descriptors chosen, which corresponds to the number of words used by the patient to qualify their pain, the lowest number being zero (if no descriptor is chosen) and 15 being the highest (if chosen all descriptors); quantitative index of pain, obtained by summing the intensity values of the chosen descriptors, 45 being the highest possible index; Pain Present Index (PPI), which is the combination of the number (on the left) with the chosen word (on the right), indicator of the pain intensity as a whole at the time of questionnaire administration; visual analog scale (VAS) and NPS, in order to obtain an indicator of pain intensity as a whole.

After the last QR-MPQ measurement, the patients were divided into four groups, according to the anxiety level presented in Ham-A, applied in the preoperative period: group 1, the absence of anxiety; group 2, mild; group 3, moderate; and group 4, intense.

The research was approved by Ethics and Research Committee of the Teaching and Research Foundation for Health Sciences (*Fundação de Ensino e Pesquisa em Ciências da Saúde (FEPECS)*), with the opinion No. 307/2009 and registration No. 395/2009.

Statistical analysis

Statistical Package for Social Science for Windows (SPSS 10.0) was used. Initially, the descriptive analyzes were carried out to characterize the sample. Normality assessment was done using the Kolmogorov-Smirnov's test, and the homoscedasticity assessment was done with the Levene's test. Data were represented by averages and standard deviations. Variance Analysis for repeated measurements was done with the Bonferroni's test, being used as a post hoc to verify the pain's behavior, according to the anxiety level found in the preoperative period. Spearman's correlation was assessed between anxiety levels and pain intensity. The significance level was set at $p \leq 0.05$.

RESULTS

From the 78 elderly patients submitted to TVP during the study period, 14 were excluded for the following reasons: use of anxiolytic (2) and antidepressant (1); consultation in an outpatient clinic for pain (2) and psychiatry (2), anesthesia different from that adopted in the research protocol (4); and no signature of the ICF (3).

The sample consisted of 64 male patients, average age of 69.25±5.38 years (60 to 83 years), divided into four groups according to the anxiety level presented in the preoperative period: group 1, 29 (10.9%) showed no anxiety; group 2, 26 (40.6%) mild; group 3, 20 (31.2%) moderate; and group 4, 11 (17.9%) intense.

Among the groups, there were no significant differences related to age, weight, schooling, marital status, occupation, smoking and alcohol consumption, comorbidities and days of hospitalization, as well as the data monitored during the surgical procedure.

In the preoperative period, there was no significant correlation between the anxiety level and the somatic and affective pain reported. When correlating the preoperative anxiety level with somatic pain in the immediate postoperative period, a positive and moderate correlation was identified after 6h and positive and intense, after 18, 24 and 30h. Thus, the higher the anxiety level presented in the preoperative period, the greater was the report of somatic pain in the immediate PO. When this same correlation was carried out with affective pain in the immediate PO, a positive and intense correlation was identified after 6, 18, 24 and 30h, showing that the higher the anxiety level in the preoperative period, the higher the affective pain in the immediate PO (Table 1).

Table 1. Correlation between preoperative anxiety levels and somatic and affective pain in the immediate postoperative period of transvesical prostatectomy (n=64), HRAN, DF

	Somatic pain		Affective pain	
	R	P value	R	p value
Preoperative	0.02	0.90	0.02	0.86
6h PO	0.53	0.001*	0.80	0.001*
18h PO	0.80	0.001*	0.83	0.001*
24h PO	0.76	0.001*	0.84	0.001*
30h PO	0.70	0.001*	0.87	0.001*

PO: postoperative; *p<0.001.

A significant interaction between the groups and evaluation moments of the sensory pain [F (12,240)=13.65; p=0.001] was demonstrated. Results between the groups showed that in the preoperative period there was no significant difference between them; 6, 18, 24 and 30h PO, there were significant differences

(p<0.05), with pain values (pain index) in groups 1 and 2 being lower than in groups 3 and 4 (Figure 1).

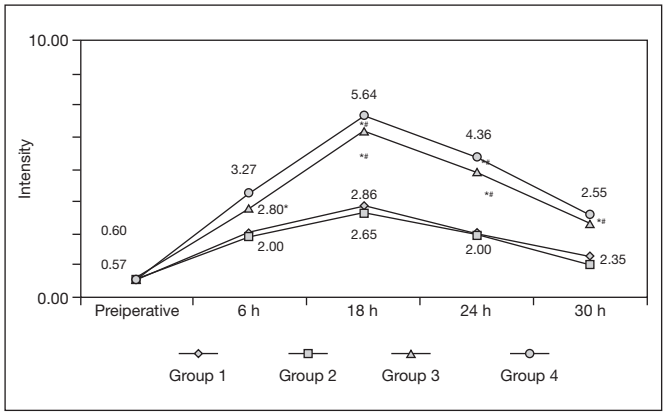

Figure 1. Sensitive pain's evaluation in the preoperative period and in different moments of the immediate postoperative period of transvesical prostatectomy, according to the anxiety level presented in the preoperative period (n=64), HRAN, DF

* p<0.05, significant difference in relation to group 1; # p<0.05, significant difference in relation to group 2.

A significant interaction between the groups and evaluation moments at NPS [F (12, 240)=31.50; p=0.001] was observed. As for affective pain, the comparison between groups showed that in the preoperative period there was no significant difference; 6, 18, 24 and 30h PO showed significant differences (p<0.05), with values of groups 1 and 2 lower than those of groups 3 and 4; and 30h PO, a significant difference (p<0.05) also appeared with values of group 3 smaller than those of group 4 (Figure 2).

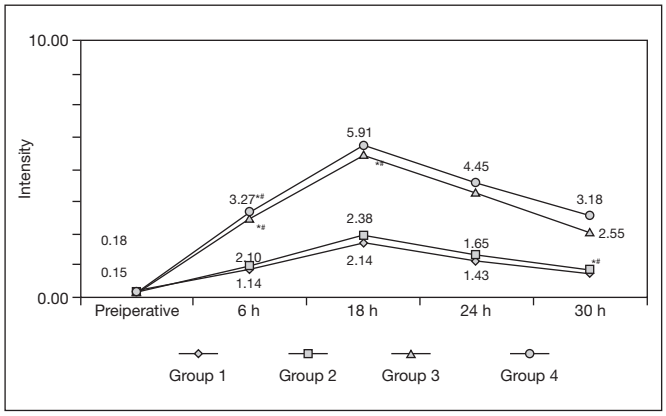

Figure 2. Affective pain's evaluation in the preoperative period and in different moments of the immediate postoperative period of transvesical prostatectomy, according to the anxiety level presented in the preoperative period (n=64), HRAN, DF

* p≤0.05, a significant difference in relation to group 1; # p≤0.05, a significant difference in relation to group 2; ∞ p≤0.05, a significant difference in relation to group 3.

Significant interaction between the groups and evaluation moments at NPS [F (12, 240)=15.56; p=0.001] appeared. On this scale, results between the groups showed that in the preoperative period there was no significant difference; while 6, 18, 24 and 30h PO, there were significant differences (p<0.05), with values in groups 1 and 2 being lower than in groups 3 and 4 (Figure 3).

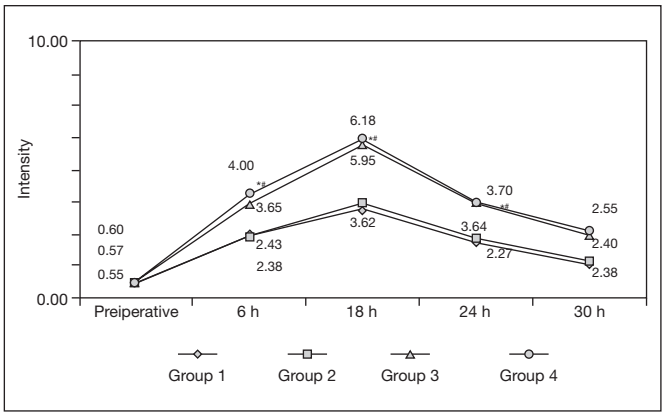

Figure 3. Numerical scale assessment of pain in the preoperative period and in different moments of the immediate postoperative period of transvesical prostatectomy, according to the anxiety level presented in the preoperative period (n=64), HRAN, DF

* p<0.05, significant difference in relation to group 1; # p<0.05, significant difference in relation to group 2.

A significant interaction between the groups and evaluation moments at PPI [F(12, 240)=9.82; p=0.001] was found. There was an interaction between groups 1 and 2 and, at the other end; between groups 3 and 4, i.e., groups 1 and 2 with each other and groups 3 and 4 with each other were similar in the evaluation of this index. Results between the groups showed that in the preoperative period there was no significant difference; while 6, 18 and 24h PO, there were significant differences (p<0.05), with results in groups 1 and 2 being lower than in groups 3 and 4. Groups 1 and 2 had lower pain indexes than groups 3 and 4, with a significant difference, which indicates that the higher the anxiety level presented in the preoperative period, the greater the pain reported in the immediate postoperative period. At evaluation time of 30h PO, no significant differences emerged (Figure 4).

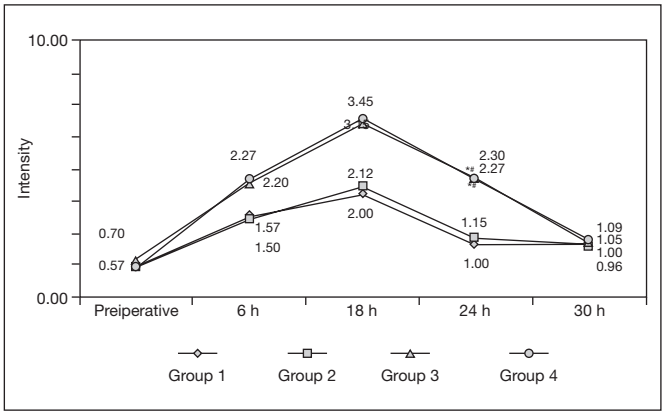

Figure 4. Assessment of present pain index in the preoperative period and in different moments of the postoperative period of transvesical prostatectomy, according to the anxiety level presented in the preoperative period (n=64), HRAN, DF

When correlating the anxiety levels presented in the preoperative period with NPS in the PO, a positive and intense correlation was demonstrated after 6, 18 and 24h and a positive and moderate correlation was demonstrated after 30h. That is, the higher the anxiety level demonstrated in the preoperative period,

Table 2. Correlation between the preoperative anxiety levels and the numerical scale of pain measured in different moments of the postoperative period of transvesical prostatectomy, according to the anxiety level presented in the preoperative period (n=64), HRAN, DF

Measurement moments of NPS	Preoperative anxiety levels	
	p value	p value
Preoperative	0.02	0.90
6h PO	0.75	0.001*
18h PO	0.84	0.001*
24h PO	0.77	0.001*
30h PO	0.67	0.001*

NPS = numeric pain scale; PO = postoperative; * p<0.001.

Table 3. Correlation between the preoperative anxiety levels and the present pain index measured in different moments of the postoperative period of transvesical prostatectomy, according to the anxiety level presented in the preoperative period (n=64), HRAN, DF

Measurements moments of PPI	Preoperative anxiety levels	
	p value	p value
Preoperative	0.06	0.66
6h PO	0.56	0.001*
18h PO	0.76	0.001*
24h PO	0.81	0.001*
30h PO	0.16	0.21

PPI = present pain index; PO = postoperative; *p<0.001.

the greater was the report of pain in the immediate PO. There was no significant correlation between anxiety level and NPS reported in the preoperative period (Table 2).

When correlating preoperative anxiety levels with the present pain index (PPI), a positive and moderate correlation was demonstrated after 6h (r=0.56, p=0.001) and positive and strong was demonstrated after 18h (r=0, 76, p=0.001) and 24h (r=0.81, p=0.001). Thus, the higher the anxiety level presented in the preoperative period, the greater was the report of pain in the 6h, 18h and 24h immediate PO. There was no significant correlation between anxiety level and PPI in the preoperative period and after 30h PO (Table 3).

Table 4 lists the correlations between preoperative anxiety levels and pain measured at different postoperative moments. In the four measurements, sensitive pain, affective pain, NPS and PPI, these correlations were significant (p=0.001).

DISCUSSION

In this research, there was a correlation between the anxiety presented in the preoperative period and the pain referred in different moments of the immediate PO of TVP surgery. Therefore, in the sample studied, the presence of anxiety in the preoperative period was a positive predictor of pain presented in the immediate PO of this surgery.

In a systematic review of instruments for anxiety evaluation in the Brazilian population, it was evidenced the adequacy of

Table 4. Correlation between the preoperative anxiety levels and the pain measured in different moments of the postoperative period of transvesical prostatectomy, according to the anxiety level presented in the preoperative period (n=64), HRAN, DF

Measurements	Moments	Group 1 (n=7)	Group 2 (n=26)	Group 3 (n=20)	Group 4 (n=11)	F value	p value
Sensitive pain	Preoperative	0.57 ± 0.53	0.54 ± 0.51	0.60 ± 0.50	0.55 ± 0.52	13.65	0.001
	6h PO	2.00 ± 0.58*	1.92 ± 0.63*	2.80 ± 1.44*	3.27 ± 0.47*		
	18h PO	2.86 ± 0.69*	2.65 ± 0.69*†	5.20 ± 0.95*†	5.64 ± 0.81*†		
	24h PO	2.00 ± 1.15*	1.96 ± 0.96*∞	3.95 ± 0.83*†∞	4.36 ± 0.50*†∞		
	30h PO	1.29 ± 0.49∞	0.96 ± 0.77†∞°	2.35 ± 0.49*∞°	2.55 ± 0.52*∞°		
Affective pain	Preoperative	0.14 ± 0.38	0.15 ± 0.37	0.15 ± 0.37	0.18 ± 0.40	31.50	0.001
	6h PO	1.14 ± 0.38*	1.23 ± 0.65*	3.10 ± 0.72*	3.27 ± 0.65*		
	18h PO	2.14 ± 0.90*†	2.38 ± 0.50*†	5.55 ± 1.28*†	5.91 ± 0.94*†		
	24h PO	1.43 ± 0.53*∞	1.65 ± 0.56*∞	4.10 ± 0.97*†∞	4.45 ± 0.82*†∞		
	30h PO	1.00 ± 0.00*∞	1.04 ± 0.45*∞°	2.55 ± 0.60*†∞°	3.18 ± 0.40*∞°		
NPS	Preoperative	0.57 ± 0.53	0.54 ± 0.51	0.60 ± 0.50	0.55 ± 0.52	15.56	0.001
	6h PO	2.43 ± 0.53*	2.38 ± 0.57*	3.65 ± 0.59*	4.00 ± 0.63*		
	18h PO	3.43 ± 0.53*†	3.62 ± 0.64*†	5.95 ± 0.76*†	6.18 ± 0.60*†		
	24h PO	2.14 ± 0.38*∞	2.27 ± 0.53*∞	3.70 ± 0.47*∞	3.64 ± 0.50*∞		
	30h PO	1.29 ± 0.49†∞°	1.38 ± 0.64*†∞°	2.40 ± 0.60*†∞°	2.55 ± 0.52*†∞°		
PPI	Preoperative	0.57 ± 0.53	0.54 ± 0.51	0.70 ± 0.47	0.55 ± 0.52	9.82	0.001
	6h PO	1.57 ± 0.53*	1.50 ± 0.51*	2.20 ± 0.41*	2.27 ± 0.47*		
	18h PO	2.00 ± 0.58*	2.12 ± 0.59*†	3.35 ± 0.49*†	3.45 ± 0.52*†		
	24h PO	1.00 ± 0.00†∞	1.15 ± 0.37*†∞	2.30 ± 0.47*∞	2.27 ± 0.47*∞		
	30h PO	1.00 ± 0.00†∞	0.96 ± 0.34*†∞	1.05 ± 0.22†∞°	1.09 ± 0.30*†∞°		

Intragroup differences: *p<0.05, difference in relation to preoperative period; †p<0.05, difference in relation to 6h; ∞p<0.05, difference in relation to 18h; °p<0.05, difference in relation to 24h; PO = postoperative; NPS = numeric pain scale; PPI = present pain index.

the instrument used in this research for the anxiety evaluation in Brazil[30].

Different forms of pain were evaluated in the immediate PO, and there were no differences between their perceptions. Preoperative assessments and in different moments in the immediate PO, both of the sensitive pain and of the affective pain, showed ascending pain curves at moments 6 and 18h PO in all groups. However, the groups that presented without anxiety and with mild anxiety preoperatively showed this curve with significantly lower ancestry, whereas in the groups with moderate and intense anxiety this curve arose with greater ascendancy, which means that the patients of these two groups showed higher indexes of PO pain. A meta-analysis was recently carried out to evaluate the main relationships between preoperative emotional pain and postoperative pain. 46 studies were selected, with a total of 6,207 patients, in which it was observed that the high levels of pre-surgical emotional stress were associated with a significantly higher degree of pain and analgesic use in the immediate PO. The size of these relationships depended on methodological factors and samples characteristics, such as anxiety and depression associated, as well as the type of surgery. It was concluded that preoperative emotional stress is a risk factor for greater PO pain and disability, and there is a need for measures that reduce these emotional changes in the preoperative period[31].

There was also a peak of pain at the time 18h PO in all groups, which revealed an important pain window at that time. Therefore, actions that reduce pain and, consequently, its deleterious effects should be performed at this time. Previous publications reporting this pain window were not found. On this occasion, it is possible that the patients reported greater pain intensity because they presented low plasma concentration of analgesic since they had not yet used the drug in the morning. Another possibility is that, upon waking and moving, they felt the so-called incidental pain, as it is the moment that they realized that they had had surgery indeed. From the evaluation moment at 18h PO, i.e., 24 and 30h PO, there was a progressive reduction of the sensory and affective pain in all groups, but the previous relationship was maintained, i.e., the groups without anxiety and with mild anxiety presenting lower pain scores than those with moderate and intense anxiety.

It is described that a significant proportion of elderly patients submitted to different surgical procedures do not receive adequate treatment for pain arising in the immediate PO[32]. Among the factors that may contribute to hesitation, or even reluctance to provide analgesic treatment for the elderly postoperatively, include the risk of adverse drug reactions; misconception about the efficacy of non-pharmacological treatment strategies for pain; discriminatory attitudes towards patients with advanced age; and increased risk of polypharmacy[33]. Also among hospitalized elderly, 16 to 27% do not receive treatment for pain relief[34], and among elderly people with dementia, this fact occurs even more frequently[35].

PO pain that is more intense than expected and patients' reduced satisfaction with surgery are predictable when there is a high level of preoperative anxiety[36]. In addition, when patients are emotionally suffering in PO, with consequent anxiety, this is accompanied by an increase in the incidence of somatic symptoms and painful complaints, leading to the frequent prescription of anxiolytics in the PO. However, the results of this association are still controversial[37].

In the present study, patients had surgery in a public hospital. Although every care was taken to make surgical teams as similar as possible, as well as the techniques applied in the surgical procedure, this was a potential bias in this study, since the teams were alternated on each 12-hour shift.

Early preoperative intervention, reducing the anxiety degree in elderly population, will probably alter the pain response in the immediate PO, optimizing pain handling and, consequently, reducing the consumption of potent analgesics during this period, which is particularly important in this age group that often uses polypharmacy. Future studies should be carried out evaluating the interventions in the elderly to reduce their anxiety in the preoperative period, thus reducing the pain response in the immediate PO. Mathematical models should be developed to test their predictive validity, as well as protocols that identify the vulnerable elderly.

CONCLUSION

It was confirmed that the elderly submitted to TVP presented a higher level of anxiety in the preoperative period and higher pain index in the immediate PO. There was also a peak of pain at the 18h PO in all groups, which revealed an important pain window at that moment.

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Prevalence of musculoskeletal pain in nursing professionals working in orthopedic setting

Prevalência de dor musculoesquelética em profissionais de enfermagem que atuam na ortopedia

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DOI 10.5935/1806-0013.20170119

ABSTRACT

BACKGROUND AND OBJECTIVES: Musculoskeletal pain is considered one of the major causes for leave of absence. In the hospital setting, researchers classify the nursing activity as one of the most harmful to human health. The aim of this study was to identify the prevalence of musculoskeletal pain in nursing professionals working in the orthopedic setting at a hospital in the South of Brazil.

METHODS: The study population consisted of 29 nursing professionals among which three were nursing assistant, 23 nurse techs, and three nurses. The workers answered a questionnaire with questions related to musculoskeletal pain (Nordic adapted), sociodemographic profile, labor characteristics, and habits and lifestyle.

RESULTS: The prevalence of musculoskeletal pain in the studied subjects was 96.6% in at least one of the body parts in the last 12 months. The main regions involved were the lower and upper back (79.3 and 75.9%, respectively), the neck (65.5%), the shoulder (62.1%), ankle/feet (55.2%) and wrists/hands (51.7%). Of the professionals studied, 65.5% reported a leave of absence due to health problems in last the 12 months. It was identified that nurse practitioners showed a higher prevalence of pain in the majority of the body regions in comparison to the other professionals.

CONCLUSION: The prevalence of musculoskeletal pain reported by the nursing professionals in the study was considered high. This points to the need for health promotion programs such as exercise at the workplace, ergonomics, pre-established breaks and more professionals in the ward, measures described in the literature that can contribute to reduce the overload and improve the working conditions and quality of life of these professionals.

Keywords: Musculoskeletal abnormalities, Nursing practice, Nursing staff, Orthopedics, Quantitative analysis.

RESUMO

JUSTIFICATIVA E OBJETIVOS: As dores musculoesqueléticas são consideradas uma das principais causas de afastamentos do trabalho. No âmbito hospitalar, pesquisadores classificam a atividade de enfermagem como uma das mais nocivas à saúde humana. O objetivo deste estudo foi identificar a prevalência de dor musculoesquelética em profissionais de enfermagem atuantes na ortopedia de um hospital do Sul do Brasil.

MÉTODOS: Participaram da pesquisa 29 profissionais de enfermagem, sendo três auxiliares, 23 técnicos e três enfermeiros. Os trabalhadores responderam um questionário contendo perguntas referentes às dores musculoesqueléticas (Nórdico adaptado), perfil sociodemográfico, características laborais, e hábitos e estilo de vida.

RESULTADOS: A prevalência de dores musculoesqueléticas nos trabalhadores analisados foi de 96,6% em pelo menos uma das partes corporais nos últimos 12 meses. As principais regiões anatômicas acometidas foram as partes inferiores e superiores das costas (79,3 e 75,9%, respectivamente), o pescoço (65,5%), os ombros (62,1%), os tornozelos/pés (55,2%) e punhos/mãos (51,7%). Dos profissionais analisados, 65,5% relataram ter se afastado do trabalho por motivos de saúde nos últimos 12 meses. Identificou-se que os auxiliares de enfermagem apresentaram maiores prevalências de dores na maioria das regiões anatômicas em comparação aos outros profissionais.

CONCLUSÃO: A prevalência de dor musculoesquelética relatada pelos profissionais de enfermagem analisados foi considerada alta. Aponta-se a necessidade de programas de promoção da saúde como ginástica laboral, ergonomia, pausas pré-estabelecidas e mais profissionais no setor, medidas descritas na literatura que contribuem para diminuir a sobrecarga e melhorar as condições de trabalho e a qualidade de vida dos profissionais.

Descritores: Análise quantitativa, Anormalidades musculoesqueléticas, Enfermagem prática, Equipe de enfermagem, Ortopedia.

INTRODUCTION

Musculoskeletal disorders are an important cause of morbidity in workers in developed and developing countries[1-4]. Many studies have highlighted the important role of stressful physical activities, psychosocial risk factors and health beliefs, culturally determined in the generation and progression of musculoskeletal injuries. Individual characteristics and cultural circumstances also appear to interfere in the prevalence of these health problems[5-9].

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Submitted in May 04, 2017.
Accepted for publication in October 09, 2017.
Conflict of interests: none – Sponsoring sources: none

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Normative Instruction Nº 98 of the Brazilian Ministry of Health[10] defines musculoskeletal disorders as a set of signs and symptoms of pain, paresthesia, weight sensation, fatigue, movement limitation and incapacity to work. These signs can arise in isolation or simultaneously, and determine work-related musculoskeletal disorders (MSD) and repetitive strain injuries (RSI).

Queiroz et al.[11] refer to musculoskeletal pain as a set of inflammatory and degenerative diseases of the locomotor system. Ranney[12] relates this concept to professional activities, mentioning that there is an imbalance between the repeated mechanical demands of the work and the ability to adapt the body zone reached due to insufficient time for fatigue's recovery. Several studies report that musculoskeletal disorders are frequent in nursing professionals in different fields of activity. These studies indicate that the main anatomical regions affected are the lumbar, the knees, the shoulders and the cervical[13,14].

Nursing professionals are key players in any healthcare team. They perform the most varied functions, work for continuous hours or have more than one job, reflecting the low appreciation of the profession. The American Nursing Association[15,16] defines Nursing as the protection, promotion, and optimization of health. Also, according to this organization, it is the responsibility of the nursing professional to act in the prevention of diseases and injuries, in facilitating healing, in alleviating suffering through diagnosis and treatment of the human being, and in the care of individuals, families, groups, communities and the general public.

In their daily exercise, nursing workers are responsible for moving and dislocating patients. These workers spend a lot of time standing and work with ergonomically obsolete equipment, and may still have very few hours of sleep and rest. Such conditions are predictive factors for exposure to occupational risks and reflect the high rates of removal from work, medical leave and disability retirement[13,17].

Nurses working in hospitals are particularly susceptible to work-related musculoskeletal disorders, as their work activities often involve inadequate postures and strong upper limb movements. In addition, there is a high prevalence of back, neck and shoulder pain[18]. These complications may reflect in varying degrees of functional disability, resulting in increased absenteeism, temporary or permanent removals, as well as treatment costs and indemnities[19]. In addition, as a result of absences from work, the nursing staff becomes even more overwhelmed, which makes it easier for other workers to get sick, forming a vicious cycle.

In the context of hospital institutions, orthopedics represents a section that has intense demands. This sector is responsible for the care of patients with diseases, traumas, bones deformations of bones, muscles, joints, and ligaments, therefore, it is the sector that treats patients who underwent surgical and physical interventions to treat and correct deformities, diseases and injuries in the skeletal system, in their joints and associated structures[20].

All the efforts related to occupational legislation up to now seem not been enough, as the prevalence of musculoskeletal disorders remains high in the most diverse professions, especially in nursing.

In view of the above, the present study sought to answer the following question: what is the prevalence of musculoskeletal pain in orthopedic nursing professionals of a large public hospital in the South of Brazil.

METHODS

This study included nurses, technicians and nursing assistants who were in the study site. The hospital's orthopedic sector had a total of 34 professionals. Exclusion criteria were those who were removed by medical leave or on vacation during the collection period, as well as those who had been working in the institution for less than a year. Thus, the number of participants was 29 nurses.

Data were collected from September to October 2016. Participants were invited to answer a questionnaire in an appropriate place in the institution, thus avoiding possible sampling losses. The questionnaire was delivered to the study participants by the researchers, who provided the necessary guidance and clarification. Due to the demand of the different work periods and the worker's availability, the collection was carried out in more than one moment.

The instrument used to evaluate the outcome variable, musculoskeletal pain, was the *Nordic Musculoskeletal Questionnaire* (NMQ)[21], adapted and validated for the Brazilian population. This instrument was developed with the proposal of standardizing the reports measurement of musculoskeletal symptoms in order to facilitate the comparison of the results of the studies.

The survey questionnaire was divided into four parts. The first part was related to sociodemographic information such as age, gender, body mass, height, number of minor dependents, marital status, schooling, monthly income and socioeconomic data. These latter were evaluated using the socioeconomic classification criterion of the Brazilian Association of Research Companies[22], widely used in Brazilian's research. This analysis considers the ownership, the education level of the family head and access to public services (piped water and paved street), classifying the subjects in the strata: A, B1, B2, C1, C2, D and E. The weight status was classified according to the Brazilian Guidelines for Obesity[23]. For analysis purposes, subjects with a body mass index (BMI) lower than 18.5 were considered as low weight, those with a BMI≤24.9 as normal weight, those with a BMI between 25.0 and 29.9 as overweight and obesity in cases of participants having a BMI equal to or greater than 30.0.

The second part included labor information, such as the type of work performed, working time at the institution, working time in orthopedics, if in leadership position, academic education, time of graduation, work shift, time working in the informed shift, if working only in orthopedics, if

he has another bond of paid work, if he has been removed from work and the reason for his removal. In addition, the information on the weekly workload, as well as the hours on call, were provided by the unit's coordinating nurse.

The third part of the questionnaire looked for information about habits and lifestyle, such as smoking, physical activity practice, and practice of domestic activities. In the fourth and last stage, information on musculoskeletal pain was collected. Based on a human figure in anatomical position, divided into nine regions: cervical, shoulders, thoracic, elbows, wrists/hands, lumbar, hip/thighs, knees and ankles/feet, musculoskeletal pain was assessed considering two moments, the last 12 months and the last seven days. In addition, NMQ allows the respondent to answer about the impediment to performing activities and the search for health professionals, both by anatomical region.

All participants were asked to respond to the questionnaire voluntarily, after being aware of the research objectives. From this, they signed the Free Informed Consent Form (FICF). All ethical procedures were in accordance with Resolution Nº 466/2012[24] of the National Health Council (CNS), which regulates such research procedures in humans. The study was approved by *Universidade Paulista (UNIP)*'s Research Ethics Committee, under number 1,676,533 / 2016, and only after its approval the researchers started data collection.

Statistical analysis

The data were tabulated in Microsoft Excel® software version 2010 for Windows. Descriptive analyzes of the variables investigated were performed using averages, frequency (absolute and relative) and standard deviations. Statistical Package for the Social Sciences (SPSS) for Window was used for descriptive statistics.

RESULTS

Study results were presented in four parts: sociodemographic profile; labor characteristics; habits and lifestyles; and musculoskeletal pain. Twenty-nine nursing professionals working in orthopedics participated in the study, being three auxiliaries, 23 technicians, and three nurses.

The sociodemographic characteristics of the study participants are presented in table 1.

It was observed that the majority (86.2%) of the 29 professionals were female, with an average age of 41.3±9.4 years. The anthropometric measurements of self-reported body mass and height were used to calculate BMI. It was verified that the average BMI obtained, 26.2±4.2, indicated a value above the established limit (24.9) for eutrophic individuals (normal weight in relation to height), according to the Brazilian Guidelines for Obesity[23]. In addition, almost 60% of the participants were over the weight considered normal according to height.

Nursing professionals' majority reported having dependents (62.1%). In relation to the number of children, the average was one child per participant. Regarding the marital situation, it was identified that 72.4% had a partner. Regarding the level of education, the majority (72.4%) of nursing professionals stated that they had completed high school and/or technical education, 13.8% had a higher education level, and 13.8% reported having a postgraduate degree.

Table 1. Sociodemographic characteristics of the participants

Variables	Indexes
Age, (years±SD)	41.3±9.4
Gender, n (%)	
Male	4 (13.8)
Female	25 (86.2)
Body mass index (kg/m²±SD)	26.2±4.2
Body mass, n (%)	
Low weight	1 (3.4)
Normal weight	11 (37.9)
Overweight	12 (41.4)
Obesity	5 (17.2)
Dependent, n (%)	
Yes	18 (62.1)
No	11 (37.9)
Number of children	1
Marital status n (%)	
With partner	21 (72.4)
Without partner	8 (27.6)
Education, n (%)	
High school/technical	21 (72.4)
Higher education	4 (13.8)
Postgraduate studies	4 (13.8)
Income (R$±SD)	3,652.0±1,826.7
Socioeconomic classification, n (%)	
A	2 (6.9)
B1	6 (20.7)
B2	7 (24.1)
C1	12 (41.4)
C2	2 (6.9)
D-E	-

According to the socioeconomic classification criterion of ABEP[22], it was evidenced that the nursing professionals participating in the study belonged, in decreasing order, to the following economic classes: C2 (6.9%), C1 (41.4%), B2 (24.1%), B1 (20.7%) e A (6.9%).

Table 2 shows the results related to the work activity of the professionals who answered the questionnaire. It was identified that the majority of professionals (65.5%) performed operational functions. However, there was a high index of professionals who declared that they performed administrative and operational functions (27.6%) and only two (6.9%) had exclusive administrative functions. The average working time was 11.2±10.1 years, and the average working time in the orthopedic sector of the referred hospital was 9.1±7.4 years.

Only three of the nursing professionals (10.3%) held leadership positions. The academic education was described in three groups: nursing technicians (79.3%), nursing as-

Table 2. Labor characteristics of participants

Variables	Indexes
Type of work performed, n (%)	
Administrative	2 (6.9)
Operational	19 (65.5)
Both	8 (27.6)
Time at institution (years±SD)	11.2±10.1
Time in orthopedics (years±SD)	9.1±7.4
Leadership position, n (%)	
Yes	3 (10.3)
No	26 (89.7)
Academic education, n (%)	
Assistant	3 (10.3)
Technical	23 (79.3)
Nurse	3 (10.3)
Time of professional qualification (years±SD)	15.4±8.6
Work shift, n (%)	
Morning	3 (10.7)
Full-time	16 (57.1)
Night	9 (32.1)
Time on shift (months±SD)	75.3±97.8
Weekly workload (hours)	30.0
Weekly duty hours (hours)	12.0
Performance only in orthopedics, n (%)	
Yes	28 (96.6)
No	1 (3.4)
Other paid activity, n (%)	
Yes	6 (21.4)
No	22 (78.6)
Weekly workload at the other institution (hours±SD)	6.9±13.0
Reports of work removals, n (%)	
Yes	19 (65.5)
No	10 (34.5)
Removals per professional in the last 12 months, (X±SD)	2.3±1.2
Reason for removal, n (%)	
Pain	8 (42.1)
Stress	-
Work accident	1 (5.3)
Diseases	2 (10.5)
Other reason	1 (5.3)
Pain/stress	3 (15.8)
Pain/disease	2 (10.5)
Pain/work accident	2 (10.5)

sistants (10.3%) and nurses (10.3%). The time of professional education was on average 15.4±8.6 years.

Regarding the shift in which the nursing professionals worked, the majority (57.1%) reported working full-time, followed by night shifts (32.1%) and morning shifts (10.7%). The average workload obtained by the head nurse was 42 hours per week, already added the hours on duty. Although the work regime adopted by the state is of 30 h per week, most of them did in average 12h a week complementary. In addition, six professionals (21.4%) worked in another paid activity, in addition to the one in the sector where the research was performed, adding a weekly load average of 6.9 ± 13.0h.

From nursing professionals involved in the research, 19 (65.5%) reported having already been removed from work for health reasons. Among these, 42.1% reported that their removal was due to musculoskeletal pain, another seven workers (36.8%) declared other reasons as the removal cause.

Regarding habits and lifestyle, most professionals (82.8%) reported not being a smoker, and 51.7% of them reported they performed physical activities. All professionals affirmed to perform domestic activities, with an average of 5.7±2.2 days per week.

Research results analysis showed that 96.6% of professionals reported musculoskeletal pain in at least one of the body parts in the last 12 months. Table 3 presents data on the Nordic instrument that evaluates musculoskeletal pain. It was identified, among the nursing professionals analyzed, considering the last 12 months that the anatomical regions with the highest rates of musculoskeletal pain were: the lower back (79.3%), followed by the upper back (75.9%), neck (65.5%), shoulders (62.1%), ankles/feet (55.2%) and wrists/hands (51.7%).

Still considering the last 12 months, it was observed that the nursing professionals surveyed reported having been prevented from performing any activity due to musculoskeletal pain. The most affected anatomical regions were: ankles/feet (34.5%), upper back (31%), wrists/hands (27.6%), and lower back (24.1%). As a result of the musculoskeletal pain pre-

Table 3. Prevalence of musculoskeletal pain by body regions

Variables	Indexes			
Body parts	Problems like pain, tingling/numbness (last 12 months)	Impediment to performing normal activities in the last 12 months	Consultation with a healthcare professional in the last 12 months	Presence of a problem in the last 7 days
Neck, n (%)	19 (65.5)	6 (20.7)	9 (31.0)	8 (27.6)
Shoulders, n (%)	18 (62.1)	6 (20.7)	4 (13.8)	9 (31.0)
Upper back, n (%)	22 (75.9)	9 (31.0)	10 (34.5)	11 (37.9)
Elbows, n (%)	7 (24.1)	3 (10.3)	3 (10.3)	5 (17.2)
Wrists/hands, n (%)	15 (51.7)	8 (27.6)	6 (20.7)	8 (27.6)
Lower back, n (%)	23 (79.3)	7 (24.1)	9 (31.0)	11 (37.9)
Hip/thighs, n (%)	10 (34.5)	6 (20.7)	6 (20.7)	9 (31.0)
Knees, n (%)	10 (34.5)	6 (20.7)	5 (17.2)	8 (27.6)
Ankles/feet, n (%)	16 (55.2)	10 (34.5)	7 (24.1)	9 (31.0)

sented, many of them sought specialized care in the last 12 months in an attempt to solve the problem. The upper back (34.5%), the lower back (31%) and the neck (31%) were the main anatomical regions responsible for seeking help. Regarding the musculoskeletal pain reported in the last seven days, the prevalence was 65.5% among the professionals analyzed. The anatomical regions reported as the greatest pain in this period were: upper and lower back, both with 37.9%, and shoulders, hip/thighs and ankles/feet, all with 31%.

The prevalence of musculoskeletal pain was also described according to the worker's academic education. In nursing assistants, the most affected regions were: shoulders, neck and ankles/feet with an index of 100.0%. With the same group of professionals, there was a high index of pain in other regions such as upper and lower back, elbows and wrists/hands, all with 66.7% of prevalence. Among nursing technicians, the main musculoskeletal pain was found in the upper and lower back, with 82.6 and 78.3%, respectively. Besides, neck (65.2%), shoulders (60.9%), wrists/hands (52.2%) and ankles/feet (52.2%) also obtained a high prevalence of pain among these professionals. Finally, the body regions with the greatest pain among nurses were: upper and lower back, both with a prevalence of 66.7% (Figure 1).

Figure 2 shows the number of body parts affected by musculoskeletal pain stratified by academic education. It was identified that nursing assistants had a greater number of pain regions (6.3), followed by nursing technicians (4.7) and nurses (3.6). With this analysis, it can be inferred a tendency to decrease the number of body parts affected by musculoskeletal pain as the academic title of nursing professionals increases.

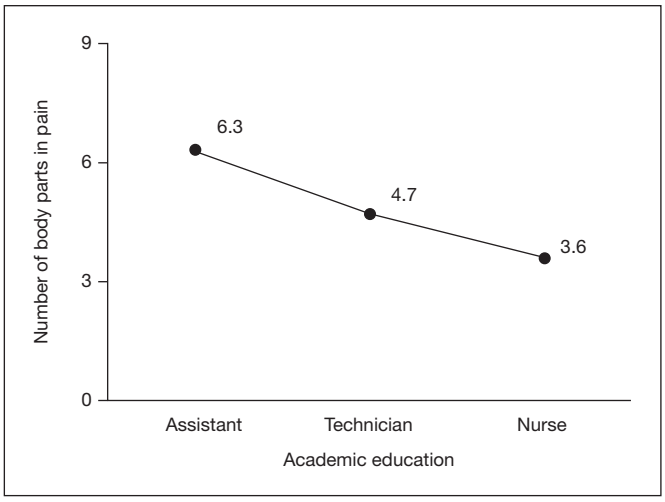

Figure 2. Number of body parts with pain according to academic education

Although it was not possible to identify associations between musculoskeletal pain and work shift, full-time workers had a higher prevalence in practically all body regions analyzed. The exception was the elbow region, which had a higher prevalence (42.9%) among night shift workers.

DISCUSSION

Research result identified that 96.6% of professionals reported musculoskeletal pain in at least one of the body parts in the last 12 months. This high prevalence has also been identified in previous studies with this popula-

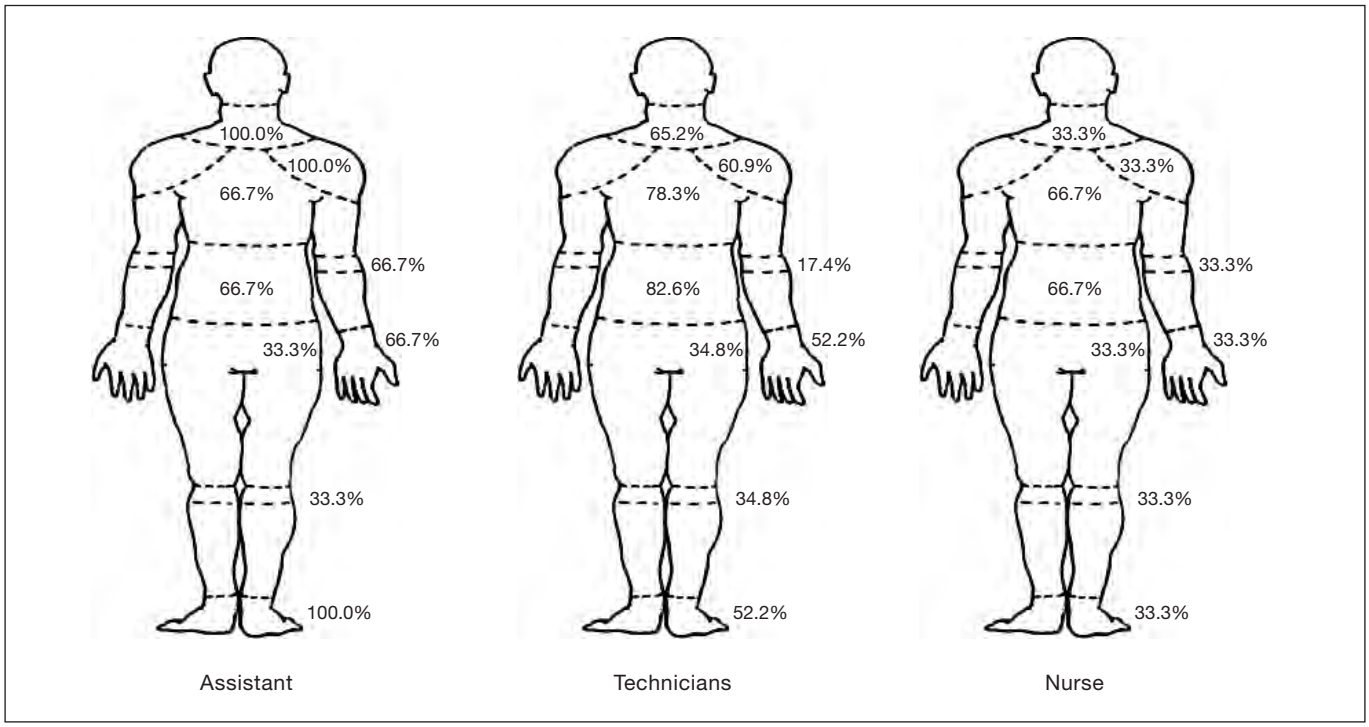

Figure 1. Percentage of musculoskeletal pain reported by the three categories of nursing workers by body region

tion in Brazil[25,26], and in other countries, such as Italy[27], Nigeria[28] and Estonia[29]. Thus, this situation seems to be the same, regardless of location and seems to be a consequence of nursing practice, and thus, more clarification is needed to improve the professionals' work quality and health.

Regarding the anatomical regions reported with musculoskeletal pain, the body parts with the highest prevalence identified in the present study were upper and lower back (79.3 and 75.9%, respectively), neck (65.5%), shoulders (62.1%), and wrists and hands (51.7%). The studies already mentioned also performed this same analysis and corroborate the results found. D'Agostin and Negro[27], for example, compared nursing professionals and workers of a university in Italy and identified a higher prevalence of musculoskeletal pain in nursing professionals compared to the other individuals analyzed. Authors reported that the most affected anatomic regions among nursing professionals were the lower back (lumbar) (61.0%) and shoulders (36.7%). In the De Souza Magnago et al.[25] study, the region with the highest prevalence of pains was also the lumbar region (71.5%). In another study with 416 nurses, Freimann et al.[29] identified lumbar (56.1%) and neck (52.0%) as the most affected regions.

It is worth noting that among the studies found in the literature, a high prevalence of musculoskeletal pain in the hand and wrist region was not identified, as in this research (51.7%). This suggests that the work characteristics in orthopedics exert a direct influence on these body regions. Researchers Ribeiro et al.[30] reported a 26.9% prevalence in this body region in their sample, composed of nursing workers from the orthopedics and traumatology sector of a hospital in Salvador, Bahia. Despite being relatively low compared to the results of the present study, the authors justify this index due to repetitive movements, the muscular force exerted when handling patients, which are characteristics similar to the workers in the orthopedic sector of the present study. This suggests that the repetitive movements and patients handling is an aggravation factor of this question.

Another important indicator regarding musculoskeletal pain refers to the pain's presence in the last seven days. This prevalence was 65.5% among the professionals analyzed. In the same way as the prevalence in the last 12 months, the value identified in this research was similar to that found in previously published studies[25,31]. In Raithatha and Mishra's[31] work with nursing workers in India, this value was 60.5%. De Souza Magnago et al.[25] in a survey carried out with 491 nurses from the *Hospital Universitário de Santa Maria*, this index was 73.1%. These data are important to be taken into account since they portray the pain occurrence in a recent period and may be associated with the number of attendances and the excessive workload at the health institution in the week prior to the collection. Authors De Souza Magnago et al.[25] relate in their findings the psychological load to which these professionals are submitted, and classify the exercise of the nursing profession as a "high labor demand." This classification is based on the two-dimensional Demand-Control model at work, proposed by Karasek and Theörell[32]. Authors classify this condition (high requirement) as high demand and low control of activities. These types of activities have important repercussions on worker physiology, such as high production of cortisol (stress hormone), with direct action on the musculoskeletal system. Its chronic increase may influence muscle atrophy and decreased strength[33], with a consequent effect on pain responses.

One of the important consequences related to musculoskeletal pain is absenteeism or the absence of work. In this study, 65.5% of the professionals analyzed reported they had been absent from work in the last year due to health reasons. Among these, the absence average was 2.3±1.2 times per year. It is noteworthy that among the reasons for this absence, 42.1% of the respondents stated they were exclusively due to musculoskeletal pain and other 36.8% reported the pain was associated with another type of occurrence, such as stress, illness and/or work accidents. These data are corroborated by the literature. An integrative review on the theme[34] identified that the main cause of work absences is related to musculoskeletal pain, and among these, scientific evidence points to low back pain as a prominent feature[35]. This region was the most prevalent among the workers analyzed in the present study, which may justify the high rate of absenteeism identified.

Main strategies adopted by health institutions to reduce these indexes are preventive actions of health education and the staff dimensioning[34], once the absenteeism is considered a problem for organizations, since it has a negative influence on costs with the labor replacement that, when not replaced, causes an overload to the other workers; and leads to a decrease in the care quality provided to patients and to an increase in the chances of new pain events in other professionals[36].

In addition, for the worker, the damages go beyond the loss of working days. Absences are associated with demotivation, low self-esteem and a decrease in the professional's quality of life[37].

One of the main factors associated with musculoskeletal pain among nursing professionals identified in the literature is related to the professional nursing practice itself. However, it was not the present study's objective to identify the work routines. Yet, it is known that the activity of moving, transferring, and transporting the patient is part of the nursing professionals' daily routine, which is related to pain, especially in the lumbar region[38]. In addition, it is part of these professionals' routine to remain standing for long hours, and this is a significant risk factor for pain in this region, in the ankles and feet[39].

Another factor that must be taken into account is the weekly workload. In the present study, the average of worked hours was 42 hours per week. Besides, six work-

ers reported having a second labor activity, and all stated they performed domestic activities. According to Prieto, Múnera and López[40], muscles, tendons, ligaments and articular capsules, human body's structures that allow the movement and the execution of numerous activities, need rest for its recovery. Overwork seems to have harmful effects on health; and, in addition to increasing the likelihood of musculoskeletal injuries, increase the chances of work accidents, fatigue, psychological symptoms and cardiovascular diseases[41]. Thus, excessive work hours, including on-call hours, along with the second work activity and daily activities, may contribute to muscle fatigue and be associated with the high prevalence identified in the present study.

With regard to sociodemographic characteristics, it can be affirmed that the nursing profession is culturally exercised mostly by women. Previous studies have shown that women have lower capacity than men to support high loads due to coping mechanisms[25] and their biomechanical characteristics[40]. The fact is that, in most cases, women still have the household demands and chores. In this way, women may be more susceptible to the greater presence of pains when compared to men. These factors are strengthened with the advancing age, due to the aging process, since the older the worker, the more sensitive he becomes to the adverse events caused by the work. This issue is corroborated by the average age of the workers analyzed (X = 41.3±9.4) years.

Another relevant question concerns the socioeconomic level. This variable is quite complex and, in general, takes into account schooling, occupation, and family income, or a combination of these[42]. Although the average income was considered satisfactory (R$ 3,652.0±1826.7), most of the workers analyzed were classified, according to ABEP[22], in the economic stratum C1. This dissonance is justified by ABEP's own criteria, which takes into account consumer goods and may not accurately reflect the actual socioeconomic level of the workers analyzed. However, recent studies have pointed out that better living conditions, such as higher income and quality of life, are determinants in the health/disease process[43].

One of the most relevant current issues with regard to worker health is shift work, especially night work. According to the International Agency for Research on Cancer (IARC)[44], night work is considered a risk factor, being associated with cancer in humans, on the same level as smoking and sun exposure, and is associated with other disorders, including the musculoskeletal pain[45], mainly due to the physiological alterations to which the worker is submitted and the biological rhythms' changes caused by the exchange of sleeping and vigil hours from night for day[46]. Besides, during sleep, physiological processes occur directly in the body that aid in tissue recovery[47]. However, in the present study, the highest prevalence of musculoskeletal pain was identified in full-time workers. Unfortunately, it was not possible to perform inferential analyzes due to the small number of workers analyzed. However, when we analyzed the number of body parts in pain, night workers obtained the highest averages (X=5.1±2.8), compared to morning workers (X=4.0±1.0) and full-time (X=4.8±2.6). Therefore, it is believed that the lower prevalence of pain in night workers may be masked due the reduced number of workers analyzed.

An important indicator of health is BMI. This index is a parameter widely used in epidemiological studies for weight classification (low weight, normal weight, overweight, and obesity). High BMI or overweight and obesity are considered risk factors for several diseases, including cardiovascular problems, hypertension, and diabetes[23]. In the present study, almost 60% of workers were classified as overweight/obese. Corroborating this prevalence, in the study of De Souza Magnago et al.[25] nursing workers also presented high BMI values. For the authors, the main anatomical regions with pain associated with high weight were the elbows, the lumbar spine, the thighs and the knees. In addition, Sapia, Felli, and Ciampone[48] identified the relationship of elevated weight with the physiological process of wear in ambulatory nurses, such as varicose veins, microvessels, and feet callosities. Therefore, the relationship of pain with high weight is pointed out as a limiting factor for the overload of work in the day to day functions. Workers of adequate weight, in general, have a greater capacity to support the workloads. However, care must be taken in these statements, since normal weight does not necessarily reflect a good physical conditioning of the subject. This relationship can be justified by the higher number of professionals who regularly practice physical activities (48.3%), compared to workers with normal weight (37.9%). Thus, it is necessary to encourage regular physical activity practices for all professionals, in order to improve physical capacities such as strength, flexibility and localized muscular endurance, aiming at a better quality of life and ability to work. Besides, it is crucial to implement weight control programs for this group of workers.

Finally, the present study results indicate that nursing assistants have a higher frequency of musculoskeletal pain in the anatomical regions of the shoulders, neck, elbows, hands/wrists and feet/ankles. Previous studies have associated musculoskeletal pain with low academic education[49]. In this sense, it was identified that, as the education level of workers increases, the number of body parts reported with pain is smaller (Figure 2). Comparing technicians and nurses, it is possible to identify a higher prevalence of musculoskeletal pain in practically all anatomical regions (Figure 1). This information suggests, according to Tezel[50], that nursing technicians' experience greater material's manipulation and, therefore, may be more exposed to develop musculoskeletal injuries compared to nursing bachelors.

The number of professionals participating in this study should be considered as a study limitation, which made it impossible to perform inferential analyzes of statistical

association between the variables. In addition, the cross-sectional design of the research prevents the evaluation of the cause and effect relationship. However, no other research with a sample composed exclusively of nursing workers from the state of Santa Catarina was identified in the literature. Thus, this study can be used as an initial reference for future research, indicating the prevalence of musculoskeletal pain in nursing workers in this state.

CONCLUSION

The prevalence of musculoskeletal pain in nursing professionals working in the orthopedic sector was considered high. Most affected anatomical regions were the upper and lower back, neck, shoulders, ankles/feet, and wrists/hands. It was not possible to identify statistical associations between musculoskeletal pain and sociodemographic, labor and lifestyle variables due to the limited number of participants number in the study.

Thus, new research should be performed with a greater number of subjects, in order to establish statistical inferential relationships. In addition, regular training programs aimed at worker health and safety is suggested, seeking to prevent complications caused by work overload. Such as, for example, workplace exercise, a training course on ergonomic issues at work, implementation of pre-established pauses and weight control programs. It is highlighted that musculoskeletal pain among nursing professionals reflects on the care provided to people. Finally, it is believed that a greater number of professionals in the orthopedic sector would improve the worker health, with the workload reduction among nursing professionals.

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Pain and palliative care: the knowledge of medical students and the graduation gaps

Dor e cuidados paliativos: o conhecimento dos estudantes de medicina e as lacunas da graduação

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DOI 10.5935/1806-0013.20170120

ABSTRACT

BACKGROUND AND OBJECTIVES: Currently, the medical course does not provide complete education and handling of pain, and it is also devoid of disciplines addressing thanatology in palliative care. The objective of this study was to evaluate the knowledge about pain and palliative care of medical students and their perception on how these themes are taught the graduation course.
METHODS: We invited to participate in the survey students of the medical school who are concluding the fourth, fifth and sixth year of graduation at the Federal University of Health Science of Porto Alegre. The demographic and characterization data of the sample were collected, and a questionnaire was applied and validated with 19 direct questions about pain and palliative care.
RESULTS: Forty-seven students agreed to participate in the study. The vast majority mentioned not receiving enough information during the undergraduate program about the proper handling of patients with pain, and patient care in a terminal situation.
CONCLUSION: This study highlights education gaps on pain and palliative care in medical schools. It shows the difficulties of the students have to put the theoretical knowledge into practice, for example, their insecurity in handling pain, especially when it comes to the use of opioids.
Keywords: Academic institutions, Analgesia, Medical students, Palliative care, Students.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Atualmente, o curso de medicina não contempla de forma completa o ensino e o manuseio da dor, assim como é desprovido de disciplinas que tratem da tanatologia abordando os cuidados paliativos. O objetivo deste estudo foi avaliar o conhecimento sobre dor e cuidados paliativos por parte dos estudantes de medicina e a sua percepção sobre o ensino dessas temáticas durante a graduação.
MÉTODOS: Foram convidados a participar do estudo os alunos do curso de medicina que estavam finalizando o quarto, quinto e sexto anos de graduação na Universidade Federal de Ciências da Saúde de Porto Alegre. Os dados demográficos e de caracterização da amostra foram coletados e foi aplicado um questionário validado com 19 perguntas diretas sobre dor e cuidados paliativos.
RESULTADOS: Quarenta e sete alunos aceitaram participar da pesquisa. A grande maioria referiu não receber informações suficientes durante o curso de graduação em relação ao correto manuseio de pacientes com dor, e sobre o cuidado de pacientes em situação terminal.
CONCLUSÃO: Este estudo apontou lacunas no ensino sobre dor e cuidados paliativos na graduação médica. São demonstradas as dificuldades dos alunos em transpor o conhecimento teórico para a prática profissional, a exemplo da insegurança no manuseio da dor, especialmente em se tratando do uso de opioides.
Descritores: Analgesia, Cuidados paliativos, Estudantes, Estudantes de medicina, Instituições acadêmicas.

INTRODUCTION

Care provision by health professionals to patients with pain allows the rational use of the health system and drugs, in addition to humanitarian aspects involved. It also provides a reduction in disabilities and absenteeism due to pain. Consequently, public health care expenditures and the psychosocial and economic repercussions due pain[1] are reduced. In addition, the pain presence is associated with a longer hospitalization period[2], and its evaluation is related to the reduction of analgesic use and mechanical ventilation duration[3]. However, it still occurs in professional health institutions that do not have enough capacity to recognize, evaluate and take effective measures to control the pain symptom[4].

Correct pain control and its treatment face barriers related to 1) professionals' knowledge deficit in relation to pain phenomenon dimension; 2) reluctance to use opioid analgesics due to lack of knowledge[5-7]; 3) belief in pharmacological dependence; 4) difficulty in believing the patients manifestation in response to pain experience and interventions to ameliorate it[4].

As with knowledge about pain, knowing about palliative care is fundamental to deciding on the best behavior, once

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Submitted in April 04, 2017.
Accepted for publication in October 23, 2017.
Conflict of interests: none – Sponsoring sources: Taxa Capes/ppgeh/UPF.

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is through this the physician will be able to integrate psychological, social and spiritual aspects in the care, having good communication with the patient, his family, and the multiprofessional team and promote autonomy by providing diagnostic and prognostic's information[8].

Most of the medical curriculum briefly integrate the pain issue and in clinical stages, this is often a non-existent subject[9-11]. Indeed, in a study conducted at the University of Michigan, only 10% of physicians had received formal education about pain and its treatment during medical school, medical residency and/or continuing education[12]. Therefore, lack of knowledge about pain makes it difficult for physicians to correctly diagnose and treat it, which reveals the need to improve pain education during undergraduate medical courses[13,14].

Likewise, many medical curricula are devoid of disciplines dealing with the thanatology addressing palliative care. The teaching of health professionals, including the physician, is more technical-oriented, sometimes neglecting the human side[8]. Therefore, as with pain, palliative care is not sufficiently taught during graduation[15,16]. In Brazil, knowledge about palliative care is often acquired in other undergraduate fields as an intuitive feature due to lack of specific training[17].

This study aimed to evaluate the knowledge about pain and palliative care, and the perception about these subjects' teaching during graduation, by the students at the end of the fourth, fifth and sixth years of the medical course at The Federal University of Health Sciences of Porto Alegre (UFCSPA).

METHODS

All students of UFCSPA medical course, which in December 2016 were finishing their fourth, fifth, or sixth year of graduation, were invited to participate anonymously and voluntarily, totaling 264 students. Researchers contacted the survey undergraduates via online networks. The Free Informed Consent Form (FICF) was sent, and the questionnaires were made available through Google Docs.

All 264 students in the fourth, fifth, and sixth years of the UFCSPA medical course were invited to participate in the study, and the final sample consisted of all the students who answered the online instrument, being, therefore, a non-probabilistic sample.

Questions were asked to characterize the sample, including the year of the student's education, gender, marital status, the previous need for medical care in the medium or long term, health plan and medical specialty to be chosen after graduation. Students' satisfaction with the undergraduate course and their performance were evaluated using the visual analog scale (VAS) from zero to 10 (zero indicating dissatisfaction and 10 indicating total satisfaction). To verify knowledge about pain and palliative care, a questionnaire with 19 direct questions on these subjects, previously validated[18] and applied in a study with medical students from the State of São Paulo[19] was applied.

The Ethics and Research Committee in Human Beings of UFCSPA, protocol No. 2,162,651 of July 7, 2017, approved this study.

RESULTS

From the variables obtained in the socioeconomic questionnaire, it was possible to identify the profile of the 47 students who agreed to participate in the research. Undergraduates of the fifth year are the majority (46.8%), followed by the fourth year (42.6%) and sixth year (10.6%). The male sex (53.2%) and the single marital status (97.5%) prevailed. In relation to the specialization area, 18 areas were mentioned, of which are highlighted surgery, with 11 interested students, neurology with 5, dermatology and pediatrics both with 3. Regarding access to health through plans, most of them enjoy private access (78.7%), and only 14.9% have reported having already needed medical care for the medium or long term. Students' satisfaction with the medical course, and with their own performance in the undergraduate course, both received a score of 8 with higher frequency (44.7 and 29.8% of the sample, respectively).

With regard to theoretical knowledge, it is seen that: 97.9% of students answered they know some scale for pain assessment; as well as 80.9% of participants reported knowing the World Health Organization's "analgesic ladder" for pain handling; 97.9% stated they know the difference between nociceptive pain and neuropathic pain; 74.5% are aware of the antidepressants action mechanism in pain handling. On the other hand, the problem of clinical practice stands out: 78.7% of students report insecurity in the analgesia handling of cancer patients; 76.6% do not know which drug and dose to start opioid treatment; 87.2% do not know the equivalents for rotating opioids; 76.6% do not feel confident about prescribing opioids.

Objective questions were applied with a "yes" or "no" response to evaluate the knowledge of medical students about pain and palliative care (Table 1).

Table 1. Medical students' knowledge and perceptions of pain and palliative care

Questions	Yes (%)	No (%)
Do you believe that during graduation you received enough information to handle the pain patients?	23.4	76.6
Is there a specific discipline of pain in your college?	19.1	80.9
Do you believe that during graduation you received enough information about the care of terminally ill patients?	10.6	89.4
Do you know the World Health Organization's definition of palliative care?	53.2	46.8
Do you know the difference between nociceptive and neuropathic pain?	97.9	2.1

Continue...

Table 1. Medical students' knowledge and perceptions of pain and palliative care – continuation

Questions	Yes (%)	No (%)
Do you know any scale for pain assessment?	97.9	2.1
If you answered yes to the previous question, do you always use scales to evaluate patients with pain?	40.4	59.6
Do you believe that during graduation you received enough information about controlling the most common symptoms (dyspnea, vomiting, constipation, and cachexia) in patients under palliative care?	19.1	80.9
Did you learn during undergraduate communication tools and medical posture to "give bad news" to patients and family members?	40.4	59.6
Do you think it is necessary to improve your knowledge in the treatment of patients with pain?	100	0
Do you know the World Health Organization's "ladder" for pain handling?	80.9	19.1
If you treat an oncology patient with pain, would you feel safe to start analgesia handling?	21.3	78.7
Do you know which drug and dose to start an opioid treatment?	23.4	76.6
Do you know the equivalences for rotating opioids?	12.8	87.2
With regard to the opioids handling, do you feel confident about prescribing them?	23.4	76.6
Is the respiratory depression your major fear of prescribing opioids?	51.1	48.9
Is chemical dependency your major fear of prescribing opioids?	34	66
Do you know the antidepressants action mechanism in pain handling?	74.5	25.5
Do you know the anticonvulsants' action mechanism in pain handling?	42.6	57.4

DISCUSSION

Pain is a problem with great impact on public health, since its prevalence is high, becoming the main complaint in 40% of the primary care services[20]. Similarly, a substantial part of primary health care involves patients with chronic pain[21]. In hospitalized patients, the pain prevalence is also high, possibly because the analgesics use is inadequate, which testifies the patient's lack of health care[22] and the tendency of health professionals to underestimating and neglecting the pain felt by the patients[23]. Thus, as a function of pain, hospitalized patients report a significant worsening of their functionality and greater suffering. There are data in the literature indicating pain's handling strategies need to be reviewed with the necessary criticism[24]. In view of the patient pain handling's lack of adequacy, it is necessary to look for significant knowledge deficits about principles currently accepted in the practice of pain handling, as well as beliefs that may interfere with the correct care of the patient's needs[25].

From this study results, it was possible to observe that the majority of the students reported not receiving enough information during the undergraduate course in relation to the correct handling of patients with pain (76.6%), being that all these students (100%) pointed out the need to improve their knowledge in the treatment of people with pain. Compared to a study conducted using the same questionnaire in the State of São Paulo, response rates for such questions were similar (58 and 97%, respectively)[19]. Thus, it is possible to infer the existence of a gap in the pain's teaching in medical schools nationwide; however, more studies would be necessary to confirm this hypothesis.

Along the same lines, there are international studies that point out similar deficiencies in medical schools[9]. Study results with medical students who graduated from five Finnish medical schools in 2001 show those definitions of pain, research on pain as well as aspects of pediatric and geriatric patients with pain were insufficiently taught. Only 34% of the students had access to in-depth studies on the subject, and only 15% had access to research projects in pain medicine. Besides, the lack of teaching about the concept of a multidisciplinary pain clinic was recognized by almost all students[26]. In another study, which reviewed the education of 368 licensed physicians in Michigan, it was shown that 30% did not report formal education on pain handling[12].

With regard to palliative care specifically, the results observed in the present study showed that students perceive the lack of theoretical knowledge about the subject, since they did not receive enough information about the care of patients in terminal situation (89.4%) or about control of most common symptoms (dyspnea, vomiting, constipation, cachexia) in patients undergoing palliative care (80.9%). These results are similar to those of a study conducted at the Alpert School of Medicine in the United States, where it was shown that fewer than a half of students had worked with terminally ill patients, and almost a quarter of medical students did not feel prepared for common symptoms' palliation including pain, nausea, shortness of breath and anxiety[27]. Thus, the study by Hermes and Lamarca[8] confirmed the need to reformulate the curriculum of medical schools, due to the lack of disciplines involving palliative care.

Regarding pain, a characteristic observed from this study is that many students have reported difficulty in handling patients who require analgesia, despite claiming to have theoretical knowledge on the subject. In this sense, Leila et al.[28] pointed out that when developing a pain education curriculum, the focus should be on pedagogical methods about how to help students apply the knowledge learned in their daily practice.

A study by Upshur, Luckmann, and Savageau[21] found dissatisfaction with medical education on pain, and the need for emphasis on patient-centered approaches to treatment, including skills to assess the risk of opioid abuse and dependence. Accordingly, Lebovits et al.[25] highlighted the unjustified fear of dependency as a misunderstood concept that needs to be revised. In this study, it was observed that 51.1% of students are more apprehensive about prescribing opioids for respiratory depression, and 34% are more afraid of chemical dependence. Therefore, it is clear that the need to demystify the use of opioids in medical schools persists.

Participated in this study only students from the UFCSPA medical course, and there is no specific discipline on pain in the undergraduate medical curriculum of this university. Despite this, 19.1% of the students answered affirmatively when asked about the existence of a specific discipline about pain in their college. In order to explain this result, it may be thought that these students have considered, in such response, the existence of the Anesthesiology discipline in the fourth graduation year or of optional disciplines on pain, which eventually are offered by the University.

CONCLUSION

It is important to emphasize the relevance of the discussion about pain education and palliative care in medical graduation since this implies the quality of health care delivery and that the present study results point to gaps in the teaching of these topics. It was also highlighted the students' difficulties in transposing theoretical knowledge into professional practice, such as insecurity in the pain handling, especially in the opioids use, are demonstrated.

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ORIGINAL ARTICLE

Pain tolerance and cardiorespiratory fitness in women with dysmenorrhea

Tolerância à dor e aptidão cardiorrespiratória em mulheres com dismenorreia

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DOI 10.5935/1806-0013.20170121

ABSTRACT

BACKGROUND AND OBJECTIVES: Hormonal changes are known to affect quality of life of women and may interfere in pain tolerance and cardiorespiratory exercise performance. Thus, the aim of this study was to evaluate and compare pressure pain tolerance threshold and cardiorespiratory fitness in women in luteal and follicular phases of the menstrual cycle.

METHODS: University students aged 18-30 years old with a regular menstrual cycle were evaluated for cardiorespiratory fitness (ergospirometry), pain perception through the visual analog scale and pressure pain tolerance (algometry).

RESULTS: When evaluated in follicular phase, the 13 participants exhibited a significant increase ($p<0.001$) in pain perception. Follicular phase also resulted in a significant reduction in pressure pain tolerance in all sites evaluated ($p<0.05$). At rest, follicular phase resulted in a significant increase ($p<0.05$) in systolic and diastolic blood pressure, but no effect was observed in heart rate. At peak exercise, follicular phase caused a significant reduction ($p<0.05$) in heart rate and peak VO2, without significantly affecting speed, test duration and indicators of metabolism efficiency.

CONCLUSION: Healthy women with dysmenorrhea show higher pain perception in follicular phase, which results in increased pain sensitivity and prejudice in hemodynamic aspects at rest and during exercise, as well as in cardiorespiratory fitness, without significant alterations in metabolism.

Keywords: Dysmenorrhea, Menstrual cycle, Pain threshold, Physical fitness.

RESUMO

JUSTIFICATIVA E OBJETIVOS: As mudanças hormonais afetam a qualidade de vida das mulheres e podem interferir na tolerância à dor e no desempenho cardiorrespiratório. Assim, o objetivo deste estudo foi avaliar e comparar o limite de tolerância de dor à pressão e a aptidão cardiorrespiratória em mulheres nas fases lútea e folicular do ciclo menstrual.

MÉTODOS: Estudantes universitárias de 18 a 30 anos de idade com ciclo menstrual regular foram avaliadas quanto à aptidão cardiorrespiratória (ergoespirometria), percepção de dor pela escala analógica visual e tolerância de dor à pressão (algometria).

RESULTADOS: Quando avaliadas na fase folicular, as 13 participantes apresentaram aumento significativo ($p<0,001$) na percepção da dor. A fase folicular também resultou em uma redução significativa na tolerância de dor à pressão em todos os locais avaliados ($p<0,05$). Em repouso, a fase folicular resultou em um aumento significativo ($p<0,05$) na pressão arterial sistólica e diastólica, mas nenhum efeito foi observado na frequência cardíaca. No pico de exercício, a fase folicular causou uma redução significativa ($p<0,05$) na frequência cardíaca e no VO2 máximo, sem afetar a velocidade, a duração do teste e os indicadores de eficiência do metabolismo.

CONCLUSÃO: Mulheres saudáveis com dismenorreia apresentam maior percepção de dor na fase folicular, o que resulta em aumento da sensibilidade à dor e prejuízo em aspectos hemodinâmicos em repouso e durante o exercício, bem como na aptidão cardiorrespiratória, sem alterações significantes no metabolismo.

Descritores: Aptidão física, Ciclo menstrual, Dismenorreia, Limiar de dor.

INTRODUCTION

During most part of life, women deal with hormonal cycles that generally occur at every 28 days, from menarche to menopause, regulated by the pituitary gland and ovaries through gonadotropic secretions[1]. These hormones affect psychological aspects, as well as musculoskeletal sensitivity and quality of life of women[2].

A regular menstrual cycle can be divided into three consecutive phases: follicular (which starts on the first day of menstruation), ovulatory (which can last up to 3 days), and luteal (from the end of ovulation to the beginning of a new menstrual flow. There are reports of clinical conditions related to these phases, such as insulin resistance, supraventricular tachycardia, Raynaud syndrome, sleeping disorders and migraine[3].

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Submitted in May 31, 2017.
Accepted for publication in November 01, 2017.
Conflict of interests: none – Sponsoring sources: Taxa Capes/ppgeh/UPF.

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Although regular exercise has been reported to reduce dysmenorrhea and physical and psychological symptoms[4], changes in cardiorespiratory fitness and function may also occur, most likely in response to changes in body temperature and metabolism, accompanying hormonal curves and influencing aerobic performance and muscle strength[3,5]. Regarding cardiorespiratory fitness, due to the growing rate of estrogen and higher secretion of noradrenalin in luteal phase, a significant improvement in exercise performance might be observed. However, in premenstrual stage performance exhibits a noticeable reduction related to the increase in progesterone levels[6].

Chantler, Mitchell and Fuller[7], found a significant reduction in time of treadmill test and in heart rate of women with dysmenorrhea exercising at follicular phase. Furthermore, there are also studies that could not identify any changes in flexibility, muscle strength, endurance, aerobic performance and reaction time over the menstrual cycle[1,8,9]. These controversies justify the expansion of information about cardiorespiratory fitness along the menstrual cycle, especially with regard to determinants of cardiorespiratory performance: maximal oxygen uptake (VO_2 max), ventilation (VE), ventilatory equivalent of oxygen (VE/VO_2) and carbon dioxide (VE/VCO_2), anaerobic threshold (AT) and respiratory compensation point (RCP). To the best of our knowledge no study so far has explored this issue.

When it comes to pain, it is more pronounced when estrogen levels fall[10]. However, a recent review[6] points out that most recent studies show no changes in sensitivity to pain during the phases of the menstrual cycle, yet the authors report that, as there is still no consensus on the influence of the cycle on the sensation of pain in healthy women, more studies on this topic are necessary.

Therefore, the aim of this study was to evaluate and compare pressure pain tolerance threshold and cardiorespiratory fitness in women with dysmenorrhea in luteal and follicular phases of the menstrual cycle.

METHODS

This transversal observational study, female university health students (nursing, physical therapy, nutrition and physical education) were recruited through public announcement in the classrooms of health courses at a private university in the city of São Paulo (Brazil). The ones who agreed to participate (n=21) were invited to attend at the Laboratory of Exercise Physiology, where more instructions about the research protocol were provided. Inclusion criteria were ageing between 18 to 30 years old, having a regular menstrual cycle (between 28 and 32 days)[3] and dysmenorrhea complaint. Students in use of hormonal contraceptives were excluded from the study, as well as current smokers, the ones who were in use of analgesic drugs, pregnant women or the ones who had already had babies, the ones with a history of uterine diseases and the ones who presented motor disabilities or did not perform one or more tests.

After receiving instructions on the research procedures, participants gave informed written participation consent, according to Declaration of Helsinki and Resolution 466/12 from the Brazilian Health Council.

Participants were assessed for anthropometry and body composition at their first visit to the Exercise Physiology Laboratory, where all study evaluations occurred. Height was measured with an appropriate stadiometer, and body weight was assessed in a digital scale with minimum possible clothes. Body composition was assessed by tetrapolar bioelectrical impedance, after 10 minutes of rest. The data collection team was composed by an exercise physiologist and a physical therapist.

All further assessments were conducted in two specific moments of the menstrual cycle[1,3]: premenstrual or luteal phase (10 to 15 days before menstruation) and menstrual or follicular phase (between the first and third day of menstruation).

Pain perception

Data regarding pain intensity were collected by the visual analog scale (VAS). VAS consists of a straight line of 10cm that has "zero" (no pain) in one extremity, and "10" (maximal pain) in the other. Every participant was asked to mark a cross on the line indicating her discomfort level. The closest to zero, the less the level of perceived pain, and the closest to 10, the worse perceived pain was.

Pressure pain tolerance threshold (PPT) corresponds to the amount of pressure an individual can tolerate in a given site, measured in pounds by algometry (JTech Medical, Salt Lake City, UT, USA). Reliability of this test has already been demonstrated[11]. Pressure was applied at a 90° angle (between the stimulation surface and the stimulated point) with a constant speed of 1kg/s. Volunteers were evaluated by the same examiner and equipment. The test was interrupted once the volunteer indicated the onset of pain, and the final amount of force applied was recorded. PPT was assessed bilaterally at the muscles vastus medialis, vastus lateralis, gluteus maximus, gluteus medius, iliopsoas, tibialis anterior, lumbar paraspinals, lumbar quadrate, pectoralis major and trapezius, as well as at the supraspinous ligaments between L4-S1[12,13].

Cardiorespiratory fitness was assessed by a ramp protocol in a breath-by-breath gas analysis system (Cortex Biophysik Metalyzer 3B, Stationary CPX System, Leipzig, Germany). The test was conducted in a treadmill with adjustable incline and speed (Albatroz VT2500, Vitally, São Paulo, Brazil). Data were collected and analyzed by a specific software (Cortex Biophysik Meta Soft CPX testing software, Leipzig, Germany).

Before testing, volunteers had their resting heart rate and blood pressure assessed, after 15 minutes of rest, with a heart rate monitor and a calibrated sphygmomanometer, respectively.

All participants were familiarized with the exercise of walking/running on a treadmill to determine the maximum comfortable cadence before testing. The actual test started with a speed of 3km/h and was increased by 0.5km/h at every 30 seconds, so that after 3 minutes test speed was reached. After that, the progressive ramp protocol began, with increasing incline of 1% at every 60s until the voluntary requested interruption (between 8 and 12 minutes).

The effort was considered maximal when three of the five following criteria were reached[14]: 1) heart rate (HR) equal to or higher than 95% of maximum predicted heart rate, 2) ventila-

tion exceeding 60% of maximum predicted voluntary ventilation (MVV), 3) respiratory quotient (RQ) equal to or higher than 1.10, 4) evidence of respiratory compensation point, and 5) presence of plateau of oxygen consumption (VO_2), i.e., increased effort without subsequent increase in VO_2.

After testing, the participant walked at a speed that allowed her HR to reach 120 bpm or less. Maximal predicted heart rate for age was calculated as follows: 208 - 0.7 x age[15]. Forced expiratory volume in the first second (FEV_1) was calculated by the following equation[16]: FEV_1 (liters) = 0.0309 x height (cm) - 0.0201 x age (years) - 1,405. The expected MVV was calculated as follows[16]: 37.5 x FEV_1 +15.8.

Ventilatory and metabolic parameters (VO_2, HR and RQ)[14,17,18] were determined at AT, RCP and at the highest VO_2 observed in the last 30 seconds of exercise (peak VO_2). Ventilatory equivalent of oxygen (VE/VO_2) and carbon dioxide (VE/VCO_2), as well as oxygen pulse were determined only at peak VO_2. The respiratory exchange ratio (RER) represents the relationship between VCO_2 and VO_2[14], and oxygen pulse (O_2 pulse) is the relationship between VO_2 and HR[19]. VE/VO_2 and VE/VCO_2 are ventilatory efficiency indicators and O_2 pulse is an indicative of left ventricular ejection. This study was approved by the local Ethics Committee (CAAE 43429215.9.0000.5377)

Data analysis

Data were analyzed using the statistical package GraphPad Prism version 6.0 for Windows (www.graphpad.com). Results were expressed as means±standard deviations. Comparisons between luteal and follicular phases were performed by Student's *t* test. The established significance level was 5% ($p<0.05$).

RESULTS

Out of the 21 women initially enrolled in the study, 8 were excluded from the sample for not attending the assessments or for taking analgesic drugs. Thus, the final sample of this study was composed by 13 women with dysmenorrhea complaint. Most of them (77%) presented adequate BMI, but less than half (46%) exhibited adequate adiposity. Body water content and angle of phase were adequate in 92% of them (between 41% and 60% and between 5.3º and 10º, respectively), as shown in table 1.

Results of pain perception and pressure pain tolerance (algometry) are described in table 2. When evaluated in follicular phase, participants exhibited a significant increase ($p<0.001$) in pain perception (assessed by VAS), and correlation between VAS in luteal and follicular phases showed moderate association ($r=0.58$, $p<0.001$). Also, follicular phase resulted in a significant reduction in pressure pain tolerance in all sites evaluated, indicating increase in pain sensitivity ($p<0.05$).

The impact of follicular phase on several metabolic and cardiorespiratory parameters is shown in table 3. At rest, follicular phase resulted in a significant increase ($p<0.05$) of 8mmHg in systolic and diastolic blood pressure (BP), but no effect was observed in HR.

No effects in ergospirometry parameters evaluated at AT (first ventilatory threshold) were observed in follicular phase when compared to luteal phase. Nonetheless, at RCP (second ventilatory threshold), parameters occurred sooner at follicular phase, but statistical significance was observed only in VO_2 and VO_2 relative to predicted values ($p<0.05$).

Finally, at peak exercise, follicular phase caused a significant reduction ($p<0.05$) in HR (4%), in HR relative to predicted (3 percentage points), peak VO_2 (13%) and VO_2 relative to predicted (8 percentage points), without significantly affecting speed, test duration, RQ and the indicators of ventilatory efficiency (VE/VO_2 e VE/VCO_2).

Table 1. General characteristics of the sample (n=13)

Variables	Mean ± SD	n (%)
Age (years)	21.1±1.2	
Height (cm)	161.0±7.2	
Weight (kg)	60.9±13.1	
BMI (kg/m²)	23.4±4.0	
Adequate BMI		10 (77)
%F	26.4±5.3	
Adequate %F		6 (46)
LM (kg)	44.4±7.3	
Relative LM (%)	73.5±5.4	
Adequate relative LM		1 (8)
Phase angle (degrees)	7.0±1.4	
Adequate phase angle		12 (92)
Body H_2O content (%)	54.2±4.8	
LM H_2O (%)	73.7±2.4	

SD = standard deviation; cm = centimeters; kg = kilograms; m^2 = square meters; BMI: body mass index; %F = percent body fat; LM = lean mass; H_2O = water.

Table 2. Pressure pain tolerance threshold in muscles and ligaments evaluated (n=13)

	Luteal phase	Follicular phase
VAS (cm)	1.2±1.3	6.6±1.8***
R Vastus medialis(lb)	7.7±2.6	5.9±1.8*
L Vastus medialis (lb)	8.5±2.1	5.8±1.8*
R Pectoralis major (lb)	4.6±1.1	3.2±1.4**
L Pectoralis major (lb)	4.7±1.3	3.3±1.2***
R Gluteus maximus (lb)	8.9±2.5	5.6±3.1***
L Gluteus maximus (lb)	9.2±3.2	6.2±2.2***
R Gluteus medius (lb)	7.1±1.7	4.9±1.5***
L Gluteus medius (lb)	7.9±2.8	5.6±2.7***
R Iliopsoas (lb)	8.4±2.1	4.9±1.6***
L Iliopsoas (lb)	7.3±2.0	5.3±1.6*
R Lumbar paraspinals (lb)	8.1±2.8	5.6±2.6**
L Lumbar paraspinals (lb)	7.9±2.8	5.4±2.7*
R Trapezius (lb)	5.1±1.6	3.8±1.5*
L Trapezius (lb)	4.9±1.6	3.4±1.4**
Supraspinous ligament L4-L5 (lb)	7.4±1.3	5.5±2.2**
Supraspinous ligament L5-S1 (lb)	7.6±2.7	5.3±2.2**

Data expressed as means ± standard deviations. VAS = visual analog scale; cm = centimeters; R = right; L = left; lb = pounds. *p<0.05, **p<0.01, ***p<0.001.

Table 3. Hemodynamic, ergospirometry and metabolic parameters of women in luteal and follicular phases of the menstrual cycle

	Luteal phase	Follicular phase
Rest		
HR (bpm)	79±15	84±10
Systolic BP (mmHg)	112±11	120±13*
Diastolic BP (mmHg)	69±7	77±10*
Anaerobic Threshold		
HR (bpm)	114±14	115±11
FC (% of peak)	61±6	64±5
VO_2(mL/kg/min)	14.3±2.6	13.8±3.5
VO_2(% of peak)	44±8	49±12
RQ	0.75±0.04	0.75±0.06
Respiratory compensation point		
HR (bpm)	176±11	165±15
HR (% of peak)	95±5	92±5
VO_2 (mL/kg/min)	30.4±4.6	25.1±5.1**
VO_2 (% of peak)	92±5	87±6**
RQ	1.04±0.06	1.01±0.07
Peak exercise		
Maximal age predicted HR (bpm)	193±1	
Peak HR (bpm)	186±9	179±14*
Peak HR (% predicted)	96±6	93±7*
Predicted VO_2max (mL/kg/min)	52.3±0.5	
Peak VO_2 (mL/kg/min)	32.9±4.4	28.7±4.7*
Peak VO_2 (% predicted)	63±8	55±9*
Peak RQ	1.11±0.06	1.08±0.08
Peak VE/VO_2	34.8±5.0	34.7±5.5
Peak VE/VCO_2	32.0±3.3	32.9±3.4
Testing speed (km/h)	5.8±0.7	5.8±0.7
Test duration (minutes)	10.1±2.0	9.4±2.2

Data expressed as means ± standard deviations. HR = heart rate; bpm = beats per minute; BP = blood pressure; mmHg = millimeters of mercury; VO_2 max = maximal oxygen consumption; mL/kg/min = millimeters per kilogram per minute; % = percent; RQ = respiratory quotient; VE/VO_2 = ventilatory equivalent of oxygen; VE/VCO_2 = ventilatory equivalent of carbon dioxide; km/h = kilometers per hour. *p<0.05, **p<0.01.

DISCUSSION

It is known that pain tolerance threshold differs in luteal and follicular phases, and that women bear less pressure pain at different points of the body during follicular phase[20]. This phenomenon was identified in this study. Women from our sample bore on average, 31% less pressure at the 16 points assessed by algometry. Moreover, although several studies have indicated losses in functional capacity due to physical pain in follicular phase, the present study provides unprecedented data of cardiorespiratory and metabolic parameters obtained by ergospirometry.

Although the exact mechanisms are still unclear, female gonadal hormones interact with nociceptive processes at multiple levels of the peripheral and central nervous system, and variations in hormonal levels are associated with variations in pain experience[6]. Some hemodynamic determinants may also vary across the menstrual cycle, but they seem to be more influenced by epinephrine reactivity to stress than by sex hormones themselves[21]. There are indications of a strong inverse correlation between level of pain (measured by VAS) and performance in a physical exercise on treadmill (r=0.69, p=0.01)[7]. Chantler, Mitchell and Fuller[7] et al.,[7]showed that women with dysmenorrhea pain exhibited significantly less time of test (Bruce protocol), decreased muscle strength (1 repetition maximal in leg press exercise at 45º) and more time to perform an exercise (bending down and getting up carrying a load) in comparison to controls (in use of anti-inflammatory drug). Oral administration of diclofenac potassium (50mg), a nonsteroidal anti-inflammatory drug (inhibitor of prostaglandins) suppressed these declines. Similar results were found in this study. Although there was no significant reduction in test duration, follicular phase resulted in losses ranging from 3.7 to 17.6% in the peak HR (3.9%), peak VO_2 (12.8%), and VO_2 at RCP (17.6%), without significant changes in AT, ventilatory efficiency (VE/VO_2 and VE/VCO_2) and rate of gas exchange (RQ). Together, these results indicate that the prejudice in cardiorespiratory fitness in follicular phase was related to oxygen consumption and ventilatory efficiency or changes in the use of energy substrates (RQ). Additionally, at rest, there was a significant increase in systolic and diastolic BP (7.4 and 11.8%, respectively), indicating a greater hemodynamic stress in follicular phase.

Pain is a very complex phenomenon and depends on cognition, emotion, environment and biological status of nerve structures[22]. Although a limitation of this study might be the sample size, we sought to standardize the sample so it was as homogeneous as possible, as women from our study had little variation in age, were students of health courses (with similar cognition), inserted in the same university context and had no other possible bias such as contraceptive use and previous uterine diseases. However, dysmenorrhea was assessed by self-report, which does not allow full discrimination between primary or secondary dysmenorrhea.

If the menstrual cycle is relevant to the determination of painful symptoms, it must be considered as a factor influenced by women's pain experience[20]. In the present study, we sought to evaluate this experience through dolorimetry. This type of evaluation, using a digital algometer, is considered a gold standard for the measurement of pressure pain sensitivity[23]. With respect to the sites assessed by algometry in this study, it was found that different areas of the pelvic region and muscles of the upper limbs and trunk were also negatively influenced in the follicular phase, revealing that hormonal changes affect pain tolerance in general. In a way, our results counteract a recent review pointing out that currently, most studies show that menstrual cycle has no effect on pain perception in healthy women[6]. However, unravelling the present findings, the authors of the review study[6] acknowledge that hormonal interaction and pain perception are complex and not fully understood.

Adding to the findings of the influence of menstrual cycle on pain, cardiorespiratory capacity also presented worse results in follicular phase. Although a previous study has not found differences in other physical capacities such as flexibility[1], muscle strength and endurance[8], anaerobic performance, and walking speed[9], this study revealed that, with respect to cardiorespiratory

fitness, evaluated by a progressive maximal cardiopulmonary exercise test, several parameters are negatively affected by pain. Reduction in exercise performance associated to increased pain sensitivity may have important repercussions in daily living activities, social life and quality of life of women, as previously observed by authors who studied pain in follicular phase[24,25]. Despite this finding, women should not avoid exercising in follicular phase, as exercise contributes to the reduction of dysmenorrhea symptoms[4]. Health professionals must provide orientations to women with dysmenorrhea about these physiological transitory changes that accompany menstrual cycles, as well as when and how to use pharmacological and non-pharmacological methods of pain management, in order to minimize the negative impacts in their quality of life.

CONCLUSION

Healthy women with dysmenorrhea show higher pain perception in follicular phase, which results in increased pain sensitivity and prejudice in hemodynamic aspects at rest and during exercise, as well as in cardiorespiratory fitness, without significant alterations in metabolism.

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ORIGINAL ARTICLE

The transcutaneous electrical nerve stimulation of variable frequency intensity has a longer-lasting analgesic action than the burst transcutaneous electrical nerve stimulation in cancer pain

Estimulação elétrica nervosa transcutânea de intensidade e frequência variável tem ação analgésica mais duradoura que a estimulação elétrica nervosa transcutânea burst sobre a dor oncológica

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DOI 10.5935/1806-0013.20170122

ABSTRACT

BACKGROUND AND OBJECTIVES: Pain is one of the most frequent symptoms in cancer, and physical therapy offers non-invasive methods such as the transcutaneous electrical nerve stimulation for the relief of symptoms. The objective of this study was to compare the effect of the burst transcutaneous electrical nerve stimulation with the transcutaneous electrical nerve stimulation with variable intensity frequency in cancer pain.

METHODS: This study was conducted with 53 patients of the Hospital Erasto Gaertner, divided into two groups: burst transcutaneous electrical nerve stimulation and variable intensity frequency transcutaneous electrical nerve stimulation. Pain assessment was performed before and right after the electroanalgesia, and at every hour until completing 6 hours.

RESULTS: The group treated with burst transcutaneous electrical nerve stimulation maintained complete analgesia for 2 hours, returning to the initial score value within 6 hours of evaluation; the group of variable intensity frequency transcutaneous electrical nerve stimulation maintained complete analgesia for 4 hours, not returning to the initial score value within the 6 hours. When comparing the intensity of the pain between the groups there was a significant difference between them ($p<0.001$) in all the assessments from the third hour after the electroanalgesia, showing a significant difference ($p<0.001$) at the 3rd and 4th hour after the electroanalgesia. There was no difference at the 5th hour and at the 6th hour.

CONCLUSION: The variable intensity frequency transcutaneous electrical nerve stimulation provided a longer-lasting analgesia in cancer pain than the burst transcutaneous electrical nerve stimulation.

Keywords: Analgesia, Cancer, Pain, Physiotherapy modalities, Transcutaneous electrical nerve stimulation.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Dor é um dos sintomas mais frequentes no câncer, e a fisioterapia dispõe de métodos não invasivos como a estimulação elétrica nervosa transcutânea para propiciar alívio do sintoma. O objetivo deste estudo foi comparar o efeito da estimulação elétrica nervosa transcutânea *burst* com a estimulação elétrica nervosa transcutânea de intensidade e frequência variável sobre a dor oncológica.

MÉTODOS: Esta pesquisa foi realizada com 53 pacientes, do Hospital Erasto Gaertner, divididos em dois grupos: estimulação elétrica nervosa transcutânea *burst* e estimulação elétrica nervosa transcutânea de intensidade e frequência variável. A avaliação do quadro álgico foi realizada antes, logo após a eletroanalgesia e de hora em hora até que completassem 6 horas.

RESULTADOS: O grupo tratado com estimulação elétrica nervosa transcutânea *burst* manteve analgesia completa por duas horas, retornando ao valor inicial do escore dentro das seis horas de avaliação; o grupo estimulação elétrica nervosa transcutânea de intensidade e frequência variável manteve analgesia completa por quatro horas, não retornando ao valor inicial do escore dentro das 6 horas. Observou-se na comparação da intensidade da dor entre os grupos que houve diferença significativa entre eles ($p<0,001$) em todas as avaliações a partir da 3ª hora após a aplicação da eletroanalgesia, mostrando diferença significativa ($p<0,001$) na 3ª e 4ª hora após a eletroanalgesia; na 5ª hora e na 6ª hora não houve diferença.

CONCLUSÃO: A estimulação elétrica nervosa transcutânea de intensidade e frequência variável promoveu maior tempo de analgesia sobre a dor oncológica que a estimulação elétrica nervosa transcutânea *burst*.

Descritores: Analgesia, Câncer, Dor, Estimulação elétrica nervosa transcutânea, Modalidades de fisioterapia.

INTRODUCTION

The control of cancer pain is routinely done through the evaluation of the symptom, drug administration, and surgical treat-

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Submitted in May 10, 2017.
Accepted for publication in October 30, 2017.
Conflict of interests: none – Sponsoring sources: none

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ment. However, its treatment should not be restricted to these conventional approaches[1,2]. Among the several non-phamacological approaches, there is a physiotherapeutic modality called transcutaneous electrical nerve stimulation (TENS)[3], that transmits electric current using electrodes located on the skin[2]. The current acts at the cellular level, exciting the peripheral nerve cells, causing the release of endogenous substances such as endorphins, enkephalins, and serotonin in the body[4], that consequently will affect segmentary and systemic levels. Its main advantages are not overwhelming organs and systems since it does not need to be metabolized; low cost; easy to use; and few adverse effects[5,6].

Some studies confirm the effectiveness of TENS in cancer pain[4,7]. However, patients tend to adapt themselves to the sensitivity of the continuous stimulaton[6,8]. In the face of this came the questioning if variations in the form of the transcutaneous electrical stimulation, as it occurs in TENS with variable intensity and frequency (VIF), would present better results in pain relief since the tendency to adaptation is lower.

Thus, the objective of this study was to investigate which modality has a better beneficial effect on cancer pain: TENS with modulated pulses (burst) or TENS VIF.

METHODS

This is a prospective, applied, experimental and quantitative study conducted at Hospital Erasto Gaertner (HEG). The sample was collected in a directed form for convenience, and the patients included in the study were hospitalized to undergo chemotherapy and/or radiotherapy, of both gender, who had a physiotherapy prescription, and that reported cancer-related pain. Patients below 18 years old with a complaint of pain not related to cancer were excluded from the sample. The size of the sample was estimated in a number higher than 20% of the population who had a prescription for physiotherapy during hospitalization, and that reported pain since this size is enough to represent the population. However, after the previous evaluation of the patients, the size of the sample was bigger, totalizing 73% of the evaluated patients.

Before starting the evaluation procedures and the current application, the patient signed the Free and Informed Consent Form (FICT). The initial evaluation, made by researcher 1, consisted of collecting information inherent to the patient's characteristics, type of cancer and the pain symptom. To evaluate pain characteristics, we used the McGill Pain Questionnaire, translated and adapted to the Portuguese language in 1996 by Pimenta and Teixeira[9], and the multidimensional pain evaluation scale (EMADOR)[10], that consists of a numerical scale (NS) from 1 to 10; the higher the numerical value, the higher is the pain reported by the patient; descriptors referring to the types of pain - acute or chronic; and an illustration of the body to register the site of pain.

After that, the patient raffled off the current that would be applied, without knowing which current it would be. The single application was made by a physiotherapist (Researcher 2) using the HTM® TENS-FES device portable, with burst parameters and pre-programmed VIF with maximum intensity tolerated by the patient, with duration of 40 minutes. In case the patient reported pain in more than two sites, the electrodes were placed on the site with higher reported pain, being related to cancer.

The pain revaluation, made by Researcher 1, who did not know the applied current, was done right after the removal of the device, and at every hour until completing 6 hours.

Figure 1 details the study design.

This study was approved by the Committee of Ethics in Research of the Hospital Erasto Gaertner (HEG) under number 2153-nov/2011.

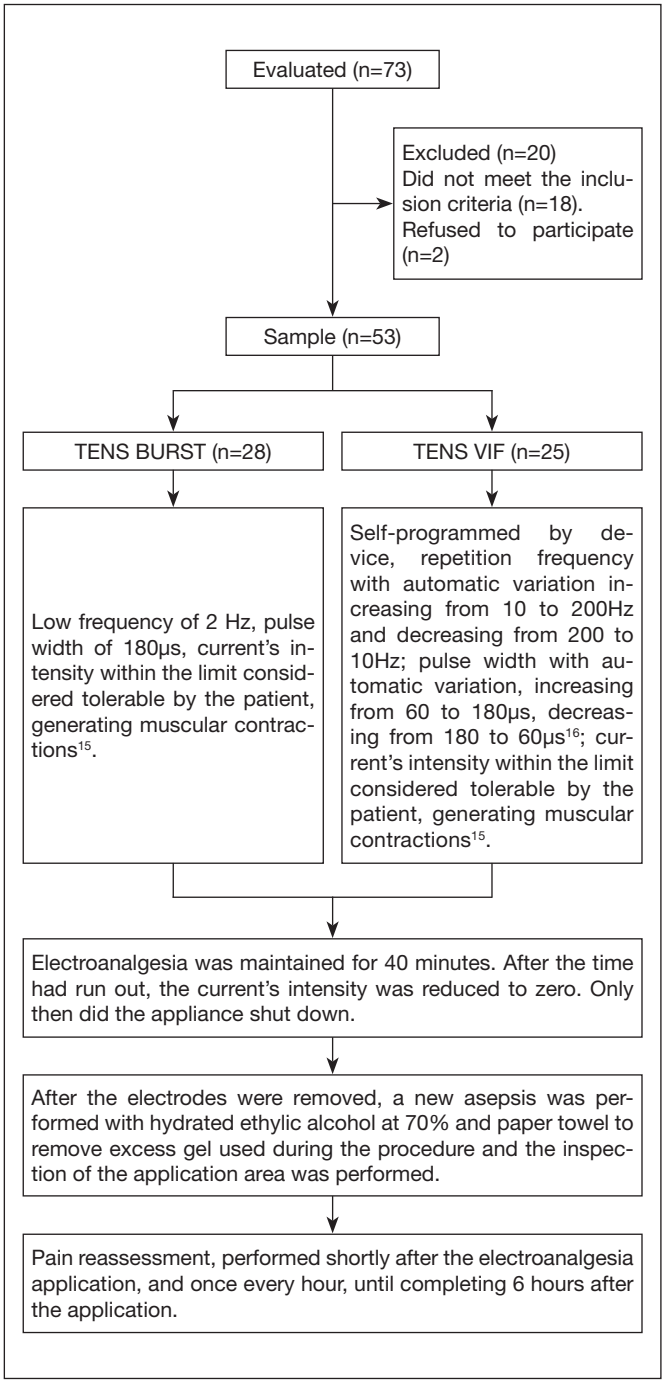

Figure 1. Details of the survey (attached file)

Statistical analysis

It was found that the sample did not follow the Gaussian distribution with the Kolmogorov-Smirnov test. Non-parametric Wilcoxon tests were used for the descriptive analysis of the data to check the difference between the evaluation before applying TENS and all the other evaluations of the same group; and the Mann-Whitney's U test to compare all evaluations between the groups. To better understand the treatment effect of each current, we calculated the differences in pain intensity rates at the fifth hour after the treatment and the necessary number to treat (NNT) to prevent any failures in the proposed treatment. To verify if there was an association between the pain classification identified by the patients and the electrotherapeutic resources applied, the Chi-square test was used. The significance level adopted for the statistical tests was 5% in a 95% confidence interval.

RESULTS

The burst group consisted of 13 male patients, and 15 female patients, the age of this group was 56.53±14.21 years, with a minimum of 23 years and a maximum of 81 years. The VIF group consisted of 15 male patients and 10 female patients. The age was 53.16±12.78 years, being 36 years the lower age and 83 years the highest.

The neoplastic topography of the groups varied between lungs, breast, stomach, ovaries, liver, lymphatic system, face, and neck. In burst group, 16 patients had a histological diagnosis of adenocarcinoma, 2 patients had lymphoma and 4, sarcoma, and 6 patients did not have such information in the medical record. In the VIF group, 14 patients had adenocarcinoma as histological diagnosis, 4 had lymphoma, 4 had sarcoma, and 3 patients did not have this information in their medical records.

Regarding the use of pain medication, all patients received analgesics, including anti-inflammatories or opioids. When evaluated by the EMADOR, the number of body sites that the patients reported pain in the burst group were n=10 (36%) at one site, n=15 (52%) at two sites and n=3 (12%) at three sites; and in the VIF group, n=5 (21%) had pain at one site, n=17 (69%) at two sites and n= 3 (10%) at three sites.

In the burst group, n=1 (4%) had pain in the thigh, n=2 (8%) in the arms, n=3 (11%) in the buttocks, n=4 (15%) in the chest region, n=4 (15%) in the cervical region, n=5 (18%) in the lumbar region, n=23 in the abdomen (36%), n=13 (47%) in pectoral region. In the VIF group n=2 (8%) of patients had pain in the arms, n=4 (16%) in the lumbar region, n=5 (20%) in the cervical region, n=8 (28%) in the abdomen, n=11 (44%) in the pectoral region, n=15 (60%) in the chest region.

In the classification of the type of pain, in the burst group n=12 (42.86%) of the patients classified pain as chronic and n=16 (57.14%) as acute. The VIF group had n=9 (36%) of the patients with the symptoms classified as chronic and n=16 (64%) as acute.

The percentage of each EMADOR describer reported by the patients in the burst group was n=12 (43%) chronic, depressing, overwhelming, deep, harmful, painful, unbearable, daunting, and uncomfortable, n=16 (57%) as acute, terrible, maddening, disastrous, tremendous, despairing, fulminant and monstrous, 100% described it as cruel. In the VIF group n=7 (28%) reported as disastrous, n=9 (36%) as chronic, depressing, overwhelming, harmful, painful, unbearable and uncomfortable, n=11 (44%) as daunting, n=14 fulminant (56%), n=16 (64%) as acute, terrible, maddening, tremendous, despairing, intense, monstrous, n=18 (72%) as deep and n=25 (100%) as cruel.

In the assessment of pain before the electroanalgesia between the groups (Mann-Whitney U test), no significant differences were found, both in the McGill score (p=0.538), and in the numeric pain rating scale (p=0.536). Both groups presented severe pain according to the numeric pain scale.

The comparison of the pain intensity reported by the patients and the score obtained with the McGill pain questionnaire between the pre-application evaluation of electroanalgesia and the post-application evaluations are described in table 1.

The intensity of the pain of the two groups, throughout the evaluations, is presented in figure 2.

As of the third hour after the application of the electroanalgesia, a significant difference was found in the VIF group (p<0.001 versus burst) in all evaluations until reaching 6 hours.

The McGill pain score of both groups throughout the assessments is shown in figure 3.

The VIF group presented a significant difference in the McGill score (p<0.001 versus burst) and at the 3rd and 4th hour after the electroanalgesia, at the 5th hour it was p=0.020 and at the 6th hour p=0.043 when compared with burst.

After finishing the electrotherapeutic application two hours later, there was the absence of pain in both groups. The patients pre-

Table 1. Comparison of the pain intensity and pain score by the McGill questionnaire of all the evaluations of the referred scores before the application of the transcutaneous electrical nerve stimulation

	Burst				VIF			
	Intensity		McGill		Intensity		McGill	
Before	10 (9-10)		48 (43-54)		9 (9-10)		51 (44-56)	
0 h	0 (0-0)	<0.001	0 (0-0)	<0.001	0 (0-0)	<0.001	0 (0-0)	<0.001
1st h	0 (0-0)	<0.001	0 (0-0)	<0.001	0 (0-0)	<0.001	0 (0-0)	<0.001
2nd h	0 (0-0)	<0.001	0 (0-0)	<0.001	0 (0-0)	<0.001	0 (0-0)	<0.001
3rd h	2 (0-2)	<0.001	44 (0-51)	0.012	0 (0-0)	<0.001	0 (0-0)	<0.001
4th h	5 (3.25-6.75)	<0.001	48 (43-54)	1.000	0 (0-0)	<0.001	0 (0-0)	<0.001
5th h	7,5 (7-8)	<0.001	48 (43-54)	1.000	2 (0-2)	<0.001	29 (0-52.5)	0.002
6th h	10 (9-10)	1.000	48 (43-54)	1.000	2 (0.3.5)	<0.001	41 (0-52.5)	0.008

Values described in median (first and third quartiles) and p values.

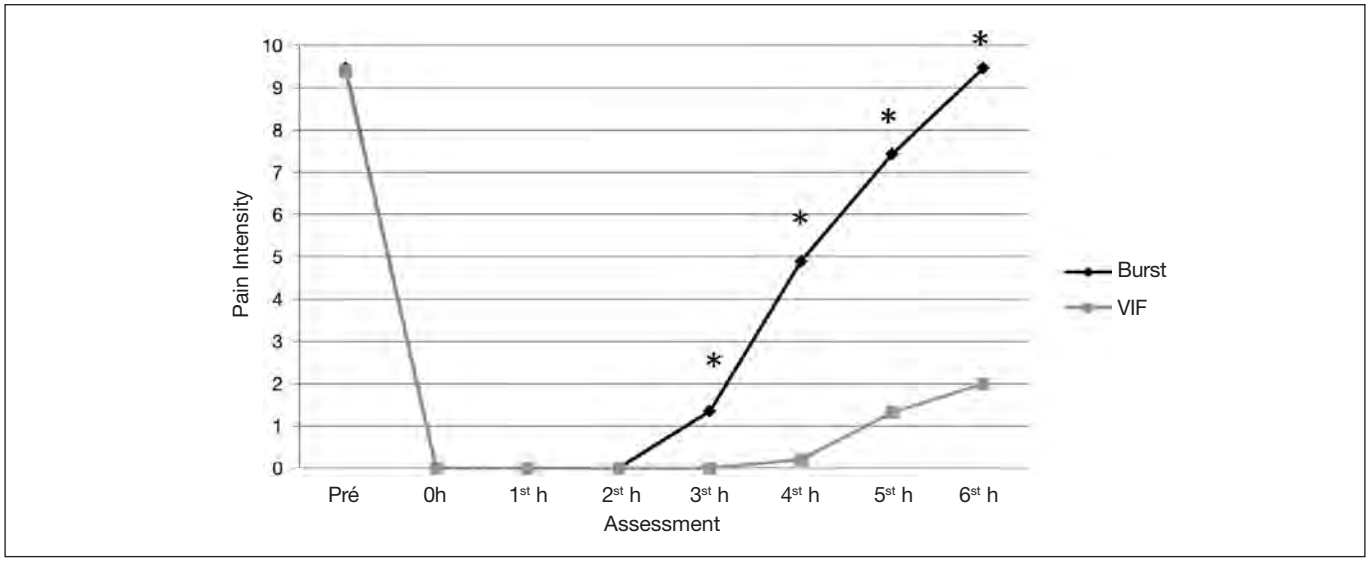

Figure 2. Pain intensity in both groups over the different evaluation moments
*p<0.001 versus VIF.

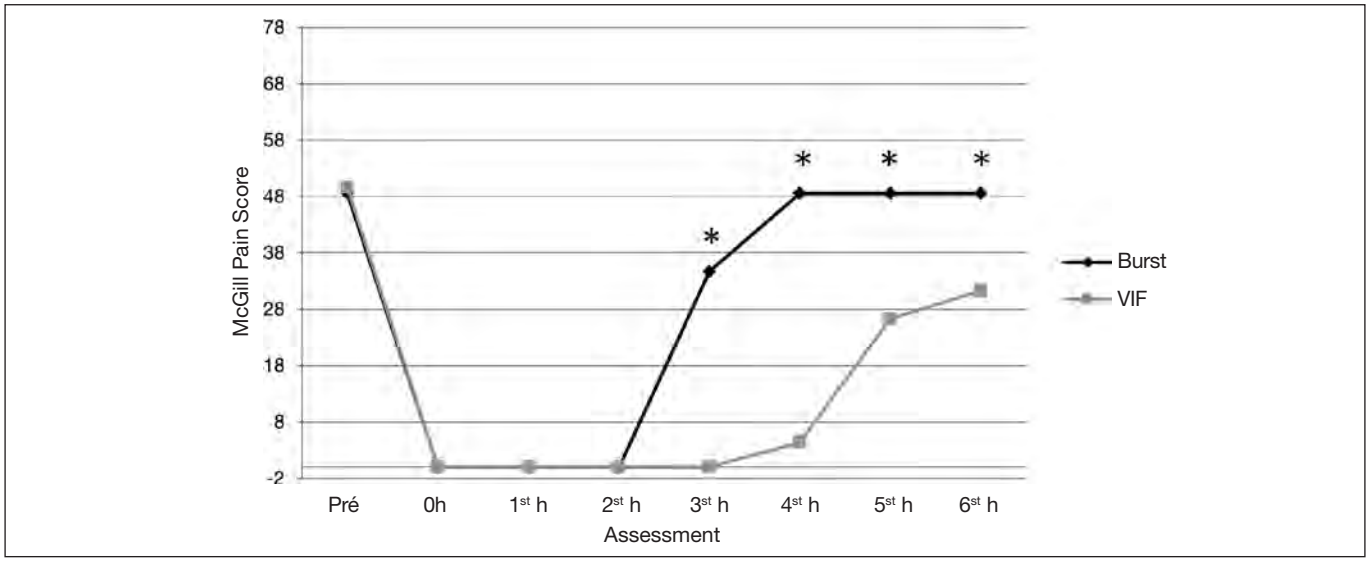

Figure 3. McGill pain score in both groups over the different evaluation moments
*p<0.001 versus VIF.

sented a mild pain at the 3rd and 4th hours after application, in both groups. At the 5th hour, they presented a mild pain n=10 (34%) of the patients in the burst group and n=16 (65.8%) in the VIF group, resulting in an NNT of 1.5 in the VIF group and 2.9 in the burst group. The moderate and intense pain was reported only by patients in the burst group. Table 2 shows the pain rating in the last evaluation.

Table 2. Frequency of pain rating reported by patients at the sixth hour after the electroanalgesia application

	Burst	VIF	p-value
Mild	0 (0%)	25 (100%)	<0.001
Moderate	0 (0%)	0 (0%)	
Intense	28 (100%)	0 (0%)	

DISCUSSION

The neoplastic topographies found in the present study varied among different regions, as did the study by Salamonde et al.[11] who studied 93 patients and the location also referred to several sites as the lung, uterus, large intestine, breast, prostate, bone marrow, kidney, liver, stomach, pancreas and small intestine. Loh and Gulati[12] analyzed the use of TENS to improve the functionality of cancer patients, and the topography was also very diverse, predominating the breast cancer and sarcomas.

Few studies have evaluated the action of TENS in a population with some specific type of cancer. Hurlow et al.[13] did a systematic review aiming to develop studies addressing the treatment of cancer pain in adults with the use of TENS, but only three

randomized controlled trials were included in the review, which evidences the lack of research on the subject.

Most patients had pain in more than one site. This same result was reported by Pimenta, Koizumi and Teixeira[14], who stated that every patient had reported pain in more than one site, averaging 1.8 different pain sites.

The pain level of both groups was initially high. When comparing the pain and intensity scores before the electroanalgesia, both levels were similar.

A study[15] evaluated 8 patients with sarcoma-related pain who were treated with high-frequency TENS, and, as in the present study, the McGill questionnaire was used to quantify pain before and after the application. Among the 8 patients, 7 had satisfactory results regarding the reduction of pain besides the improvement in functionality, showing the clinical efficacy of TENS both in movement and at rest.

In the comparison of the pain score and pain intensity between the groups, from the 3rd to the 6th hour after the electroanalgesia, there was a significant difference between them, that is, TENS VIF had a longer lasting analgesic effect than TENS burst. It is believed that this result occurred because in the TENS VIF it is established a minimum and maximum value and frequency, generating a variation of these values during the application. This function prevents, or at least delays, the onset of the accommodation effect[16].

In Loh and Gulati[12] retrospective study, the use of TENS was analyzed concerning the functionality improvement of 87 patients with different types of cancer, when the pain questionnaire was applied at the beginning of the treatment and two months later. At the end of two months of follow-up, 76 patients were evaluated, and among them, 69.7% reported benefits in the use of TENS, with improvement in pain and quality of life.

Johnson et al.[17] conducted a systematic review of the effect of TENS in acute pain. There were 19 randomized clinical trials, and among these, only four have compared two active currents. The authors reported difficulties due to the lack of information on the intensity, extent, duration, and frequency of the treatment sessions. Most studies used standard questionnaires to quantify pain. However very few clarified the moment when those questionnaires were applied, which does matter when the goal is to compare the duration of the analgesic action of the current.

Although the present study and the others cited do present positive results about the reduction of cancer pain, yet there is no consensus on the use of TENS in these patients. However, there is an increasing interest in investigating its effect, since it has been used in the control of acute and chronic pain in this population[18,19]. Another important point is that few studies focus on the parameters adjusted in that current. Gopalkrishnan and Sluka[20] analyzed the effects of two frequencies (100Hz and 4Hz), two pulse widths (100μs and 250μs) and two intensities (motor and sensory), during 20 minutes, on hyperalgesia and induced inflammation in rats. In that study, to the surprise of the authors, only the frequency had relation with analgesia. It is worth mentioning that the parameters were fixed and did not vary as in our study. Based on the preceding, the use of electroanalgesia with TENS, with the parameters used, was effective in the treatment of cancer pain, since this type of intervention does not cause addiction and has no adverse effects[18,20].

CONCLUSION

The use of TENS, with the used parameters, has efficiently reduced the cancer pain for at least 3 hours. The best results were found with the use of the TENS VIF current regarding analgesia duration compared to TENS_ burst.

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ORIGINAL ARTICLE

Drawing pain for children with sickle cell anemia: the pain that hurts, really hurts

O desenhar da dor para as crianças com anemia falciforme: a dor que dói, dói muito

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DOI 10.5935/1806-0013.20170123

ABSTRACT

BACKGROUND AND OBJECTIVES: Painful crises are part in the evolution of sickle cell anemia, is the more dramatic picture of variable intensity and location, caused by chronic hemolysis and vaso-occlusion, which alter the daily life of the patients. The objective of this study was to understand, by means of drawing, the repercussions and the coping strategies in situations caused by the painful crises of the sickle cell anemia, from the children's perspective.

METHODS: Exploratory, qualitative study, carried out in a pediatric referral hospital of Ceará, with five children diagnosed with sickle cell anemia. Data collection was performed from May to July 2016, by means of observations and drawings-story by Trinca. In the analysis, it was used the analysis of drawings content by Coutinho.

RESULTS: Two categories emerged: the pain that hurts and coping with pain. Every child identified its bigger meaning, evoking the repercussions of pain as the most striking element and more present in its life.

CONCLUSION: In face of the sufferings confronted by children with sickle cell anemia, it is necessary to create strategies that promote the implementation of public policies to prevent crises and treat the disease, modifying the course of the disease and improving the quality of life.

Keywords: Child, Pain, Sickle cell anemia.

RESUMO

JUSTIFICATIVA E OBJETIVOS: As crises dolorosas fazem parte constante na evolução da anemia falciforme, é o quadro mais dramático, de intensidade e localização variáveis, ocasionados pela hemólise crônica e vaso-oclusão, que alteram o cotidiano dos pacientes. O objetivo deste estudo foi compreender, por meio do desenho, as repercussões e as estratégias de enfrentamento em situações ocasionadas pelas crises dolorosas da anemia falciforme, a partir da perspectiva das crianças.

MÉTODOS: Estudo exploratório, qualitativo, realizado em um hospital de referência pediátrica do Ceará, com cinco crianças diagnosticadas com anemia falciforme. A coleta de dados ocorreu de maio a julho de 2016, por meio de observações e desenho-estória de Trinca. Na análise, foi utilizada a análise de conteúdo para desenhos de Coutinho.

RESULTADOS: Emergiram duas categorias: a dor que dói e enfrentando a dor. Cada criança identificou o seu significado maior, evocando as repercussões da dor como elemento mais marcante e mais presente em suas existências.

CONCLUSÃO: Diante dos sofrimentos enfrentados pelas crianças com anemia falciforme, se faz necessária a criação de estratégias que favoreçam a implantação e implementação de políticas públicas com esforços de prevenir as crises e tratar a doença, modificando positivamente o curso da doença e melhorando sua qualidade de vida.

Descritores: Anemia falciforme, Criança, Dor.

INTRODUCTION

The sickle cell disease (SCD) is part of the group of chronic diseases, and one of the main and most frequent inherited hematological diseases that affect the human population[1]. A genetic mutation affects the DNA and causes erythrocyte distortion by a type of mutant hemoglobin that replaces the glutamic acid by a valine at position six of the beta chain, resulting in an abnormal hemoglobin, forming the hemoglobinopathies[2].

Of the hemoglobinopathies, sickle cell anemia (SCA) is the most serious, with the highest clinical significance[3], of more impacting epidemiological character[4] and more frequent morbidity and mortality in the human population, especially in developing countries[5]. In Brazil, it is estimated an incidence of 1-3:1,000 live births with this type of disease[6], with a tendency to achieve increasingly significant portions of the population due to the high degree of racial miscegenation, reaching blacks, browns, and whites[7].

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Submitted in February 20, 2017.
Accepted for publication in October 26, 2017.
Conflict of interests: none – Sponsoring sources: none.

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Characterized as a public health problem, the SCA has a great diversity of clinical manifestation that appears during the life of the people affected, caused by chronic hemolysis and vaso-occlusion[8]. Such processes are related to the painful crises that occur unexpectedly, involving any organs or tissues, producing pictures of great severity and pain intensity that impact directly on the quality of life of the patient.

In the face of the SCA complexity of symptoms and complications, it is necessary that the family seek immediate care at health centers in order to evaluate the picture and prevent complications. However, when the pain intensifies, patients need to look for treatment at urgency or emergency units which may involve successive and frequent hospitalizations[9].

This period of illness impairs and changes the daily life of children and adolescents, being, according to the World Health Organization[10], a chronic condition that requires continuous management, treatment, and care for many years or even decades.

The repercussions of a chronic disease and the treatment of children afflicted with SCA require constant care in relation to the therapy and to the determinants that may aggravate their health[11]. Thus, it is necessary that both the families and health professionals be knowledgeable about the disease, its manifestations and implications, as well as being inserted into the process of care to provide a better service.

In order to contribute to the understanding of the meaning that this chronic disease has for a child, this article aims at sharing revelations that can lead to reflections both for health professionals, who need to catch up on, and the families, with the purpose of rethinking care to better meet the unique needs of this population.

Given that, the objective of this study was to understand, by means of drawing, the repercussions and the coping strategies in situations caused by the painful crises of the SCA, from the children's perspective.

METHODS

It is a qualitative, exploratory, descriptive research, carried out in a tertiary unit of the State of Ceará, located in the city of Fortaleza, a referral center for the treatment of children and adolescents with serious and high complexity diseases.

Five children participated in the study, with ages varying from 5 to 11 years, with a diagnosis of SCA, undergoing outpatient follow-up, who agreed to participate in the study. In order to ensure children's anonymity, letters with a number were used to identify them as C_1, C_2, C_3, C_4, and C_5.

Data collection was performed from May to July 2016. We used the observations and drawing-story constructions by Trinca[12] since it is considered the best material by which one can understand the children's subjectivity involving their lives, history, their way of looking at and thinking about the reality. The Free and Informed Acknowledge Form (FIAF) was signed by the children and adolescents, and the Free and Informed Consent Form (FICT), by their legally responsible person.

The drawing-story technique was applied after establishing a contact with the researcher who explained this technique to the child. Next, the child was asked to produce one single drawing, focusing on what it meant to the child to have SCA. This happened in only one moment, in a free and individual manner, on a sheet of paper, and the duration varied from child to child. When finished, the child was invited to speak, clarify and/or explain what was produced, so assigning its meaning.

Data analysis was based on the assumptions of drawings content analysis by Coutinho[13]. This method meets the following analysis procedures: systematic observation of the drawings and themes; floating reading of the stories content; selection of drawings by graphic similarities and/or proximity to the themes; exploration of the material, identification of core sense, categorization, and processing of the results. After the data decoding and categorization, two broad categories emerged: **The pain that hurts and coping with pain.**

The study complied with the ethical principles of research with humans, being approved by the Research Ethics Committee of the State University of Ceará (UECE) and the Children's Hospital Albert Sabin (HIAS), under the opinion number 1.547.314.

RESULTS

When the children were asked to draw their perceptions of coping strategies in relation to SCA, it was found that each has identified its bigger meaning, evoking pain as the most striking and more present element.

The pain that hurts

In the first category, children represented in their drawings their personal experiences, with special emphasis to their representations in relation to pain, as noted in figure 1.

Figure 1 was produced by a 5-year old child who represented pain in the form of drops, with lines coming from above on the upper part of the sheet of paper. The drops reach his body directly, as shown by the line on the bottom of the paper.

When invited to talk about the production, he first pointed to the drops and said: -"that's the pain [...]". *Then, pointing to the bottom part of the paper, he continued*: - "[…] *and this is me*. *It is my leg and my foot*".

When asked about the reason of the drawing, C_1 he pointed again to the bottom part and answered: - "[…] *it hurts here*." *Then he took the pencil in his hand, and started moving it upwards and downwards touching his foot, and said*: - "[…] *it's like this, see* […] *like this* […] like this […] and it hurts."

Another 5-year old child represented her pain showing the feeling she has when attacked by a painful crisis.

C_2 did something like a pain monster, which is on the right side of the paper, involving her and her mother. It's like an involvement, in the form of a balloon. The child drew herself twice, once alone and then she drew herself again in the arms

Rev Dor. São Paulo, 2017 oct-dec;18(4):321-6

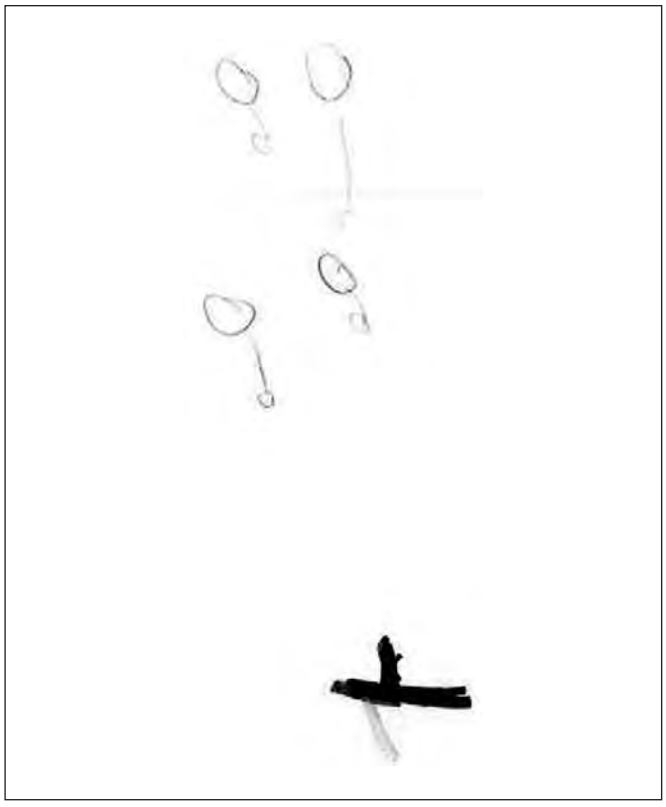

Figure 1. Drops of pain
Source: 5-year-old child (C_1).

of her mother, sitting on a rocking chair inside the balloon on the left. It is interesting of notice in this drawing that in the same way the child marked the monster, she also marked her your own face as if she was emphasizing that she has been hit.
When asked to talk about her work, the child, very casually started to tell what she feels when in pain: *it hurts, and the baby is sad and cries* […] *it hurts, a lot* […] *the baby is crying* […]" (Figure 2).
Then, she pointed to the girl with the marked face and continued:
"*It hurts and the baby is sad and cries* […] *it hurts, a lot* […] *the baby is crying* […] *then, her mom gives the soother* medicine *in the arm, in the other arm and feet* […] *then, mom goes to the* chair *and takes the baby in her arms, sits and starts rocking to make the baby sleep* […] and […] *gives the baby the pacifier* […] *and the baby sleeps and the pain goes away*".
When asked what would be the line that was involving her, on the right of the paper, C_2 looked at it and said: - "[…] *it hurts, is bad, makes the baby cry*."
In the third drawing, we see, once again, another child representing its pain (Figure 3).
The explanation was straightforward with few words, as shown in the author's own speech: - *This is a girl crying, she is in pain* […] *much pain* […], *she was in school, but she had to leave. She couldn't stand the pain*".
Later, the child ended up saying: "[…] *This is me, crying in pain*."

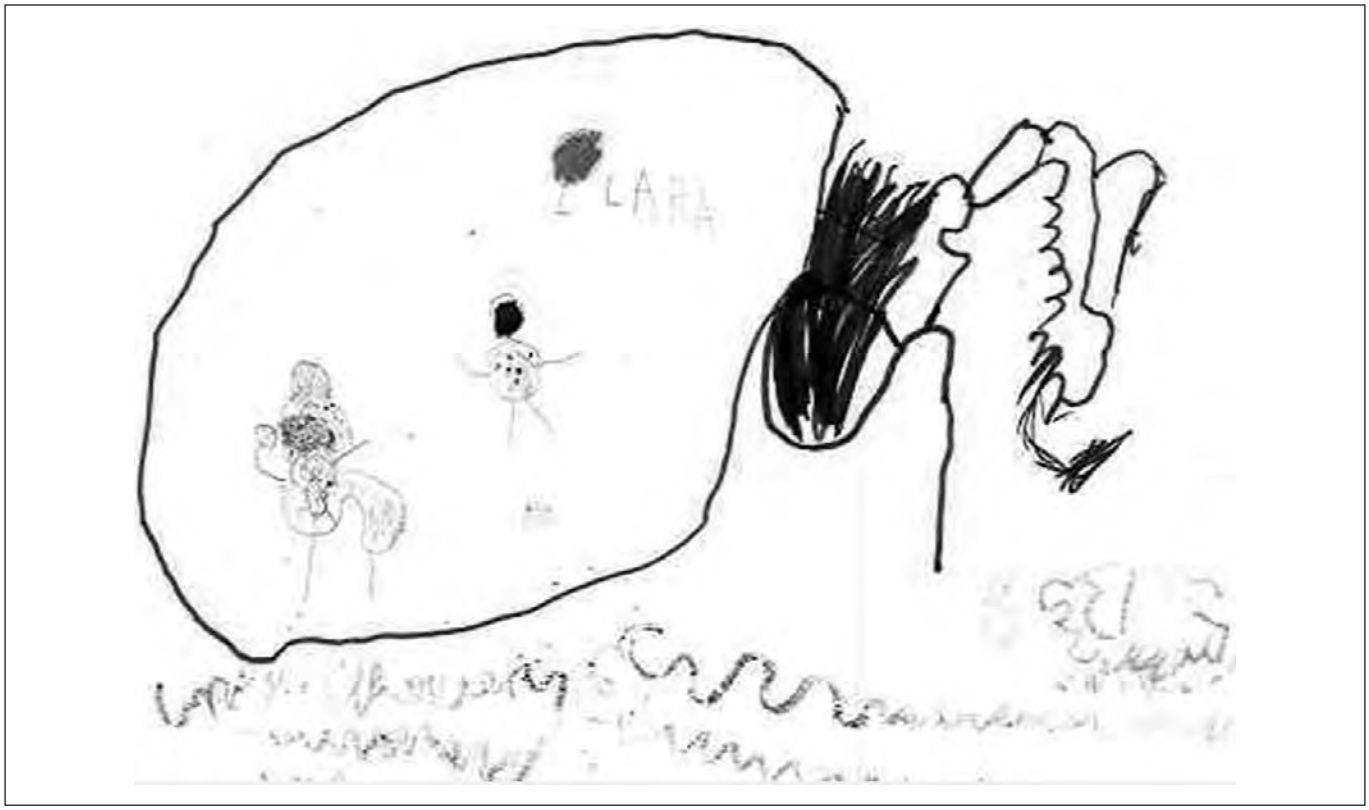

Figure 2. Involved by pain
Source: 5-year-old child (C_2).

Figure 3. Crying in pain
Source: 9-year old child (C_3).

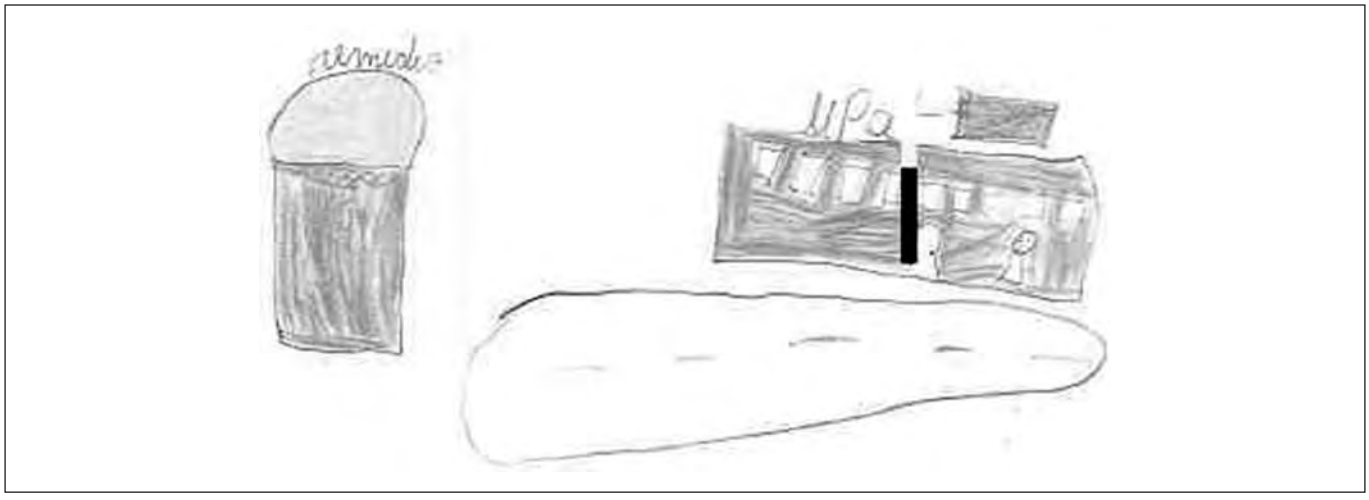

Figure 4. The urgent care unit and the medication
Source: A 7-year old child (C_4).

In the second category, it was possible to grasp how each child faces its process of pain crisis due to SCA, as we can see in figure 4.

The way C_4 copes with pain is expressed searching for help, apparently alone and crying next to the door of an urgent care unit, called UPA, on the right side of the paper. She drew a road below and a gigantic medication on the left side.

When explaining its production, C_4 first pointed to the person crying inside of UPA and said: *Here, it's me crying and feeling much pain, then I go to UPA*] … *I always go there* […] *it is where I take my medication*". Then, pointing to the medication: - "[…] *this is the medication, it helps me to feel better*."

Another way of coping with SCA pain was shown by an 11-year old child (Figure 5).

The drawing shows an apparently happy girl holding a rosary in her right hand, she explains: "[…] *This is me. I do that when I'm sick, in pain*".

And she was asked: -"Do that what? And she added: "*I take my rosary and pray* [...], *and I get better*".

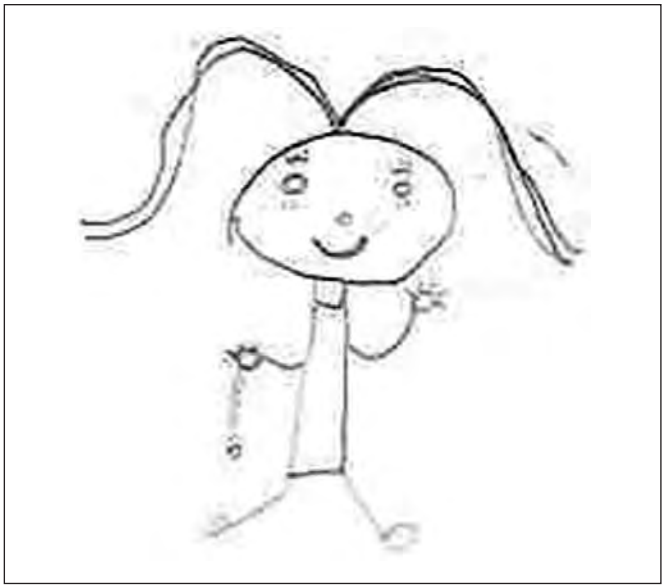

Figure 5. Spiritual support
Source: 11-year old child (C_5).

DISCUSSION

The analysis was established from the elements that emerged from the data about the children's perception by means of their drawings and the researchers' observations. Therefore, the child drawing and its symbolic language were considered instruments through which children establish contact with their inner world, being able to express their feelings by means of graphic representation, articulating their problem or their emotional conflict, or the stress that arises in that moment of life[13,14].

Several meanings attributed in the children's drawings were noticed, mainly related to the painful crises due to SCA. According to the first category, the pain appears as a common symptom among participants, in line with a study[15] that compares the perception of SCA painful episodes among 27 children and their caregivers. The results revealed differences in relation to the type and intensity of pain. In terms of the pain location, the majority referred to the trunk region followed by the limbs.

In the first two drawings, the experience of a painful episode was expressed in its physical aspects, probably by a manifestation related to dactylitis. C_1 makes its approach in a solitary way, indicating the pain site; whereas C_2 draws itself involved by pain, but the mother appears, embracing the child, giving the medication, taking her in her arms until "the baby sleeps and the pain goes away."

The way C_2 copes with pain is in line with a survey[16] carried out in two referral centers for pediatric cancer treatment in the Midwest of the state of São Paulo, where 66.7% of the cases showed that the mothers were the primary caregivers.

The attempt to have a regression to improve and neutralize the experience of physical discomfort caused by the painful crisis is delegated to the mother, as shown in another survey[17], whose results show that when the children are sick and/or hospitalized, they become the focus of the attention, requiring exclusive dedication and, it is in the family, especially the mother, that the child has its references assured.

Indeed, in the third drawing, the girl did not identify nor her caregivers either the specific location of the pain but drew herself crying because of a painful crisis she had when in school, and because of that she had to leave.

The impact of pain affects the daily life of the children, in such a way that C_3 had to leave school, as in the study[17] aiming at identifying the impact of SCA in the daily life of adolescents that demonstrated frequent reports of pain, fatigue, and limitations to social interaction. Corroborating this idea, in the study[18] on the experience of people with SCA, it confirmed the limitation in these people's lives causing physical and emotional destabilization.

In the second category, the children expressed the way how they face the episodes of SCA painful crisis. In drawing four, C_4 brings to the scene a healthcare unit where she seeks for care, she called it UPA; showing, as well as, a big bottle of medication.

It drew attention the representation that this kid did to the size of the medication in contrast to its own size and even to the size of the healthcare unit where she is treated. The draw of such a big medicine reminds the pain felt that was motivated by the disease. It seems to be a form of greater relief for the anguish felt.

The manifestations of pain in the individuals with hemoglobinopathies include episodes that require the administration of drugs aiming at the regression and improvement of the picture the soonest the possible[19]. Therefore, analgesia should be in line with what the patient presents, with the particularity of each case. The initial orientation is to do it at home, and if there is no improvement or other symptoms arise, caregivers need to go to the hospital[20].

In the study[21] carried out in an emergency care unit in the interior of the state of Bahia, it was noticed, in the speech of the multi-professional team, that the patients look for the service when they have clinical complications or when they do not know what to do facing these complications. Another finding showed that there was a priority and focus solely on pain control, underestimating the physical examination as a chance for other episodes.

The way C_5 coped with her pain was with spiritual support, possibly learned at home with her parents or someone close, recognizing in her faith in God a way to overcome the difficulties of the complications imposed by the disease.

Spiritual practice is one of the alternatives for confronting and overcoming, being a positive aspect to alleviate the disease, as shown in the study[22] conducted in a tertiary hospital with 61 patients in dialysis treatment that identified the religious practice in the majority of the individuals.

The meaning presented shows that both to patients and family members and/or their accompanying person, "spirituality and religiosity help the experiences related to the disease and treatment, acting as a source of balance and strengthening the struggle for life"[23].

CONCLUSION

Children have a trajectory marked by multiple adversities that directly impact their lives. Therefore, we can conclude that in face of the sufferings confronted by children with SCA, it is necessary to create strategies that promote the implementation of public policies establishing a line of care, with efforts to prevent the crises and treat the disease, modifying the course of the disease and improving the quality of life.

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Prevalence of acute pain in patients attending the emergency room

Prevalência de dor aguda em pacientes atendidos na unidade de pronto atendimento

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DOI 10.5935/1806-0013.20170124

ABSTRACT

BACKGROUND AND OBJECTIVES: Despite the importance of acute pain in the health-disease process, there are few studies about its prevalence in emergency services that function as a gateway to health services. The objective of this study was to evaluate the prevalence of acute pain in an emergency room setting.

METHODS: The data were collected from September 2016 to June 2017, using the medical records of patients treated in the emergency service in 2015. Considering the average of 8,000 visits per month, we adopted a random sampling process using categorical variables, and it was estimated a sample of 4,064 records.

RESULTS: The pain was present among older people (39.6 years) when compared to patients who had pain and other symptoms associated (37.0 years) (p=0.000). There was a higher concentration of demand for the service by women (55.3%) due to pain and other causes, and for acute pain, the demand was 50.1% of females. In risk classification, 86.6% was characterized not urgent, and 99.6% sought service on their own. Only 0.5% of patients affected by acute pain were referred to other services.

CONCLUSION: The study showed that the majority of the care demand at the emergency room is of little complexity and could be attended at the primary care unit. The pain is present in all types of care, and the objective is to relieve the pain, leading patients to look for an agile and decisive service.

Keywords: Acute pain, Emergencies, Emergency medical services, Health services, Pain perception.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Apesar da importância da dor aguda no processo saúde-doença, existem poucos estudos sobre sua prevalência em serviços de emergência que atuam como porta de entrada nos serviços de saúde. O objetivo deste estudo foi avaliar a prevalência de dor aguda em uma unidade de pronto atendimento.

MÉTODOS: Os dados foram coletados no período de setembro de 2016 a junho de 2017, por meio dos prontuários de pacientes atendidos no serviço de urgência no ano de 2015. Considerando a média de 8 mil atendimentos por mês, adotou-se um processo de amostragem aleatório com utilização de variáveis categóricas, calculou-se uma amostra de 4064 prontuários.

RESULTADOS: A dor se fez presente entre pessoas com mais idade (39,6 anos) quando comparado aos atendimentos que tiveram dor e outros sintomas associados (37,0 anos) (p=0,000). Observou-se maior concentração de procura do serviço pelas mulheres (55,3%) em atendimentos por dor e outras causas, e para algia aguda a procura foi de 50,1% para o sexo feminino. Na classificação de risco 86,6% foi caracterizado não urgente e 99,6% buscaram o serviço por conta própria. Apenas 0,5% dos pacientes acometidos pela dor aguda foram referenciados para outros serviços.

CONCLUSÃO: O estudo mostrou que a maioria dos atendimentos da unidade de pronto atendimento é de pequena complexidade e poderiam receber acompanhamento na Atenção Primária à Saúde. A dor se faz presente em todos os tipos de atendimento sendo o alívio o objetivo dessa procura, o que induz a busca por assistência ágil e resolutiva.

Descritores: Dor aguda, Emergências, Percepção da dor, Serviços de saúde, Serviços médicos de emergência.

INTRODUCTION

Pain is a multifaceted process involving sensory characteristics resulting from tissue and emotional injury. Acute pain is considered a physiological response, which acts as a warning sign, favoring the repair and reestablishment of the affected area. There is a possibility of chronicity if the painful process is prolonged, even with interventions to alleviate or cease it[1-4]. Pain is a serious public health problem; it is the main cause of absenteeism and the search for medical care, resulting in low productivity and costliness. The Brazilian Society for the Study of Pain (SBED) points out socioeconomic factors, stress, hormonal conditions, and age as the variables that influence its perception and its dimensioning[5,6].

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Submitted in August 02, 2017.
Accepted for publication in October 24, 2017.
Conflict of interests: none – Sponsoring sources: none.

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As of 2000, the pain started to be considered the 5th vital sign by Joint Commission on Accreditation on Healthcare Organizations (JCAHO), emphasizing the need to quantify, evaluate and record this signal; making it possible to observe the behaviors adopted by professionals and the effectiveness of these interventions.[7]

Pain is underdiagnosed as it is considered an inevitable consequence of health problems[7]. A recent study carried out in Brazil pointed out the pain prevalence in an emergency service of 45% of the assistances, which indicates the constant pain presence in health care[8-10].

Emergency care units (ECU) are emergency services, acting as a gateway, which must provide qualified, holistic and integrated assistance. This service should guarantee resolutive care for acute medical conditions, stabilization, and referral of greater complexity cases to specialized and primary services when there are no emergencies. Technologies available in these units are of small and medium size characterizing as a prehospital service[11-15].

Despite the importance of acute pain in the health-disease process, there are few studies on its prevalence in emergency services that act as a gateway to health services.

This study aimed to evaluate the prevalence of acute pain in an ECU, enabling the professionals to know the measures that provide a more qualified assistance to the pain processes.

METHODS

This is a retrospective and quantitative study, carried out from September 2016 to June 2017, at the ECU, in the city of Petrolina, Pernambuco, Brazil.

Data were collected from medical records from individuals who were treated at the emergency department in 2015. Based on an instrument created by the authors, the following variables were collected: age, gender, date and time of assistance, diagnosis, risk classification, referral to another service and which service it is.

Ministry of Health proposed the risk classification as a mechanism for the health services organization, aiming to provide agile care, based on the standardization of the behaviors through care protocols[16]. Manchester is the most widely used protocol in the world today; when used properly, is considered the safest classification method[17].

In the researched unit, the risk classification was performed by means of a Manchester protocol adaptation. The users are classified by color, and each one represents the waiting time for the assistance, according to the need. In the red classification are those in emergency situations, needing to be assisted immediately (zero minutes); orange, when very urgent (10 minutes); yellow, when presenting as urgent (60 minutes); green, featuring little urgency, which can wait for a longer period (120 minutes); and blue, which represents non-urgent (240 minutes), that is, those patients that can wait or be referred to Primary Health Care (PHC)[17].

Attendances records were analyzed in a random way to ensure the sample's representativeness and included the records of patients that contained the collection instrument variables and excluded those that did not contain the necessary information.

Considering the target population of an average of 8 thousand attendances per month, adopting 95% confidence, 5% sample error, and 50% prevalence, for a random sampling process was adopted with the use of categorical variables, a sample of approximately 367 medical records was calculated. However, it was decided to carry out the collection in each month, selecting 4,064 medical records.

This study was approved by the Ethics Committee of the University of the State of Pernambuco, under opinion No. 1,714,672 of 2016.

Statistical analysis

Data were tabulated in Microsoft Excel 2010 and were divided into two categories: acute pain – when the symptom was an only pain; and other assistance when the pain was associated with other symptoms and analyzed using Stata 12.0 software. The analysis was done through descriptive statistics and frequency distribution. Dependent variable tested was represented by the patient's record of acute pain in the medical records. Being this one expressed categorically, the association with the independent variables was determined using Pearson's Chi-square, Fisher's Exact and Mann-Whitney non-parametric tests.

RESULTS

Table 1 shows the results obtained through sociodemographic indicators of the patients assisted in prompt service. Regarding the age average, the pain was present in older individuals (39.6 years) when compared to other assistance (37.0 years) (p=0.000). With regard to gender, a higher concentration of service demand by women (55.3%) was observed in assistances due to other causes. In acute pain, the values were equal, 50.1% female and 49.9% male (Table 1).

Table 2 shows the characteristics of the assistance period. The quarter and the shift that stood out in the assistances directed to the treatment or relief of pain were the third quarter with 36.7% and the morning shift (33.3%). For the other types of assistance, the second quarter (29.9%) and night shift (33.4%) prevailed. The occurrence of weekend assistance, regardless of motivation, did not present a significant difference (p=0.652).

Table 3 highlights the characteristics of the assistance given to the individual according to their complaints and behaviors. Regarding the risk classification, there was no discrepancy between the assistances for pain and other types of assistance; the green classification was highlighted in both cases, with 86.6 and 77.0%, respectively. Only 0.5% of the assistances to people with pain and 1.2% of other types of assistance were referred to other services, although they did not present significant statistics (p=0.081).

Table 1. Sociodemographic characteristics of the patients assisted at an emergency care unit. Petrolina, PE, 2015

	Other assistances		Acute pain		Total		p value
Age average (standard deviation)	37.0±18.5		39.6±17.4		37.6±18.3		0,000**
	n	%	n	%	n	%	
Gender							
Female	1,737	55.3	462	50.1	2,199	54.1	0.005*
Male	1,404	44.7	461	49.9	1,865	45.9	

*Pearson's Chi-square test, **Mann-Whitney test.

Table 2. Assistance period of the patients assisted at an emergency care unit. Petrolina, PE, 2015

	Other assistances		Acute pain		Total		p value
	n	%	n	%	n	%	
Quarter of assistance							
First	921	29.3	218	23.6	1,139	28	0.000*
Second	938	29.9	154	16.7	1,092	26.9	
Third	764	24.3	339	36.7	1,103	27.1	
Fourth	518	16.5	212	23	730	18	
Assistance at the weekend							
No	1,823	58	528	57.2	2,351	57.9	0.652*
Yes	1,318	42	395	42.8	1,713	42.2	
Assistance shift							
Morning	880	28	307	33.3	1,187	29.2	0.001*
Afternoon	966	30.8	302	32.7	1,268	31.2	
Night	1,050	33.4	258	28	1,308	32.2	
Dawn	245	7.8	56	6	301	7.4	

*Pearson's Chi-square test.

Table 3. Characteristics of assistance and conduct of the patients assisted at an emergency care unit. Petrolina, PE, 2015

	Other assistances		Acute pain		Total		p value
	n	%	n	%	n	%	
Risk classification							
Blue	22	0.7	4	0.4	26	0.6	0,000**
Green	2,419	77	799	86.6	3,218	79.2	
Yellow	655	20.9	117	12.7	772	19	
Red	45	1.4	3	0.3	48	1.2	
Referred to another service							
Yes	38	1.2	5	0.5	44	1.1	0.081*
No	3,102	98.8	918	99.5	4,020	98.9	
Referral service							
Of greater complexity	15	39.5	3	60	18	40.9	0,634**
Basic health unit	24	60.5	2	40	26	59.1	
Reason for referral							
It was not an emergency	22	56.4	2	40	24	54.6	0,646**
Severity or need for support	17	43.6	3	60	20	45.5	
Origin/demand							
Referenced demand	103	3.3	4	0.4	107	2.6	0,000**
Spontaneous demand	3,038	96.7	919	99.6	3,957	97.4	

*Pearson's Chi-square test, **Fisher's Exact test.

From the pain-related assistances, 60.0% required referral to units with the availability of specialized support, whereas in other types of care, only 39.5% were referred to units that are more complex and 56.4% did not present urgency. In both the other types of assistance and in the assistance services due to acute pain, the population assisted was by spontaneous demand, 96.7 and 99.6%, respectively (p=0.000).

DISCUSSION

The main demand in health care is from women in adulthood, whether in the promotion, treatment or prevention, a fact related to the lower pain threshold of the female gender, coupled with endocrine, cultural and emotional factors[18]. In the present study, women sought care in a greater proportion than men did in several complaints. In pain, the assistance demand was compatible in both cases; this refers to the fact that the objective characteristics of pain are present, regardless of gender[19,20].

Similar studies showed that the patients' age average seeking assistance in a hospital emergency service was 41.6 years[21,22]. Increased age provides a greater incidence of painful symptoms and risk for both acute and chronic pain[22].

In this research, the pain had a greater incidence in adult patients, proving the idea of pain progression with increasing age. Pain characteristics in the elderly are distinguished from the young and may be associated with changes in life, making the elderly less sensitive to pain stimuli[19].

There is a trend in service demand by morning and afternoon, which together account for more than half of the assistance. This fact can be related to periods of the workday with the need to explain the absence in service. At night time (night and dawn) these individuals are, theoretically, free of their obligations, providing rest availability, restoring health; this also applies to weekends, in which the data did not present significant statistics in this study. Assistance seek was higher in the third quarter of the year, and although this result was statistically significant, there is no data that explains the specific motivation for service demand at this time of the year.

Standardization of risk classification protocols in health services is of utmost importance, integrating assistance and ensuring the use effectiveness of this instrument[17]. Most patients assisted at the researched unit received the green classification, referring to the importance of the communication with users regarding the service operation and the need for improvement of the professionals regarding the conduct of painful processes evaluation, guaranteeing the right to assistance's humanization[7,19,20].

This study showed similarity with another study, with regard to demand and referrals[23]. There is an inadequacy related to the attendance evidenced by the percentage of spontaneous demand in both acute pain category (99.6%) and in other assistances (96.7%).

Only a small portion of the assistances analyzed were referenced for other services, a fact evidenced by the referrals number to other health units; from patients with pain, only 0.5% received referral, a small percentage compared to the total number of patients affected by acute pain syndrome (923), confirming that most cases (99.5%) have a resolution in this service. These references' reason and location were not statistically significant.

As the difficulty found during the research development is highlighted, the failure to fill in the medical records of patients classified as blue because they did not have the necessary information to collect them and the sample size in relation to the development time of the work.

CONCLUSION

This study made it clear that the occurrence of acute pain in ECU's patients was the unanimous complaint, being present in both men and women with a minimal variation. Most ECU assistances is a low level of complexity and could receive follow-up in the PHC. Population seeking assistance in this service by spontaneous demand needs clarification regarding both the network operation and the service mission. Characteristics that induce the search for assistance are the agility possibility and greater resolution. Pain evaluation is usually unobserved in the health services, once in general the concern is only with relief and not with the discovery and treatment of the cause. As pain has been present in all types of assistances such as signs, symptoms or morbidity, it is important that professionals receive guidance to better managing pain relief. The use of protocols for pain assessment is essential to assist in the behaviors adopted by the team, guaranteeing humanization in the face of painful processes.

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Pain during tracheal aspiration in patients with traumatic brain injury undergoing mechanical ventilation

Dor durante a aspiração traqueal em vítimas de traumatismo cranioencefálico submetidos à ventilação mecânica

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DOI 10.5935/1806-0013.20170125

ABSTRACT

BACKGROUND AND OBJECTIVES: Victims of traumatic brain injury, in intensive care units, frequently experience pain. Tracheal aspiration is a procedure with nociceptive potential routinely carried out in these patients. The objective of this study was to evaluate the effectiveness of tracheal aspiration in patients with traumatic brain injury undergoing mechanical ventilation.
METHODS: Prospective study conducted in two intensive care units of a general public hospital in Aracaju, Sergipe, Brazil. During three days, 300 observations were carried out in 20 victims of traumatic brain injury. The pain was assessed using the Brazilian version of the Behavioral Pain Scale and the physiological parameters of heart rate and blood pressure (systolic and diastolic). The sedation depth was measured by Ramsay scores and the Richmond Agitation Sedation Scale. The Friedman test, ANOVA, and the Bonferroni post hoc test were used to verify the existence any differences in pain scores and physiological parameters at the different moments of the evaluation. A 5% statistical significance was accepted.
RESULTS: The sample was predominantly comprised of men, young, from the interior of the State, with no comorbidities and with severe traumatic brain injury. Fentanyl and midazolam were the most used drugs for sedation and analgesia. There was a high prevalence of pain (70.0-85.5%). The pain scores were significantly higher during the tracheal aspiration, and the physiological parameters did not present any statistically significant increase.
CONCLUSION: Valid and trustworthy behavioral scales, as the Behavioral Pain Scale, should be incorporated into the routine of the intensive care units to guide analgesia and sedation management, especially to prevent suffering during these painful procedures.
Keywords: Nociceptive pain, Pain assessment, Sedation, Suction, Traumatic brain injury.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Vítimas de traumatismo cranioencefálico, internadas em unidades de terapia intensiva, frequentemente experienciam dor. A aspiração traqueal é um procedimento com potencial nociceptivo realizado rotineiramente nesses pacientes. O objetivo deste estudo foi avaliar a dor durante a aspiração traqueal em vítimas de traumatismo cranioencefálico submetidos à ventilação mecânica.
MÉTODOS: Estudo prospectivo realizado em duas unidades de terapia intensiva de um hospital geral público em Aracaju, Sergipe, Brasil. Foram realizadas 300 observações em 20 vítimas de traumatismo cranioencefálico durante três dias. A dor foi avaliada por meio da versão brasileira da *Behavioral Pain Scale* e os parâmetros fisiológicos de frequência cardíaca e pressão arterial (sistólica e diastólica). A profundidade da sedação foi mensurada pelos escores de Ramsay e da *Richmond Agitation Sedation Scale*. O teste de Friedman, ANOVA e pós-teste de Bonferroni foram utilizados para verificar a existência de diferença dos escores de dor e parâmetros fisiológicos nos diferentes momentos da avaliação. Foi admitida significância estatística de 5%.
RESULTADOS: A amostra foi composta predominantemente por homens, jovens, do interior do estado, sem comorbidades e com traumatismo cranioencefálico grave. Fentanil e midazolam foram os fármacos mais utilizados para sedação e analgesia. Houve alta prevalência de dor (70,0-85,5%), os escores de dor foram significativamente mais altos durante a aspiração traqueal e os parâmetros fisiológicos não apresentaram elevação estatisticamente significativa.
CONCLUSÃO: Escalas comportamentais válidas e confiáveis, como a *Behavioral Pain Scale*, devem ser incorporadas à rotina das unidades de terapia intensiva para nortear o manuseio da analgesia e sedação, sobretudo, para prevenção de sofrimento durante procedimentos dolorosos.
Descritores: Dor nociceptiva, Mensuração da dor, Sedação, Sucção, Traumatismo cranioencefálico.

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Submitted in August 12, 2017.
Accepted for publication in October 27, 2017.
Conflict of interests: none – Sponsoring sources: none.

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INTRODUCTION

Traumatic brain injury (TBI) is a serious Brazilian public health problem whose treatment requires intensive support[1]. Thus, in a great part of cases, victims of moderate to severe TBI are hospitalized in critical environments to stabilize the clinical picture.

Intensive care units (ICUs) are characterized by the routine performance of nociceptive procedures for diagnostic and therapeutic purposes or for the maintenance of basic physiological functions[2], such as tracheal aspiration, whose painful potential was observed in a multicenter study performed with patients after discharge from ICU[3].

Pain is a frequent experience in ICUs, but underused, neglected and undervalued[4]. Although most patients are unable to self-report their pain, it does not mean that it does not exist[5]. On the other hand, its adequate handling remains an aspect little explored by the multidisciplinary intensivist team, since the knowledge about valid and reliable instruments to evaluate the pain of these patients is incipient in Brazil.

Behavioral Pain Scale (BPS) is the only observational instrument translated and adapted to the Brazilian culture[6,7]. It is a useful tool for decision making in pain handling in ICU. Its application is fast, has simple language and uses behavioral descriptors that are frequently observed by professionals in their daily practice[8].

Surveys related to pain handling during painful ICU procedures are still scarce in our country. Given the above, this study aimed to evaluate pain during tracheal aspiration (TA) in victims of TBI submitted to mechanical ventilation.

METHODS

Observational, descriptive and prospective study, carried out from September 2015 to June 2016 in the clinical and surgical ICU of a general public hospital of high complexity, located in Aracaju, SE, Brazil.

The sample consisted of the non-probabilistic type for convenience, composed of moderate or severe TBI victims, hemodynamically stable, sedated, and submitted to mechanical ventilation for at least 48 hours. Conditions such as tetraplegia history, neuromuscular blockers use, underlying neurological disease, shock state and/or suspected brain death were considered as exclusion criteria because they interfered with the manifestation of behavioral indicators related to pain.

Sociodemographic and clinical variables present in the data collection form were: age, gender, marital status, educational background, origin, comorbidities, mechanism, and severity of TBI, the intensity of sedation, analgesic drugs, and prescribed sedatives.

Acute Physiology and Chronic Health Disease Classification System II (APACHE II)[9] scores were calculated based on data from the first 24 to 48 hours of ICU admission. Richmond Agitation Sedation Scale (RASS)[10] and Ramsay[11] scores were used to assess the intensity of sedation.

Pain evaluation was performed through the Brazilian version of the Behavioral Pain Scale (BPS-Br)[6] and observation of two physiological parameters whose variations are frequently attributed to the pain presence in clinical practice, heart rate (HR) and systolic blood pressure, and diastolic blood pressure (SBP and DBP).

BPS-Br[6] is an observational instrument for pain assessment for patients who are unable to self-report and has three subscales: facial expression, upper limbs movement, and comfort with mechanical ventilation (Table 1). Each subscale has four behavioral descriptors whose scores vary from one to four, and the total score corresponds to the sum of the partial results, varying from three (absence of pain) to 12 (inadmissible pain)[8]. A score >3 demonstrates the pain presence, and ≥5 indicates significant pain[12].

Table 1. Brazilian version of Behavioral Pain Scale[6]

Item	Description	Score
Facial expression	Relaxed	1
	Partially contracted (e.g., lowering eyelid)	2
	Completely contracted (eyes closed)	3
	Facial contortion	4
Movement of upper limbs	Without movement	1
	Partial movement	2
	Full movement with finger flexion	3
	Permanently contracted	4
Comfort with the mechanical fan	Tolerant	1
	Cough but tolerant to mechanical ventilation most of the time	2
	Fighting with the fan	3
	No ventilation control	4

Initially, a pilot study was carried out to calibrate the team and collection instrument, whose data were excluded from the final analysis. Sociodemographic and clinical data were obtained by analyzing the medical records. The physiological parameters of HR, SBP and DBP were extracted from the multi-parameter monitor. Pain assessment was performed at five different times. Eye cleansing (EC) was considered a non-painful procedure compared to TA, admittedly nociceptive. Patients were evaluated on three different days according to the collection procedure shown in figure 1, resulting in 300 observations (20 patients versus 5 moments versus 3 evaluations).

This study followed the recommendations of the Declaration of Helsinki and Resolution 466/2012 of National Health Council and was approved by Research Ethics Committee of the Federal University of Sergipe under Opinion 903.798 (CAAE: 38567714.1.0000.5546). Due to the patient's impossibility of making decisions, the Free Informed Consent Form (FICF) was signed by one of his/her legal representatives.

Statistical analysis

Data were descriptively analyzed, and the distribution normality was assessed by the Shapiro-Wilk test. Numerical variables were expressed as a mean ± standard error of the mean (SEM) and categorical variables in absolute and relative frequencies. Friedman's non-parametric test and ANOVA were used to compare pain scores and fluctuation of physiological parameters, res-

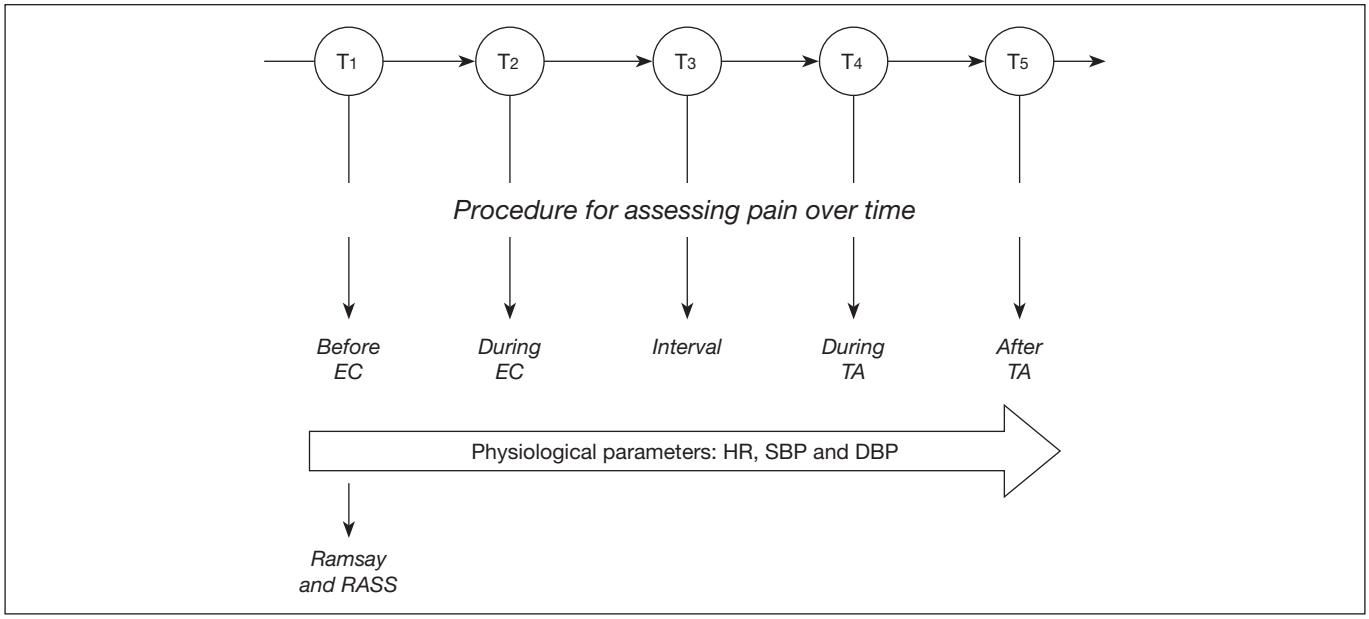

Figure 1. Timeline of data collection procedure.

TA = tracheal aspiration; HR = heart rate; EC = eye cleaning; DBP = diastolic blood pressure; SBP = systolic blood pressure; RASS = Richmond Agitation Sedation Scale.

pectively, throughout the five moments of evaluation. When the difference was identified, the Bonferroni's post-test was performed. Statistical significance was set at 5% and all tests performed were two-tailed.

RESULTS

Thirty-seven patients were included for the first study evaluation. During the follow-up, 17 were excluded because they were extubated in a programmed way, received discharge to the ward or died, so that the final sample consisted of 20 patients (Figure 2). Participants were predominantly males, 19 (95.0%), young adults (40.5±3.0 years), non-white skin color, 14 (70.0%), low schooling (4.1±0.8 years) from state's interior, 14 (70.0%), without comorbidities, with an average APACHE II score of 15.4±0.9. Severe TBI prevailed, 18 (90.0%), the main mechanism of trauma being collisions, 13 (65.5%), especially those involving motorcycles, 11/13 (84.6%).

During all evaluations, participants were intensely sedated; the infusion of sedative and analgesic solution, composed predominantly of fentanyl and midazolam, was active in more than half of the cases. Despite the simple analgesics prescription's high frequency such as paracetamol and dipyrone, these drugs were used irregularly (if necessary) (Table 2).

Pain prevalence during TA varied from 70.0 to 85.0%. Significant pain (BPS≥5) was more frequent in the second evaluation, 11/16 (68.7%) (Table 2). Pain scores were significantly higher during TA at all assessments. However, the physiological parameters were inconsistent, since HR and DBP did not show a statistically significant increase in all evaluations. Additionally, the increase in SBP was not significant in any of the evaluations (Figure 3).

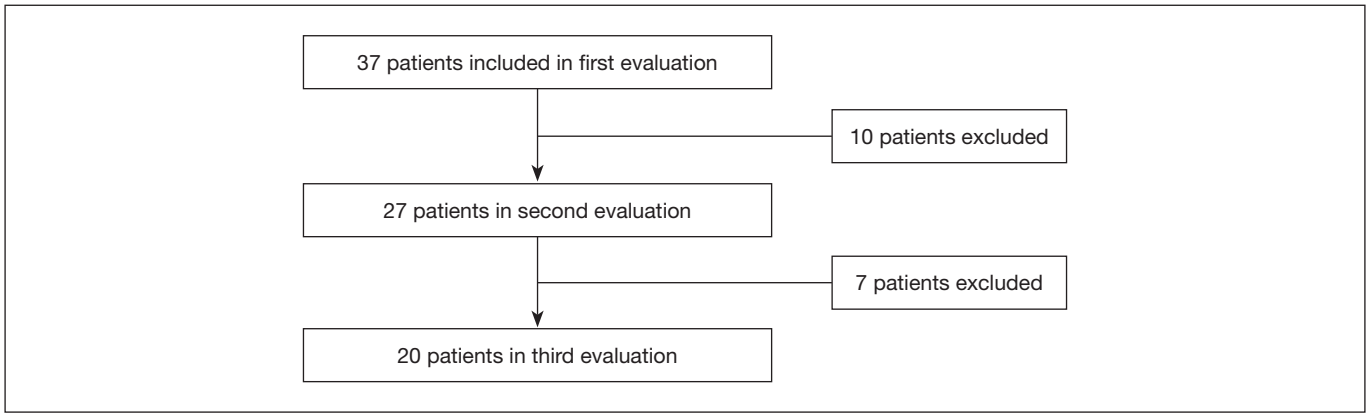

Figure 2. Allocation and follow-up flowchart of participants

Table 2. Pain, analgesia and sedation

Variables	First evaluation Mean±SEM		Second evaluation Mean±SEM		Third evaluation Mean±SEM	
Numerical						
Sedation scores						
Ramsay	5.6±0.2		5.4±0.2		5.5±0.2	
RASS	-3.7±0.5		-4.0±0.3		-3.8±0.3	
Categorical variables	n	%	n	%	n	%
Sedation and active analgesia						
Yes	13	65.0	12	60.0	14	70.0
Prescribed analgesics						
Fentanyl	18	90.0	17	85.0	17	85.0
Other opioids	3	15.0	1	5.0	7	35.0
Simple analgesics	19	95.0	18	90.0	19	95.0
Prescribed sedatives						
Midazolam	18	90.0	15	75.0	15	75.0
Propofol	1	5.0	-	-	2	10.0
Pain during TA						
Yes	14	70.0	16	80.0	17	85.0
Significant pain during TA						
Yes	7	35.0	11	55.0	11	55.0

RASS = Richmond Agitation Sedation Scale; TA = tracheal aspiration.

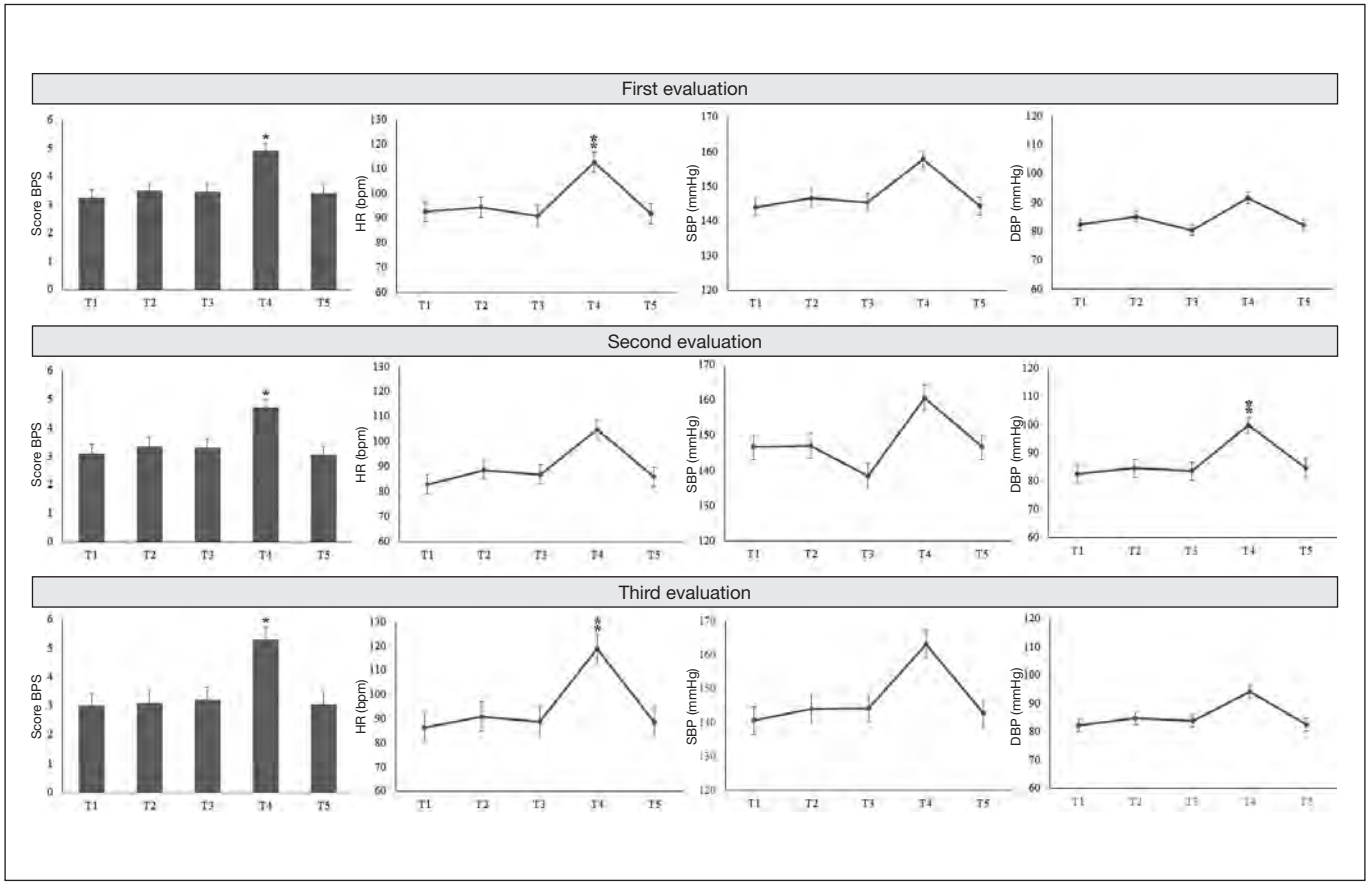

Figure 3. Pain evaluation by the Behavioral Pain Scale and physiological parameters

* T4 x T1, T2, T3 and T5: Friedman's test (p<0.001) and Bonferroni's post-test (p<0.05); ‡ T4 x T1, T2, T3 and T5: ANOVA (p<0.05) and Bonferroni's post-test (p <0.05).

DISCUSSION

Pain relief is a fundamental right of the human being and a fundamental step for the assistance humanization[13]. Despite being considered the fifth vital sign, pain is not systematically assessed in several institutions[14]. This fact is even more worrying in the intensive care picture, given that institutional protocols of analgesia and sedation are scarce and there is a mistaken belief that sedated patients do not feel pain[15].

Pain is an inherent experience of trauma, especially in victims of TBI[16]. The results of this study show that victims of severe TBI, young adults, deeply sedated and submitted to mechanical ventilation experience pain during TA, corroborating the study done with 755 intensive care's patients[17]. This result demonstrates that the analgesia of these patients should be optimized. In addition, it is important for practitioners to look for the correct implementation of the TA technique, as a recent study emphasizes that following the American Association for Respiratory Care (AARC 2010), recommendations can reduce pain during the procedure[18].

As for analgesia, the most recent guidelines on ICU agitation, sedation and delirium have prioritized the approach of analgesia and sedation, with pain relief and comfort in detriment of deeper sedation, reducing the need for the use of hypnotics[19,20]. However, deep sedation and irregular prescription of analgesics prevailed in our results, evidencing that oligoanalgesia and the regimen of analgesia and sedation are still predominant in the institution where the study was performed.

Exacerbated use of benzodiazepines adversely influences patient outcomes, as it may be associated with respiratory depression, hemodynamic instability, changes in bowel function, micro aspirations, increased risk of pressure injury, immunosuppression, muscular weakness, increased costs, the persistence of cognitive deficits, longer ICU stay, delirium and greater dependence on the mechanical ventilator[15,21].

Although elevated, pain prevalence during TA found in this study may have been underestimated, since deep sedation may reduce the manifestation of pain-related behaviors[15]. In addition, patients with traumatic brain injury may present unconventional behaviors when the painful condition lasts, which may have underestimated the results of this study[22].

Pain assessment is indispensable for proper pain handling and to avoiding deep sedation. In this way, valid, reliable, easy-to-use instruments with clear and objective descriptions are essential in this process[23], including for systematic recording, which does not occur in the study's institution. Although the psychometric properties of the scale used in this study have been tested in different countries[24], including Brazil[6,7], BPS is not an instrument widely used in Brazilian ICUs.

In this sense, the physiological parameters, such as those investigated (HR, SBP, and DBP), are still used to evaluate the pain phenomenon. The present results corroborate with other studies[25,26], which indicate that these parameters cannot be used in isolation since they are not pain-specific and are influenced by other factors. None of the investigated parameters presented a consistent increase during the three evaluations, i.e., they did not present discriminant validity. The persistence of these parameters' isolated use in clinical practice may be related to the lack of knowledge about pain in patients sedated or unable to self-report.

Studies[15,27,28] have demonstrated the precarious knowledge in pain of students and health professionals. This fact is worrying since pain training must be transversal and continuous. Therefore, practitioners should be able to use valid and reliable instruments for measurement and assessment of pain specific to each situation, as well as being aware that adequate pain handling can prevent clinical complications, agitation, delirium, post-traumatic stress syndrome[15] and even chronic pain after discharge from ICU[29].

CONCLUSION

There was a high prevalence of pain among mechanically ventilated young adults with severe TBI during TA, demonstrated by a significant increase in BPS-Br scores. Deep sedation with the use of benzodiazepines at the expense of analgesia and sedation was predominant in this study. Although they presented elevation during TA, the physiological parameters were not valid indicators for pain detection. Therefore, they should not be used in isolation.

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ORIGINAL ARTICLE

Newborn's pain under the mother's perception

Dor no recém-nascido na percepção da mãe

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DOI 10.5935/1806-0013.20170126

ABSTRACT

BACKGROUND AND OBJECTIVES: Pain can generate important complications for the newborn. The mother, inserted in this context, becomes an important ally during the hospitalization since she stays with the. Thus, the study aimed to identify the mother's perception of pain in her hospitalized child in the Neonatal Intensive Care Unit and to compare the mothers' reports with a range of behavioral and physiological signs.
METHODS: This is a qualitative study in a tertiary hospital in the State of Ceará. Fifteen mothers who were with their children hospitalized at the Neonatal Intensive Care Unit participated in the study, where they were placed in front of their children in two different moments: at rest and handling, in order to identify signs of pain. The data were analyzed by approximation of the speeches as proposed by Minayo.
RESULTS: The results showed that the mothers did not perceive signs of pain in the newborn at rest. However, when handled, the mothers were able to identify the signs of pain through the characteristics presented in the newborn: facial expression, strong crying and the movement of arms and legs.
CONCLUSION: Mothers are able to identify signs of pain in the child during painful procedures, mainly through crying and face changes. Thus, it points out the relevance of using pain evaluation scales to measure the behavioral and physiological signs of the newborn in a Neonatal Intensive Care Unit.
Keywords: Mother-child relations, Neonatal nursing, Newborn, Pain, Pain measurement.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A dor pode gerar importantes complicações para o recém-nascido. A mãe, inserida nesse contexto, torna-se uma aliada importante durante a hospitalização, por permanecer ao lado do filho. Dessa forma, o estudo teve como objetivo identificar a percepção da mãe em relação a dor no seu filho hospitalizado na Unidade de Terapia Intensiva Neonatal e comparar o relato das mães com uma escala de sinais comportamentais e fisiológicas.
MÉTODOS: Trata-se de um estudo qualitativo, em um hospital terciário do Estado do Ceará. Participaram do estudo 15 mães que estavam com seus filhos hospitalizados na Unidade de Terapia Intensiva Neonatal, onde foram colocadas frente aos seus filhos em dois momentos distintos: em repouso e ao manuseio, com o intuito de identificar sinais de dor. Os dados foram analisados por aproximação das falas, proposto por Minayo.
RESULTADOS: Os resultados apontaram que as mães não perceberam a presença dos sinais de dor no recém-nascido em repouso. No entanto, quando manuseados, as mães foram capazes de identificar os sinais de dor através das características apresentadas nos recém-nascidos: expressão facial, choro forte e a movimentação de braços e pernas.
CONCLUSÃO: As mães são capazes de identificar os sinais de dor apresentados pelo filho durante os procedimentos dolorosos, principalmente através do choro e das alterações de face. Assim fica apontada a relevância do uso de escalas de avaliação da dor para mensurar sinais comportamentais e fisiológicos dos recém-nascidos em Unidade de Terapia Intensiva Neonatal.
Descritores: Dor, Mensuração da dor, Enfermagem neonatal, Recém-nascido, Relações mãe filho.

INTRODUCTION

The pain felt by a newborn has been undervalued for many years since it was believed that they could not feel it. This irrelevance was due to some assumptions, such as the neurological immaturity of the newborn; the absence of memory in this age group, and the great toxicity of the analgesics and anaesthetics[1].
It is known that the fetus' cortical and subcortical centers, important in the perception of pain, are well developed around the 30th week of the gestational age. Thus, the newborn is perfectly capable of feeling pain, which can even be more intense than in an adult[2]. Due to the formation and maturity, the complex of pain transmission has its inhibitory mechanisms more immature than the excitatory, leading to exacerbated responses and likelihood for sequels[3].

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Submitted in May 24, 2017.
Accepted for publication in November 08, 2017.
Conflict of interests: none – Sponsoring sources: none.

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The newborns express their physical and emotional needs, since their birth, through tears, body movements, facial expression, where crying is the most expressive behavioral parameter to start the pain intervention control[4].

In this scenario, in addition to the healthcare professional, we can rely on the mother who remains next to the child during their stay in the Neonatal Intensive Care Unit (NICU). The non-verbal complaint by the newborn is one of the biggest obstacles to diagnosis, and consequently to properly treat pain in the NICU[5].

The development of NICUs together with the modernity of the therapeutical technologies is providing a reduction in the mortality of the newborns. However, we have noticed a higher number of invasive procedures necessary to guarantee the survival of these children.

The struggle for survival brings consequences such as increased exposure to pain. Newborns, in the phase of greater instability, are subject to various painful procedures necessary to their hemodynamic stabilization, such as intubation, arterial puncture, venipuncture, lumbar puncture, aspiration, mechanical ventilation, chest drainage[6].

If left untreated, the pain can lead to major complications to the newborn such as a delayed brain development, behavioral and psychiatric disorders. In a NICU, about 50 to 150 procedures considered painful are performed in the newborn during the hospitalization and the more premature, this number tends to increase, that's why it is important to identify and to intervene[7].

Since it is a personal and subjective experience, pain cannot be measured like pulse, temperature, blood pressure, among others[8]. To facilitate the intervention, pain scales are used in the NICUs to assess the behavioral and physiological signs, one of these scales is the Neonatal Infant Pain Scale(NIPS)[9].

Pain is considered as the fifth vital sign, as important as the others, which must always be recorded and assessed in the clinical setting, along with other vital signs: temperature, pulse, respiration and blood pressure. The effectiveness of the treatment and its follow-up depends on a reliable and valid pain assessment and measurement. After detection, the intervention is required to interrupt or reduce this stimulus, with pharmacological or non-pharmacological approaches[10].

The mother, inserted in this context, becomes an ally during hospitalization since when participating in the care she is able to perceive the signs of this subjective experience[10]. Thus, the mothers' participation in the care and their reports about their child deserves greater attention from the health team[11].

This questioning becomes relevant for the nursing professionals because it makes early intervention possible facing a pain experience and consequently provide quality of life and good development for the newborn. Therefore, the motivation of the researchers to conduct this study was the awareness-raising, and the search for the quality of life of newborns exposed to painful stimulation since the pain in the newborn has a direct influence in its stability and clinical evolution.

Due to the reality of the NICU, of the several procedures considered painful, of the difficulty of the nursing team in diagnosing pain, the mothers' contribution would be suitable and beneficial in this process, pointing out to the professionals the possible signs of pain. Ten comes the question: what is the mother´s perception concerning her child´s signs of pain in the neonatal unit?

This study aimed to identify the mother's perception of her child´s pain in the NICU and compare the mother´s report with a behavioral and physiological pain scale (NIPS).

METHODS

This is a descriptive study with a qualitative approach, conducted in a tertiary public hospital which is a reference to the care of high-risk newborns. The sample was composed of 15 mothers of newborns who were hospitalized in the NICU.

Mothers of premature newborns with gestational age (GA) up to 37 weeks were included. Mothers of newborns who remained in the unit only at the time of the hospital visit were excluded. In that institution, the mothers living in the city of Fortaleza were instructed to stay at least for one shift in the unit.

The data was collected between August and October 2013. Initially, the mothers were invited to participate in the study, and those who met the inclusion criteria established were interviewed in a communal area to obtain the research data. The interview lasted 20 minutes on average. At a second moment, the researcher followed the mother who was with her child inside the unit. The mother was asked to describe how she perceived the signs of pain expressed by the child. Two distinct moments were evaluated: 1st moment: newborn at rest; 2nd moment: newborn being managed. The mothers had 10 minutes to observe their child´s signs of pain. Based on the mothers´ report, the researchers applied the NIPS using the behavioral indicator to compare with the signals reported by the mothers. The instruments used to assess pain can be multidimensional, assessing behavioral and physiological changes, but can also be unidimensional only assessing one of the answers.

The NIPS is a scale used to assess pain signs in the newborn. It has six pain indicators, one physiological and five behavioral, including facial expression, crying, movement of arms and legs, sleep/alertness state and respiratory pattern[12].

The interviews were recorded and then transcribed upon the mothers´ authorization. The data obtained were organized into theme categories and grouped by the approximation of the speeches, which consists in finding out the core meaning that makes up communication, which presence or frequency mean something for the targeted object[13]. The mothers were identified by the letter M and the newborns by the letters RN. Both preceded by an Arabic numeral according to the order in which the interviews were conducted.

The study followed the precepts of Resolution 466/12 of the National Council of Health/Ministry of Health that deals with research involving humans[14] with opinion number 259.657. All the participants signed the Free and informed Consent Form (FICT), and the teenager girls, the Free and Informed Acknowledge Form (FIAF).

RESULTS

Of the 15 participant mothers of the study, the age range varied between 16 and 36 years, two were single, and the others were married. In relation to education, two had a complete higher education; two, incomplete higher education, six, complete high school; two, incomplete high school, one complete elementary school; one, incomplete elementary school, and one was illiterate. Six mothers were primiparous. With regard to the gestational age, this varied between 26 and 37 weeks. As for occupation, only six had any labor occupation. The length of stay of the newborn varied from seven days to 2 months and 12 days.

Table 1 shows the signs of pain identified by the mothers of the premature newborn at two moments: observation at rest and during management. These data were recorded and compared with the NIPS scores.

The results obtained were arranged in two categories based on the participants' responses: signs of pain in the mother´s perception and; the mother´s perception in relation to the care to minimize pain.

Category 1 - Signs of pain in the mother´s perception

The speeches describe the mother's perception concerning the pain felt by their child:

[…] generally when he feels pain, he frowns the forehead, and he gasps (M3; M6).

[…] it is the cry when the cry is very high, he stretches entirely, becomes red, and I see that there´s really something bothering him (M1; M7; M15).

[…] I notice when he is stretching like this, stretching, I see that he is in pain, one small pain thus (M13, M14.

[...] when I realize she's in pain, it is usually through crying or some physical reactions, like a grimace or too much movement (M2; M8; M9).

[…] well, I think that when he is upset with the tube in his mouth, he tries to move the nurse´s hand away, he tries to mimic a cry, ah that´s how I see it, and it is exactly what I feel, it´s something really instinctive (M5).

Category 2 - Mother's perception with respect to the care to minimize the pain

The following lines describe the mothers´ perception about the care provided by the professional to minimize the newborn´s pain.

[...] I realize that usually when children have any different reaction, like in pain, they really stay there on duty, watching a lot, and if that's the case, they do turn to and do something to improve and ease the child´s pain (M2; M10).

[...] is like this, they do a massage, show affection, they caress and calm her down (M1; M4; M8).

[...] they change his position because of the pain he feels, or because he wakes up, he wakes up due to the procedures they have to perform, right? Then he wakes up, it bothers him (M3; M8).

[...] I realize that they try to do whatever they can not to disturb, sometimes they turn off the lights, cover her with a cloth because of the lights on bothers you, even for us it is uncomfortable let alone for her who is so small and used to the dark inside the uterus. They try not to upset or to move too much(M5).

[…] sometimes she comes when it is time to give him the medication, then that pain goes away because of the medication. He is better now, he is no longer in pain (M9; M13; M14).

DISCUSSION

The neonatal pain is recognized through behavioral and physiological alterations[9]. In this study, none of the mothers noticed signs of pain when the newborns were at rest. However, when

Table 1. Comparison of the signs of pain reported by the mother at rest and management with the NIPS signs of the pain. Fortaleza, CE, 2013

Participants	Observation at rest	Observation during management	NIPS Scores
M1	No sign of pain	No sign of pain	No sign of pain
M2	No sign of pain	No sign of pain	No sign of pain
M3	No sign of pain	Grimace - face contracted	Contracted facial expression Respiration different from baseline
M4	No sign of pain	No sign of pain	No sign of pain
M5	No sign of pain	Tried to remove the professional´s hand	Extension of the arms
M6	No sign of pain	No sign of pain	No sign of pain
M7	No sign of pain	Strong cry	Vigorous cry
M8	No sign of pain	Strong cry	Vigorous cry
M9	No sign of pain	Grimace - face contracted	Contracted facial expression
M10	No sign of pain	No sign of pain	No sign of pain
M11	No sign of pain	No sign of pain	No sign of pain
M12	No sign of pain	No sign of pain	No sign of pain
M13	No sign of pain	No sign of pain	No sign of pain
M14	No sign of pain	No sign of pain	No sign of pain
M15	No sign of pain	No sign of pain	No sign of pain

M = mother; NIPS = Neonatal Infant Pain Scale.
Source: Elaborated by the authors.

observed during management, the mothers observed signs of pain, such as facial expression, vigorous cry, and movement of the limbs. Such signs meet the scores established in the NIPS.

In a study conducted in the NICU of Feira de Santana on the identification, evaluation, and intervention of newborn pain, the professionals interviewed reported crying as the most observed characteristic in relation to the newborn pain, followed by body movements and face expression[15].

In this study, the cry was the most reported pain sign. For the mothers, the characteristics of the cry and the baby's behavior are sources of information about their state of health. From the changes in behavior, the mothers are able to identify where the pain is[16].

The facial expression was the second most reported sign of pain by the mothers. Facial changes are the main elements in the study of pain in premature newborns, as it is in this age group that the facial expressions express the pain with greater precision. About 95 to 98% of the premature newborns present at least three pain indicators, such as protruding forehead, nasolabial deepen groove and chin tremor as indicative of pain[17].

The nursing staff is responsible for checking the pain, and with some methods, they can identify the pain manifestations and their characteristics, which are indispensable means in the care premature newborns. Therefore, it is important to note that the signs of pain that the mothers perceive in their children can collaborate with the nursing care[18].

In this study, the identification of the signs of pain was based on the mothers´ reports and later compared with the NIPS parameters. The results showed that the mothers were able to identify what can cause pain to their children.

The NIPS has been used not only as a parameter to assess the analgesic effectiveness of pharmacological and non-pharmacological interventions but also to evidence that certain procedures in newborns are painful[17].

Although the use of the scales to measure pain has shown to be relevant, a survey conducted in the city of Maceió with 15 nurses of the Intermediate Neonatal Care Unit (UCI NEO) and the NICU showed that only one interviewed used the scale to assess pain.

Therefore, the lack of use of multidimensional instruments, like the NIPS, can directly intervene in the quality of the nursing care and lead to an inadequate treatment of pain[19].

In a study carried with nurses[15] about the knowledge and use of the specific pain scales for the neonate, the majority affirmed not knowing them, and those that knew, do not use them. This situation evidences that perhaps pain assessment in the healthcare service is not being performed in a systematic way and probably it is based on subjective criteria, without scientific basis[15].

Following this line of thought, and analyzing the speech reported in this study, it is possible that the mother recognizes the needs signaled by her child, considering the intersubjective relation between mother and child that goes beyond the technical care sometimes observed in the nurse/newborn relationship[20]. Thus, it is important that the nurse appreciates the reports on the newborn pain expressed by the mother who has her child in the NICU because they can tell from small suggestive behavioral changes the discomfort of the newborn that is not compatible with the NIPS.

CONCLUSION

According to the results, the mothers recognize that their children are in pain, facilitating the identification and the appropriate treatment of neonatal pain.

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The use of acupuncture versus dry needling in the treatment of myofascial temporomandibular dysfunction

O emprego de acupuntura versus agulhamento seco no tratamento da disfunção temporomandibular miofascial

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DOI 10.5935/1806-0013.20170127

ABSTRACT

BACKGROUND AND OBJECTIVES: Orofacial pain is the pain felt in the oral cavity and the face, with a multifactorial etiology, being a representative of the temporomandibular dysfunction. Among the various possibilities for treatment are acupuncture and the dry needling. The objective of this study was to compare the effectiveness of these two therapies in the cases of myogenic temporomandibular dysfunction.

CONTENTS: A review of articles relating to the topic was conducted on the LILACS, Medline, Scielo and Pubmed database, cross-referencing the following descriptors: "acupuncture" OR "electroacupuncture" OR "dry needling" AND "orofacial pain syndrome" OR "orofacial pain" OR "temporomandibular dysfunction" OR "temporomandibular disorders", myofascial temporomandibular dysfunction or trigger points in last the 16 years. Clinical trials, systematic reviews, metanalysis, case studies involving human beings were included. The selected languages were English and Portuguese. Twenty-one articles were found that were carefully evaluated and tabulated. The present study identified that both acupuncture and dry needling were significantly important in the resolution of the signs and symptoms of the myogenous temporomandibular dysfunction, with adequate effectiveness.

CONCLUSION: It can be pointed out that dry needling seems to be more effective in the resolution of local pain on the myofascial trigger points than just using of acupuncture points at a distance. Acupuncture demonstrated positive influences in the general health quality and pain of patients with myofascial temporomandibular dysfunction. Therefore, the therapy of choice will depend on the professional's assessment of the clinical conditions of the patient and the therapeutic goals to be achieved.

Keywords: Acupuncture, Orofacial pain, Temporomandibular joint.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A dor orofacial é aquela que é experimentada na cavidade bucal e na face, e que apresenta uma etiologia multifatorial, sendo um representante a disfunção da articulação temporomandibular. Dentre as várias formas de tratamento, tem-se a acupuntura e o agulhamento seco. O objetivo deste estudo foi comparar a efetividade dessas duas terapias nos casos de disfunção da articulação temporomandibular miogênica.

CONTEÚDO: Foi realizado um levantamento bibliográfico nas bases de dados LILACS, Medline, Scielo e Pubmed a partir do cruzamento dos seguintes descritores: "acupuncture" *OR* "electroacupunture" *OR* "dry needling" *AND* "orofacial pain syndrome" *OR* "orofacial pain" *OR* "temporomandibular dysfunction" *OR* "temporomandibular disorders", disfunção temporomandibular ou pontos-gatilho miofasciais nos últimos 16 anos. Foram incluídos ensaios clínicos, revisões sistemáticas, meta-análises, estudos de caso, envolvendo seres humanos. Os idiomas selecionados foram o inglês e o português. Foram encontrados 21 artigos que, posteriormente, foram criteriosamente avaliados e tabelados. O presente trabalho pode identificar que tanto a acupuntura, como o agulhamento seco, foram significativamente importantes na resolução dos sinais e sintomas da disfunção da articulação temporomandibular de caráter miogênico, com adequada eficácia.

CONCLUSÃO: Pode-se salientar que o agulhamento seco parece ser mais eficaz na resolução da dor local sobre o ponto-gatilho miofascial do que somente a utilização de pontos de acupuntura à distância. A acupuntura demonstrou influências positivas na qualidade de saúde geral e dor dos pacientes com disfunção da articulação temporomandibular miofascial. Dessa forma, a escolha da terapêutica a ser aplicada dependerá da avaliação do profissional sobre as condições clínicas do paciente e dos objetivos terapêuticos a serem atingidos.

Descritores: Acupuntura, Articulação temporomandibular, Dor orofacial.

INTRODUCTION

The myofascial pain syndrome can be defined as a pain originated from myofascial trigger points (MTP) located in a tensioned muscle band that produces the localized and/or diffuse or irradiated pain[1,2].

The etiopathogenic factors are multidimensional, corresponding to biomechanical, structural, neuromuscular and biopsychosocial

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Submitted in August 24, 2017.
Accepted for publication in November 06, 2017.
Conflict of interests: none – Sponsoring sources: none.

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changes that encompass, metabolic, traumatic, and genetic conditions and habits of daily life[1,3]. In this context, special mention must be given to the temporomandibular joint disorder (TMD). The TMD involves the masticatory muscles, the temporomandibular joint (TMJ), or both, as well as its adjacent structures[4].

The main triggering risk factors of TMD are related to the presence of micro and/or macro traumas. The first one results from forces of a small magnitude that repeatedly act over time, generating changes in the joint itself. The second comes from any abrupt external force on the joint causing structural or biomechanical lesions[5].

The treatment depends on the diagnosis, which should be meticulous and ad hoc. Currently, the treatment options for TMD include behavioral and postural therapy, and physiotherapy techniques including ultrasound, transcutaneous electrical nerve stimulation (TENS), laser, exercises, massage, and mobilization. Interocclusal appliances (IOA), pharmacotherapy with tricyclic antidepressants, painkillers, central action muscle relaxants, in addition to botulinum toxin, acupuncture, and dry needling (DN)[6-8] can also be used.

DN corresponds to a mechanical stimulus from the insertion of a needle in the muscle where the presence of an MTP was detected. This technique acts directly on the nerve fibers of painful sensation, stimulating the local activation of the A-delta fibers and the inhibition of the C fibers that carry the local pain impulses, resulting in the relaxation of the tense muscle band[9].

Likewise, the acupuncture therapy involves the insertion and manipulation of needles in acupoints, that are specific sites of the body located in the meridians. In accordance with the Traditional Chinese Medicine, the acupoints put the energy flow into motion (*QI*) through the meridians in the entire body[10].

The physiological mechanisms for analgesia with acupuncture, described in the current literature, comprise the activation of the hypothalamus with the release of endogenous opioid peptides as a probable immune response pathway to the relief of pain. Another hypothesis described is that acupuncture is capable of producing analgesia on neuropathic pain by suppressing the activation of microglia and astrocytes. It is also suggested that the acupuncture pathways are related to pain pathways, as well as to the sensory-somatic nervous system with impulses described in the posterior horn of the spinal cord and medial thalamus, among others[11].

The practice of DN and the traditional acupuncture has, to a large extent, positive and significant effects in the treatment of pain[12], presenting different results depending on the case. Traditional Chinese acupuncture has shown greater efficacy in solving problems related to local pain and stress[13]. On the other hand, DN on the MTP seems to produce a better response than the insertion of this same needle in an acupuncture point that is not an MTP[14].

Starting with the analysis of the different types of clinical and physiological responses obtained with the use of DN and traditional acupuncture, the aim of this study was to compare the effectiveness of these two therapies in patients with myofascial TMD.

CONTENTS

We did a bibliographic survey in the following databases: BVS, LILACS, Medline, Scielo, and Pubmed. The search was structured from the crossing of the following keywords: acupuncture OR electroacupuncture OR dry needling AND orofacial pain syndrome OR orofacial pain OR temporomandibular dysfunction OR temporomandibular disorders, or temporomandibular dysfunction or myofascial trigger points. The search was concluded on June 17, 2016.

The selection obeyed the following inclusion criteria: quasi-experiments, randomized clinical trials involving only humans, and systematic reviews that had acupuncture, electroacupuncture and/or DN treatment in English and Portuguese, published in the last 16 years. Studies with animal models, open-label studies as well as protocols with moxibustion and laser therapy were excluded.

We found 14,021 articles for evaluation and selection of the titles. At that stage, articles that were not related to the subject of the study, or that did not present specific treatment or study focusing on the myogenic TMD were excluded, remaining 413 studies.

The reading of the summaries was subsequently performed keeping the exclusion criteria described above, also excluding the articles that did not present a methodological design consistent with the objectives and the theme of the study. Then, 71 studies were left to be read in full. Of these, a total of 21 articles were selected (Figure 1), which fit the objectives and the methodology of this survey (Table 1).

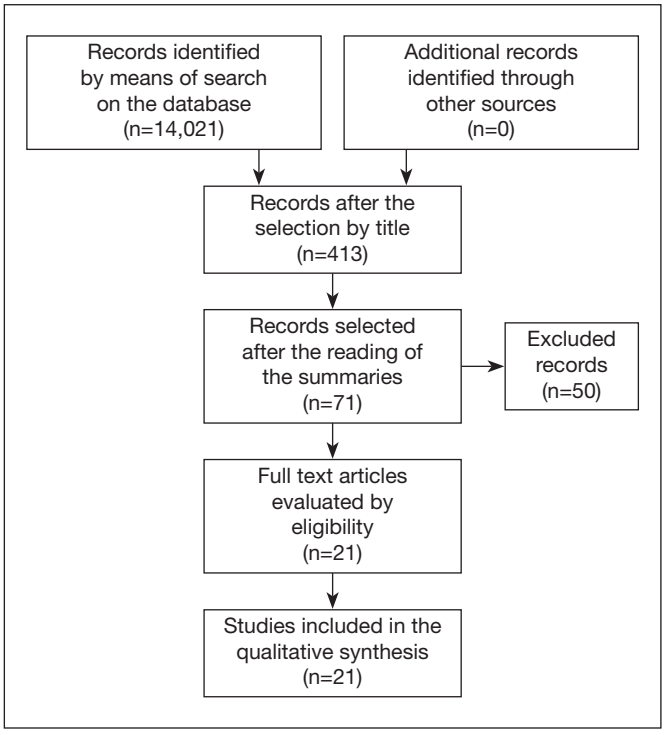

Figure 1. Flowchart of the selection of the articles

Table 1. Included articles

Authors	Population	Objective	Methodology	Therapy	Conclusion
Vicente--Barrero et al.[15]	20 patients	Evaluate the effectiveness and results of the use of acupuncture or IOA in patients with TMD.	Randomized clinical selection 1 group: IOA 1 group: acupuncture	Points: ExHN5, TA 5, TA 21, TA 17, VB 2, VB 34, E6, E36, IG4. Depth: 3.5mm, 15 sessions of 30 min.	Acupuncture comparatively showed to be more effective than IOA in the treatment of TMD.
Jung et al.[16]	7 studies	Evaluate the clinical evidence pro and cons the acupuncture treatment compared to physical therapy as TMD treatment.	Systematic review and meta-analysis	6 studies evaluated acupuncture. Average of 1 session to 3 weeks of treatment. Most used points: IG4 (most used), ID3, ID18, ID2, E6, E7.	The studies indicated that acupuncture has a significant effect on pain, but the results related to the penetrating needling, the fake acupuncture, real acupuncture with Qi sensation, did not show any significant difference among them.
La Touche et al.[17]	4 studies	Evaluate the effectiveness of the acupuncture to treat muscle DTM published in the last decade.	Systematic review	The selected points were E7, IG4, IG2, ID3, E6. Depth: 6 to 30mm, duration: 15 to 30 min.	The study suggests that acupuncture is beneficial in short-term muscle pain. The use of E7, E6, and IG4 is suggested for the treatment of TMD.
Rancan et al.[18]	17 patients	Investigate the electromyographic activation levels and the bite force in the molar region, before and after 3 months of acupuncture in subjects with TMD.	Before-and-after type of clinical trial	Most used points: IG4, E6, E7, B2, VB14, VB20, ID18, ID19, F3, E44, R3, ExHn3. 10 sessions lasting 20 minutes.	The data suggest that acupuncture interferes with the functional capacity of the masticatory system, changing the electromyographic activity patterns, bite force potential and decreases pain.
Borin et al. [19]	40 patients .	Evaluate the effect of acupuncture on pain level and TMD severity.	Randomized clinical trial. 1 group: acupuncture 1 group: untreated control group.	Most used points: E7, E5, 17, ExHn5, VB3, VB43, IG4, ExHn3. Treatment 2 times a week for 5 weeks, 30 min.	Acupuncture has shown to be effective in decreasing the level of pain and TMD severity.
Borin et al[20]	40 patients	Evaluate the effect of acupuncture on the electromyographic activity of the masticatory muscles in patients with TMD.	Clinical trial 1 group: acupuncture 1 group: untreated control group.	Used points: E7, E5, TA17, ExHn5, VB34, IG4, ExHn3. Treatment 2 times a week for 5 weeks, 30 min.	Acupuncture reduced the electric activity at mandibular rest position of the temporal muscles, provided greater balance between the masseter and temporal muscle function. Acupuncture did not act evenly on the masticatory muscles in chewing and maximum intercuspation.
Grillo et al.[21]	40 patients	Evaluate the effect of acupuncture in patients with myogenic TMD compared to the control group using IOA.	Randomized clinical trial. 1 group: acupuncture 1 group: IOA and information on TMD, diet, parafunctional activities 1 x week for IOA adjustment.	Used points: IG4, IG11, ID19, F2, VB20, VB21, VB34, B2, VC23, TA23. Once a week, 20 min for 4 weeks.	Acupuncture reduced pain intensity and improved the movement of the jaw. The two treatments have proven to be effective strategies to control TMD pain.
Camargo, Grillo and Sousa[22]	31 patients	Describe the results obtained on the reduction of TMD pain intensity in patients attending the public service with a minimum of 3 acupuncture sessions.	Descriptive study. 1 group: acupuncture Treatment aiming at the rebalance becomes different for each patient.	Used points: C7, PC6, ID3, VB20, TA23. Once a week, 3 sessions, 20 min.	With 3 sessions it was possible to control the pain of patients with TMD. Therefore, it is understood that its use may contribute to the public service.

Continue...

Table 1. Included articles – continuation

Authors	Population	Objective	Methodology	Therapy	Conclusion
Shen and Goddard[23]	15 participants.	Evaluate the short-term effect of acupuncture on myofascial pain.	Blind randomized clinical trial. 1 group: acupuncture 1 group: simulated acupuncture (needle did not penetrate) applied at 1cm distal to IG4.	Used points: IG4. 1 intervention of 15 min, depth: 10 to 20mm.	There was a significant statistical difference in pain tolerance with acupuncture. It has also reduced fascial, cervical and head pain. The tolerance to pain in the masticatory muscles increased significantly with acupuncture, more than with the simulated acupuncture.
Smith et al.[24]	27 patients	Compare the effect of the real acupuncture and the simulated acupuncture in the treatment of the TMJ myofascial pain to establish the real effectiveness of acupuncture.	Double-blind, randomized controlled trial 1 group: simulated acupuncture (no penetration) 1 group: real acupuncture	Used points: E7, bilateral, 6 interventions of 20 min with manual stimulation at 5 and 10 min., for 3 weeks, depth: 6 to 12 mm.	Acupuncture had a positive effect on TMD signs and symptoms.
McNeely, Olivo and Magee[25]	12 studies	Evaluate the methodological quality and summarize the evidence from studies, randomized controlled clinical trials, that analyzed the effectiveness of physiotherapy interventions in TMD.	Systematic review	Two studies concerning acupuncture. In the one with better quality, acupuncture significantly reduced pain compared to the other therapy. The other study did not show any difference between real and simulated acupuncture.	Most of the studies had a bad methodological quality. It is worth mentioning that exercises are effective in reducing TMD symptoms and that acupuncture still needs further studies.
Nogueira et al.[26]	23 patients	Compare the analgesic effect of acupuncture with PENS on masticatory myalgia.	Randomized clinical trial. 1 group: acupuncture. 1 group: PENS on the painful site needle and 100 Hz electrotherapy.	Used points: Shenmen, IG4, E36, F3, VG20, Yintang. 2 acupuncture sessions per week for 20 min., 5 weeks, 10 to 20 mm depth.	Acupuncture and PENS are effective in decreasing the masticatory myalgia in the masseter muscle in the short term.
Grillo et al.[27]	40 patients	Evaluate the effects of acupuncture on psychological aspects in women with chronic pain related to the diagnosis of TMD.	Clinical trial 1 group: acupuncture. 1 group: IOA when sleeping, diet information and parafunctional activities.	Used points: IG4, IG11, ID19, F2, VB20, VB21, VB34, B2, VC23, TA23 on the right side. 4 sessions, once a week for 20 min.	Both groups improved because of the chronic nature. It is recommended a longer treatment period to extend the acupuncture benefits.
La Touche et al.[28]	9 studies.	Perform an analysis to evaluate the quality of the studies and the effectiveness of acupuncture in pain relief.	Systematic review and meta-analysis of randomized clinical screening	Used points: E6, E7, VB20, Ex2, IG4, ID2, ID3, E36, Depth: 6 to 30 mm, 15 to 30 min duration.	It is suggested that acupuncture is an effective short-term adjuvant treatment for analgesia in patients with TMD.
Cho and Whang[29]	14 studies,	Evaluate the effectiveness of acupuncture for symptomatic treatment of TMD in a review of randomized clinical trials.	Systematic review	Used points: E7, IG4, ID19 were the most frequent, approximately 1 to 30 sessions.	This review provided moderate evidence that acupuncture is effective to reduce TMD symptoms; further studies are needed.
Rosted, Bundgaard and Pedersen[30]	60 patients	Investigate whether the results using acupuncture to treat patients with TMD, in a general dental practice, are comparable with the results of acupuncture achieved in previous studies in university clinics. Check if the therapeutic approach used differs from the one used in university clinics.	Clinical trials	Used points E5, E6, E7, E8, ID18, ID19, VB8, and EX2 (Taiyang). Thirteen dentists used relevant points in the cervical region for a headache, VB20, VB21 B10. 24 dentists used the VG20 and EX6 points to induce relaxation. Average of 3.4 sessions of 15min.	Acupuncture is a simple, safe, and potentially useful and effective in the treatment of TMD in the general dental practice.

Continue...

Table 1. Included articles – continuation

Authors	Population	Objective	Methodology	Therapy	Conclusion
Goddard et al.[31]	18 patients	Evaluate the effectiveness of a standardized acupuncture protocol in patients with myofascial pain in the jaw muscles	Blind randomized clinical trial 1 group: acupuncture 1 group: fake acupuncture (needle inserted at 1 cm of the acupuncture points) IG4, E6, 2 to 4mm depth.	Used points: IG4 and E6 bilaterally, depth of 10 to 30 mm, until getting Qi sensation. Duration of 30 min twittering for 5 seconds. at 15 minutes.	There was no significant difference in pain reduction between the two groups.
Fernández--Carnero et al.[32]	12 patients	Investigate the effectiveness of needling on the active MTPs of the masseter muscle in patients with TMD.	Randomized clinical trial. 1 group: Deep DN 1 group: placebo needling on painful site.	Deep DN with twitting maneuver for 5 times until the stimulation of muscle contraction. Two interventions at a 7-day interval.	Deep DN on the trigger point of the masseter muscle promoted pain reduction, increasing its level of tolerance and increasing the bite force. There was an improvement in the mouth opening in the short term.
Uemoto et al.[33]	21 patients	Compare laser therapy and needle therapy in patients with myofascial pain syndrome.	Randomized clinical trial, 1 group: laser therapy, 1 group: control 1 group: DN	Total of 4 sessions with an interval of 48 and 72h. DN on the MTP of the right-side masseter muscle and needling with an injection of 2% lidocaine with no epinephrine on the left side. The laser therapy group received infra-red laser, with a dose of 4J/cm^3 on the right side and 8J/cm^2 on the left side.	It showed that the injection of 2% lidocaine and laser therapy are effective to disactivate the MTG. DN proved to be effective in reducing pain according to the visual analog scale.
Itoh et al.[34]	16 patients	Determine if acupuncture on the MTPs is effective compared to fake acupuncture.	Blind randomized clinical trial 1 group: fake acupuncture 1 group acupuncture on the MTPs.	Acupuncture on MTPs was performed by a 5 to 15mm insertion, provoking local contraction with an average of 4.2 insertions for 15 min. Once a week, 30 min for 5 weeks. In fake acupuncture, the needling was simulated with no needle penetration, for 10 minutes with an average of 4.8 insertions.	Acupuncture on the MTPs showed to be more effective than fake acupuncture.
Gonzalez--Perez et al.[35]	48 patients	Investigate if deep DN in the lateral pterygoid muscle could reduce pain and improve jaw mobility in comparison with a methocarbamol/paracetamol treatment.	Randomized open label clinical trial. 1 group: DN 1 group: 380mg methocarbamol, 300mg acetaminophen, 1 dose every 6h for 3 weeks.	DN in the lateral pterygoid muscle, once a week for 3 weeks.	Deep DN proved to be more effective than the use of pharmacological substances in reducing pain, mouth opening, laterality, and jaw protrusion.

DN = dry needling; IOA = interocclusal appliance; TMJ = temporomandibular joint; TMD = temporomandibular dysfunction; MTPs = myofascial trigger points; PENS = percutaneous nerve electrical stimulation.

RESULTS

Of the 21 studies, 4 presented DN and 17 acupunctures as a treatment to evaluate the effectiveness of its effects on TMD in relation to other therapies. Of the total studies selected, 3 were systematic reviews, 2 systematic reviews followed by a meta-analysis of 16 clinical trials.

Of the four articles corresponding to the DN technique of, all had positive results concerning pain sensation, electric activity of the masseter and temporal muscles, maximum mouth opening, laterality, and jaw protrusion. Yet, the 17 articles that used the traditional acupuncture demonstrated that it was more effective than the placebo treatment, fake acupuncture, acupuncture without needle penetration and laser therapy. Acupuncture on painful sites and electrotherapy showed equal effectiveness on the perception of pain, electric muscle activity, maximum mouth opening mouth without pain, supported pressure level, sensitivity, and TMD severity.

The muscles involved in TMD in the studies were the masseter, temporal (anterior bundle), pterygoid, upper trapezius, anterior and posterior region of the neck that when palpated produced headaches, common in the TMD. The

muscles that had more intervention were right (R) and left (L) masseter, left and right temporal (anterior bundle), right and left pterygoid.

Three studies described the technique of deep DN[32,34,35], in its majority, on masseter, lateral pterygoid, temporal, through the back and forth movement for approximately 5 times, as well as insertions and withdrawal of the needles. The depth of the needle remained between 5 and 15mm, except for one article that deepened 1 to 2cm at a 30° angle in relation to the skin[18]. The average frequency of applications was of 4 sessions, with intervals varying between once a week and 1 session every 2 and 3 days[33]. Concerning acupuncture, treatments varied between one and 10 sessions, with a frequency of 1 to 3 times per week, with an average duration of 10 to 30min, with or without *Qi* activation (energy flow), being only considered the manual stimulation. The deepening of the needle varied, approximately 3 to 30mm[15,17,23,24,26,28,31].

The most used and recommended points for the TMD treatment were: stomach 6 (E6) that corresponds to the masseter muscle insertion (jaw angle) and stomach 7 (E7) that is located right below the zygomatic arch to the front of the ATM. There are distant points with analgesic function such as the large intestine 4 (IG4) that is anatomically between the first and second metacarpal[19], the stomach (E36) located in the tibial muscle anterior, inferior and lateral to the patella, as well as the points in the head and neck to help the relaxation of the adjacent musculature[28,36] (Figure 2).

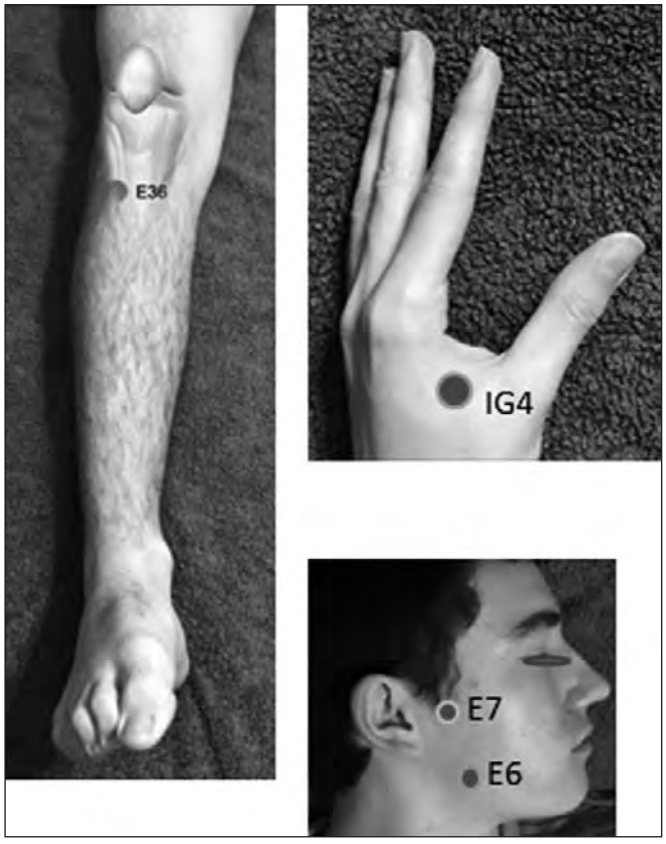

Figure 2. Most commonly used acupuncture points to treat temporomandibular dysfunction

The methods to assess TMD used in the studies were the visual analogical scale (VAS), pressure algometry, sensitivity to pressure force, maximum mouth opening without pain, jaw movements as protrusion and laterality, deviation of the jaw, electromyography of the masticatory muscles, RDC/TMD axis II questionnaire, GCPS scale, TMD severity questionnaire, craniomandibular dysfunction index, pain distribution questionnaire, frequency of joint noises, stomatognathic evaluation, numeric pain rating scale (NPRS)[15,24,26,31].

Moreover, it was possible to observe in this study that most of the patients that seek TMD treatment are female, with age between 18 and 68 years[17,20,35].

DISCUSSION

TMD has signs and symptoms that include ATM and/or masticatory muscles pain, especially when palpated, with limitation, deviation or deflection of mandibular movements and joint noises[2,7]. Pain is the most common symptom, affecting more women than men in a 4:1 ratio[16,37]. However, other studies reported a proportional occurrence of TMD in both gender[21], but reinforcing that women seek more treatment than men, relating it their concern with their health[15].

On the other hand, the MTPs can be characterized as a presynaptic dysfunction in the endplate, with an excessive release of acetylcholine in the synaptic cleft, causing a sustained contraction, recognized as muscle contraction next to this plate[40]. Therefore, it is defined as a neuromuscular disease, characterized by motor and sensory changes, causing referred pain on palpation and hyperirritability in the assessed muscle band[9,39].

Several techniques have been described for TMD, and MTP treatment and acupuncture and DN stand out[15,35]. The results of this review show that there was no study comparing the effect of acupuncture with the effect of DN in cases of myogenic TMD in the conducted search for evidence. As for the studies related to the effectiveness of acupuncture compared to other treatments, it can be pointed out that it was more effective on the overall health quality[40]. In TMD, there was similar efficacy to laser acupuncture, occlusal therapy with IOA, parafunctional habits guidelines and *sham* or placebo acupuncture[36].

In the studies that use DN, this showed significant effectiveness in resolving the pain[32,35,41]. Acupuncture with distant points showed a favorable effect on stress, quality of sleep, and headache due to its action on the physical and mental balance in comparison to the application specifically in local points[40]. One of the explanations of the physiological mechanism of action of acupuncture refers to the stimulation of peripheral innervation, responsible for forwarding the message to the spinal cord, brain stem and hypothalamic neurons, triggering an endogenous release mechanism of opiates such as endorphins, enkephalins, serotonin, acetylcholine, and hormones[24,25,42,43].

Acupuncture in the IG4, associated with the high-intensity current electrostimulation resulted in the activation of the contralateral prefrontal region, reflecting modulation in the anterior and subcortical cingulate cortex, as well as sensory-motor cortical areas involved in the emotional and cognitive relation of

pain[44]. The high frequency conducted by the acupoint may act by reducing the propagation of the Theta and alpha 1 waves, decreasing the anterior cingulate cortex activity, resulting in antinociception as pain modulation[44].

Needling and manual stimulation on the E36 acupoint with *Qi* sensation also showed a decrease in sign excitation on fiber connections and projections to the encephalon, cerebellum and limbic system, emphasizing the analgesic function of this point. It also influences the response patterns of the central nervous system related to the regulation of dopaminergic, norepinephrinergic and serotonergic substances[27]. Some authors even mention that there is the release of enkephalins and dynorphin associated with a cascade of reactions not yet fully understood[18,36].

According to La Touche et al.[17,28], the benefits obtained with acupuncture are more evident in the short term, being the E6, E7, and IG4 the points for the treatment of TMD. As advantages of this therapy, Camargo, Grillo and Sousa[22] highlighted its applicability in public healthcare services since the therapy seems to be cost-effective, safe and simple, providing pain control in a few visits. However, two systematic reviews included in this study showed that the methodological quality of primary studies conducted so far is moderate or weak, requiring better research design[17,28].

Studies that tried to evaluate the electromyographic activity after the use of manual acupuncture with distant and local points, as in the case of E7, have shown the reduction of the electric muscle activity at rest, during posture maintenance and teeth clenching, and a better distribution of the nervous impulse on the masticatory muscles, but with no uniform response pattern. It was also possible to identify changes in the bite force pattern and pain reduction[18,20].

On the other hand, in the deep needling, it is expected to effectively reach the MTP generating muscle contraction, mechanoreceptors excitement and activation of the sensory afferent pathways entering the dorsal horn of the spinal cord. However, it should be noted that the needle manipulation in deep tissue is painful and can cause more tissue damage[45,46]. In this context, Uemoto et al.[33] demonstrated that when comparing DN with the 2% lidocaine injection and laser therapy, it was effective in reducing the pain evaluated by VAS. Moreover, evidence suggests that the use of DN the is superior to fake acupuncture after 5 weeks.

Another important result worth mentioning is related to the DN superiority in relation to pharmacological substances when evaluating the reduction of pain, the amplitude of mouth opening, laterality and jaw protrusion after 3 weeks of therapy[35]. Considering the population profile on the unrestricted use of drugs, the use of a more effective technique, with a lower risk of pharmacological interactions seems to be an important indicator in the clinical practice.

One of the limitations of the present study relates to the evaluation of therapies through indirect comparisons, being necessary to conduct randomized clinical trials that compare the two therapies in one single clinical trial. It is worth mentioning that the profile of the patients included in the mentioned clinical trials is composed mainly of adult women corroborating the data already described in the literature[16,37]. More studies should be conducted with male patients in order to check whether the results obtained so far with the use of DN and acupuncture are similar in both genders.

CONCLUSION

The present study identified that both acupuncture and dry needling were significantly important in the resolution of the signs and symptoms of the myogenic temporomandibular dysfunction, with adequate effectiveness.

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The use of noninvasive neuromodulation in the treatment of chronic pain in individuals with temporomandibular dysfunction

O uso da neuromodulação não invasiva no tratamento da dor crônica em indivíduos com disfunção temporomandibular

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DOI 10.5935/1806-0013.20170128

ABSTRACT

BACKGROUND AND OBJECTIVES: Faced with mechanisms of maladaptive neuroplasticity that can generate a memorization of pain sensation in individuals with temporomandibular dysfunction, the transcranial direct current stimulation emerges as a possible treatment strategy for chronic pain. However, further studies are needed to demonstrate the efficacy of this therapeutic modality and its long-term effect. Thus, the present study aims to discuss the use of transcranial direct current stimulation in the treatment of temporomandibular dysfunction in individuals with chronic pain.

CONTENTS: The present review encompasses 40 articles, published between the years 2000 and 2016. The temporomandibular dysfunction is a disease characterized by a set of signs and symptoms that may include joint noise, pain in the muscles of mastication, limitation of mandibular movements, facial pain, joint pain and/or dental wear. Pain appears as a very present and striking symptom, with a tendency to chronicity, a condition that is difficult to treat and often associated with psychological factors such as anxiety and depression. Studies using transcranial direct current stimulation in patients with chronic pain symptomatology have been showing good results through neuromodulation of neuronal excitability. It is worth noting that it corresponds to a non-invasive technique, low cost, easy and quick to apply, besides having minimal adverse effects.

CONCLUSION: The transcranial direct current stimulation has shown promising results in the treatment of temporomandibular dysfunction pain, with the possibility of becoming a complementary technique to the existing treatments, and thus, providing a professional assistance of better quality and resolution to the patient with this disorder.

Keywords: Analgesia, Facial pain, Rehabilitation, Temporomandibular joint disorders, Transcranial direct current stimulation.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Diante de mecanismos de neuroplasticidade mal adaptativa, que podem levar a uma memorização da sensação dolorosa em indivíduos com disfunção temporomandibular, a estimulação transcraniana por corrente contínua surge como uma possível estratégia de tratamento para a condição álgica crônica. No entanto, é necessário o desenvolvimento de estudos subsequentes que comprovem a eficácia dessa modalidade terapêutica e de seu efeito em longo prazo. Dessa forma, o presente estudo teve como objetivo discorrer sobre o uso da estimulação transcraniana por corrente contínua no tratamento da disfunção temporomandibular em indivíduos com dor crônica.

CONTEÚDO: O presente estudo engloba 40 artigos, publicados entre 2000 e 2016. A disfunção temporomandibular é uma doença caracterizada por um conjunto de sinais e sintomas que pode incluir ruídos articulares, dor nos músculos da mastigação, limitação dos movimentos mandibulares, dor na articulação e/ou desgaste dental. A dor aparece como um sintoma bastante presente e marcante, com tendência à cronicidade, sendo essa uma condição de difícil tratamento, muitas vezes associada a fatores psicológicos de ansiedade e depressão. Estudos utilizando a estimulação transcraniana por corrente contínua, em pacientes com sintoma doloroso crônico, vêm demonstrando bons resultados por meio da neuromodulação da excitabilidade neuronal. Trata-se de uma técnica não invasiva, de baixo custo, de fácil e rápida aplicação, além de possuir efeitos adversos mínimos.

CONCLUSÃO: A estimulação transcraniana por corrente contínua vem apresentando resultados promissores no tratamento da dor na disfunção temporomandibular, havendo a possibilidade de se tornar uma técnica complementar aos tratamentos já existentes, e desse modo, proporcionar uma assistência profissional de melhor qualidade e resolutividade ao paciente portador dessa desordem.

Descritores: Analgesia, Dor orofacial, Estimulação transcraniana por corrente contínua, Reabilitação, Transtornos da articulação temporomandibular.

INTRODUCTION

Temporomandibular disorder (TMD) is a pathological condition that encompasses clinical problems related to masticatory musculature, temporomandibular joint (TMJ), or both structures[1]. In many cases, individuals with this disease present pain as the most striking symptom, which may be

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Submitted in June 05, 2017.
Accepted for publication in October 27, 2017.
Conflict of interests: none – Sponsoring sources: none.

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acute or chronic, the latter having a dysfunctional character, with a tendency to persist even after removing the initial cause[2].

Through scientific investigations, it was observed that neuronal circuits responsible for the pain and emotion processing are associated, one overlapping the other, suggesting a mutual influence relationship[3,4]. These results corroborate the frequent association of chronic pain with psychological dysfunctions, such as anxiety and depression[5-8]. Based on these data, it was found that pain sensation does not only depend on the stimulus nature and intensity, it is a multidimensional experience composed of emotional, sensory and cognitive aspects[3,4,9].

Considering that chronic pain is a complex and multidimensional phenomenon[1], it requires a multidisciplinary treatment, addressing different therapies[5-7]. However, some patients have a temporary and/or unsatisfactory response, leading to a suspicion that the emotional components of pain often underlie treatment refractiveness. It is also worth mentioning the development of a memory for pain[1,5,10], due to reversible structural and physiological changes in the cerebral cortex[11].

Considering that neuroplastic changes play an important role in the maintenance of chronic pain in TMD, transcranial direct current stimulation (TDCS) emerges as another treatment option, seeking to modify the cortical activity pattern and restore normal activation of the pain processing centers[12,13].

The application of stimulation protocols has shown promise in some studies, with satisfactory results regarding the reduction of painful symptoms in patients with chronic pain[13-17]. The analgesic effect provided by TDCS has been reported through anodic stimulation, mainly in the primary motor cortex (M1)[15,17,18]. However, there is another option of stimulation protocol, with the anode in the dorsolateral of prefrontal cortex (DLPFC), which has also demonstrated therapeutic effect on pain[15,19]. However, these results are still inconclusive, which indicates the need for further investigation[16,20-22].

In this context, it is pertinent to investigate alternative methods for the treatment of chronic TMD in order to increase the range of possibilities and, therefore, to promote pain relief, functional recovery and, consequently, better quality of life for a greater number of patients[1,6,11].

This study aimed to discuss the therapeutic use of TDCS in individuals with chronic pain due to muscular TMD.

CONTENTS

This is a bibliographic survey carried out between January and September of 2016 in Pubmed and Virtual Health Library (BIREME), chosen due the fact of aggregating different databases, both international and national. Some books and several articles were selected, published between the years 2000 and 2016, which approached the theme of the present study. Descriptors such as "Analgesia", "Orofacial pain", "Transcranial direct current stimulation", "Rehabilitation", "Temporomandibular joint disorders" were used. 40 articles were selected to compose the literature review, since they fit the objective of this study.

TMD is a subgroup of craniofacial pain, constituting the main cause of orofacial pain of non-dental origin that may involve masticatory muscles, TMJ and/or associated structures[23]. It has been defined as a pathological condition characterized by a set of signs and symptoms that may include joint noises, pain in the mastication muscles, limitation of mandibular movements, facial pain, headache, joint and/or dental wear[1,23,24]. It is observed that the symptoms manifest themselves in a varied form, being related to the anatomical components that collapse by the disorder, depending on the physiological tolerance of each structure of the stomatognathic system[1].

It is estimated that approximately 40 to 60% of the population presents some detectable clinical signs of TMD, being more frequent in people between 20 and 40 years old[1,25]. A very prevalent disease whose etiology is considered complex and multifactorial, being the result of an interrelationship between some main etiological factors: occlusal condition, trauma, psychological alterations, sources of deep pain stimulus and parafunctional activities[1,6,24]. Studies in the behavioral area observed that TMD was often related to psychopathologies, which may present as a initiating, precipitating and even perpetuating factor[5,6,8,26].

TEMPOROMANDIBULAR AND EMOTIONAL DISORDERS

Pain appears in a very marked and present way in the TMD and may affect the development of daily activities, physical and psychosocial functioning, as well as the quality of life (IASP-International Association for the Study of Pain). Especially when chronic, pain is related to emotional factors, such as anxiety and depression, possibly due to a sharing and proximity of neural pathways of processing[3,4,27-29]. Studies performed with patients with chronic TMD corroborate this relationship when they observe a positive correlation between the severity of this disease and the levels of anxiety and depression presented by the patients[5-8]. In addition, women showed a greater propensity to present emotional stress and concomitant psychiatric disorders[26].

PAINFUL SYMPTOMS

According to IASP, pain is defined as an unpleasant sensory and emotional experience, being associated with or related to actual or potential tissue damage. Approximately 10% of the world population presents facial pain due TDM (IASP), and this painful symptom may be characterized as acute or chronic[1,2].

Acute pain has a physiological and protective character, is self-limiting and responds to conventional therapies. It usually ceases after treatment of the causative factor. Chronic pain, however, does not have a biological character and persists after removing the cause, with a tendency not to respond

to conventional therapies, requiring a multidisciplinary treatment to control pain[2,30].

Even eliminating the nociceptive stimulus, pain will not subside, because learning-related neuroplasticity mechanisms can lead to a memorization of the pain sensation[11], making it chronic, especially if it is a constant pain condition, without periods of complete remission[1]. This memory for pain is due to functional and structural changes in the synapses underlying the painful experience, due to a repetitive pain stimulus that reinforces this circuit, and culminates in the establishment of brain memory traces that maintain the sensation of pain[1,31,32].

The painful experience is a complex phenomenon, which can be physiologically initiated by a somatic factor, but its permanence results from important structural and functional cortical modifications such as cortical atrophy and neuronal hyperactivity in different regions of the central nervous system (CNS)[11,27]. It involves brain areas responsible for emotion, perception, motor planning, behavior and memory, such as the anterior insula, anterior cingulate cortex, somatosensory, motor area, limbic system and thalamus[31-33].

Studies observed that neuronal circuits responsible for the pain and emotion processing are associated, one overlapping the other, suggesting a mutual influence relationship[3,4,28,29]. Based on these data, the principle that painful sensation does not depend only on the nature and intensity of the stimulus is reinforced. It is a multidimensional experience composed of emotional, sensory, and cognitive aspects[3,4,9]. Thus, the chronic pain understanding should address the concept of learning, emotional and motivational state, as well as memory mechanism[1,31].

In view of the complexity and multidimensionality of painful experience, the diagnosis of TMD should be judicious, including the patient's history, clinical examination and complementary tests, and the information collected mainly during anamnesis[1]. It requires a research for psychological, physical and social factors, and a multidisciplinary team is usually required[6,10,30,34].

THERAPEUTIC ALTERNATIVES

In view of the above, when it comes to chronic pain, the mechanistic model of treatment is insufficient, and the dental surgeon must understand the man as a biopsychosocial being in order to implement and/or refer the patient to the most indicated alternative therapy. Some aim to treat the musculature, others act on dental occlusion or joint structures and there are those whose main focus is the psychoemotional factor[6,10,30,34].

In dental area, there are several treatment modalities for TMD, since this disease has a variety of symptoms. These include patient education in relation to self-care, behavior modification (including relaxation techniques), drugs, physical therapy, acupuncture, stabilizing occlusal plates, occlusal therapy (orthodontics, oral rehabilitation) and surgery. The need to give preference to reversible and non-invasive procedures is emphasized. Thus, invasive procedures such as surgical, orthodontic and occlusal adjustment are not first-choice treatments and their efficacy is still questionable[1,35,36]. Among the therapies promoted by professionals from other areas are biofeedback, iontophoresis, ultrasound, transcutaneous electrical nerve stimulation (TENS), cognitive-behavioral therapy and meditation[1,35,36].

Despite the wide variety of strategies used to treat patients with TMD, some patients have a temporary and/or unsatisfactory relief response, generating hypotheses that emotional components often underlie treatment refractiveness and development of a memory for pain[1,5,10,12,31]. Given that chronic pain generates structural and physiological changes in the cerebral cortex, and these, in turn, are not irreversible[11].

Thus, it is evident the need for a therapy that acts directly on the CNS. This action can occur through drugs, however, many individuals are refractory or present adverse effects, such as dependence and/or tolerance[1,35,36]. Therefore, the importance of new treatments involving neuromodulation and neuroplasticity mechanisms is detached, such as TDCS, which can be a complementary alternative to the different types of treatment already in use[12,13].

Transcranial direct current stimulation

Neuroplastic changes play an important role in pain maintenance, thus, cerebral stimulation emerges as a possible therapeutic strategy, differentiating itself from existing treatment alternatives due to its direct action at the level of the CNS[12]. Neuromodulation techniques include TDCS, which is based on the use of a continuous electric current with the objective of modifying the neuronal membrane potential and consequently changing the pattern of cortical activity, besides restoring the normal activation of the centers processing the pain[13,15,16,26].

TDCS apparatus has two electrodes: an anode (positive pole) and a cathode (negative pole) that generate a low intensity DC current. Depending on the assembly, the flow will be either anodic, cathodic or both, where anodic stimulation results in increased neuronal excitability, while cathodic stimulation results in the opposite effect[12,13]. In addition to interfering with the neuronal activity of areas located just below the electrodes, this technique also affects the interconnected cortical and subcortical regions[16,17].

TDCS effects can be divided essentially into neuromodulatory and neuroplastic. The first corresponds to the change generated in the resting potential of the membrane, without significant effects on the synaptic plasticity. On the other hand, secondary effects occur due to modifications of the synaptic force after the stimulation period, being dependent on the modulation of GABAergic and glutamatergic synapses. Thus, TDCS efficacy is influenced by the current density applied, which involves the stimulation duration, current amplitude, location and electrode size. In general, the stimulation parameters used are: duration between 5 to 30 minutes, intensity of 0.5 to 2.0 mA, size of the electrodes between 20 and 35cm^2 [37].

It is a simple, low-cost, safe, non-invasive, well-tolerated, and painless technique that can modulate brain activity locally, presenting therapeutic effects[13,15,17,38]. These favorable characteristics stimulated the development of several clinical studies

involving neurological and psychiatric disorders such as major depressive disorder, acute and chronic pain, motor rehabilitation, drug dependence, among other diseases[38].

The application of active stimulation protocols has shown promise in some studies, with good results regarding the reduction of painful symptoms in patients with chronic pain, when compared to placebo stimulation[13-18,22]. TDCS studies obtained a significant analgesic effect through anodic stimulation in the primary motor cortex (M1)[15,17,18], possibly due to the secondary activation of the ipsilateral thalamus and other regions related to the pain processing and modulation, such as the cingulate cortex, prefrontal cortex and estriatum[12,39]. Evidence also indicates that M1 cortex stimulation inhibits the activity of the ipsilateral primary somatosensory cortex (S1)[40]. For this purpose, the anode is positioned on the contralateral M1 cortex in the affected side in case of unilateral pain or on the M1 of the dominant hemisphere in case of bilateral pain, and the cathode on the supraorbital region contralateral to the anode[13,15-18,41].

This therapeutic effect on pain after stimulation of the M1 region was reproduced in different groups of patients with chronic pain resulting from diseases such as trigeminal neuralgia, TMD, post-stroke pain and fibromyalgia[13,17,18]. However, there is another option of assembly, applying the anode in the dorsolateral region of the left prefrontal cortex (DLPFC), which has also been demonstrating therapeutic effect[15,16,19,41], since this region shows to be hypoactive in individuals with chronic pain[27-33].

Although less explored, stimulation in DLPFC region may be a useful strategy to modulate affective-emotional cognitive networks associated with pain processing in patients with chronic pain, changing their perception through cortico-subcortical and cortico-cortical pathways, since this area seems to play an important role in the cortical processing of the pain emotional aspects[19,41,42]. Thus, it could be a good alternative in cases of chronic pain, in which the emotional components are often underlying the treatment refractiveness, possibly due to an anatomical relationship of quite proximity between the circuits of pain and emotions[1,3,4,28].

Although TDCS seems to be an easy-to-use instrument, there is a minimal risk of serious adverse effects[14]. Through a systematic review, the most common side effects of active TDCS were pruritus (39.3%), tingling (22.2%), headache (14.8%), discomfort (10.4%), and burning sensation (8.7%)[43]. Thus, researches should follow protocols for TDCS' application, which include parameters such as duration, intensity, standardization of adverse effects assessment and reports, among others[14].

Although the aforementioned technique has potential for pain management, the limited number of available randomized clinical trials and their heterogeneous results evidences the need for further scientific investigations regarding the technique efficacy, in order to identify the optimal stimulation parameters (intensity, repetition rate, time, electrode positions and stimulation polarity) since the stimulation protocols optimization in relation to specific populations of patients is an important aspect in the efficacy of said therapeutic technique, as well as to monitor its analgesic effects and probable psychological repercussion in the short, medium and long term[16,19-22].

CONCLUSION

TDCS has shown promising results in the treatment of chronic TMD pain, whose technique's differential involves a direct action in the CNS, through the neuromodulation of the painful stimulus' processing centers. Thus, it presents itself as a possible therapeutic strategy, aiming to complementing the range of existing treatment alternatives.

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Physiotherapeutic treatment in temporomandibular disorders

Tratamento fisioterapêutico nas desordens temporomandibulares

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DOI 10.5935/1806-0013.20170129

ABSTRACT

BACKGROUND AND OBJECTIVES: Temporomandibular dysfunction is defined as a set of dysfunctions that affect the masticatory muscles, the temporomandibular joint and associated structures. The objective of this study was to systematize scientific evidence on the techniques of physiotherapeutic treatment for temporomandibular disorders.

CONTENTS: The search was performed on the Medline, LILACS and Scielo databases, as well as the Pubmed search tool for articles published in the last 10 years, from August 2006 to August 2016. The survey was carried out with the following descriptors: "temporomandibular joint" and "physiotherapy", "temporomandibular joint disorders" and "physiotherapy", "temporomandibular joint" and "physiotherapy techniques", "temporomandibular joint disorders" and "physiotherapy techniques". We included randomized trials and case reports, composed only of patients with temporomandibular disorders who underwent physical therapy. The search totaled 32 studies and 11 of them were selected. The pain was assessed by unanimity. The articles did the same amount of sessions.

CONCLUSION: Several resources such as ultrasound, laser, cathodic current; or manual therapies, as muscle stretching, and joint mobilization bring remarkable benefits to temporomandibular dysfunction. However, studies with higher methodological quality with follow-up are necessary.

Keywords: Physiotherapy, Temporomandibular dysfunction, Temporomandibular joint, Temporomandibular joint disorders.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A disfunção temporomandibular é definida como um conjunto de disfunções que acometem os músculos mastigatórios, a articulação temporomandibular e estruturas associadas. O objetivo deste estudo foi sistematizar evidências científicas sobre técnicas de tratamento fisioterapêutico para as desordens temporomandibulares.

CONTEÚDO: A busca foi realizada a partir da consulta às bases de dados Medline, LILACS e Scielo, além da ferramenta de busca Pubmed dos artigos publicados nos últimos 10 anos, de agosto 2006 à agosto de 2016. O levantamento foi realizado com os seguintes descritores: "articulação temporomandibular" e "fisioterapia", "transtornos da articulação temporomandibular" e "fisioterapia", "temporomandibular joint" and "physiotherapy techniques", "temporomandibular joint disorders" and "physiotherapy techniques". Foram incluídos ensaios randomizados e relatos de casos, compostos apenas por pacientes com desordens temporomandibulares que realizaram tratamento fisioterapêutico. A busca totalizou 32 estudos e destes, foram selecionados 11 artigos. A dor foi avaliada por unanimidade. Os artigos realizaram a mesma quantidade de sessões.

CONCLUSÃO: Diversos recursos como o ultrassom, laser, corrente catódica, ou ainda, terapias manuais como alongamento muscular e mobilização articular trazem benefícios notáveis na dor da disfunção temporomandibular. Porém, estudos com maior qualidade metodológica com *follow-up* são necessários

Descritores: Articulação temporomandibular, Disfunção temporomandibular, Fisioterapia, Transtornos da articulação temporomandibular.

INTRODUCTION

Temporomandibular joint (TMJ) is considered the most complex structure of the human body. TMJ performs rotational and translational movements due to the double articulation of the temporal bone condyle. The fact that TMJ presents two joints (condyles) connected to the mandible requires that they work synchronously between dental occlusion, neuromuscular balance and the joint itself. This joint is vulnerable to functional or pathological alterations, leading to disorders such as temporomandibular disorder (TMD)[1].

TMD is defined as a set of disorders involving masticatory muscles, TMJ, and adjacent segments. These disturbances affect the dynamic balance of the structures, leading to a series of signs and symptoms typical of this dysfunction. Face pains, TMJ and/or masticatory muscles and headache are the main ones. Other less frequent symptoms that may be present are manifestations

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Submitted in May 03, 2017.
Accepted for publication in November 08, 2017.
Conflict of interests: none – Sponsoring sources: none

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of tinnitus and vertigo. Regarding the signs, there is primarily muscle and TMJ sensitivity to palpation, limitation and/or disturbances of mandibular movement and joint noises. It is estimated that 40 to 75% of the population has at least one TMD signal, such as noise, and at least one symptom, such as facial pain or TMJ (33%)[2].

TMD affects a large part of the world's population. Due to this fact, it is essential to develop therapeutic techniques for its treatment. Physiotherapy contributes to lessening the TMD symptoms, as it stimulates proprioception, production of synovial fluid in the joint, improves the elasticity of adhered muscle fibers and pain[3].

Thus, to minimize the effects caused by TMD, physiotherapy becomes a fundamental and integral part of these patients' treatment.

Given the above, this study aimed to organize the scientific evidence on the physiotherapeutic treatments used in patients with temporomandibular disorders.

CONTENTS

The systematic review was carried out from a retrospective consultation with Scielo, Pubmed and LILACS databases. Articles collection was carried out in September 2016, and the search strategy was formulated through the descriptors crossing (DeCS and MeSH). Only the researches with patients diagnosed with temporomandibular dysfunction or disorder and treated with physiotherapy techniques were included. Also, the studies should be in Portuguese or English, published from August 2006 to August 2016. In Scielo and LILACS (DeCS) bases, the following crossings were used: "temporomandibular joint" AND "physiotherapy" OR "temporomandibular joint disorders" AND "physiotherapy." In Pubmed (MeSH), articles were obtained through crossings between "temporomandibular joint" AND "physiotherapy techniques" OR "temporomandibular joint disorders" AND "physiotherapy techniques". In the initial phase, titles and abstracts were independently identified and evaluated by two reviewers to select those meeting the eligibility criteria. Articles that did not fit the criteria described were excluded by the title review, followed by exclusion by the abstract, and finally, the potentially relevant studies were retained for further analysis of the full text. The relevant information was presented in the form of descriptive tables, considering the following variables: year, country, sample, evaluated outcomes, methodological design, intervention, and effects found.

In the initial search in the databases were found 32 articles. After the first selection by title, 13 articles were excluded, remaining 16 for abstracts analysis. From these, 11 articles were selected that fit the established inclusion criteria. Figure 1 shows the selecting process of the included articles. Table 1 presents the list of selected studies that used physiotherapeutic techniques for temporomandibular disorders treatment.

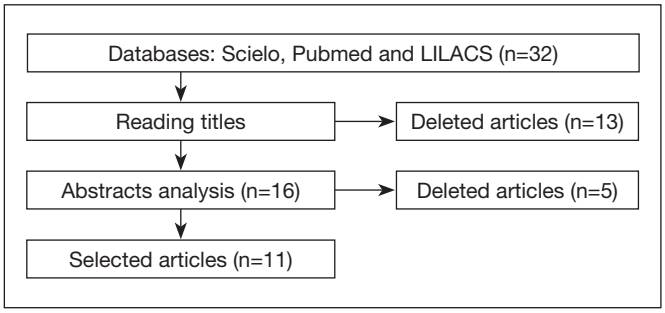

Figure 1. Data search

Table 1. Description of selected studies that used physiotherapeutic techniques for temporomandibular disorders treatment

Study	Sample	Evaluated outcomes	Methodological design	Intervention	Effects found
Priebe, Antunes and Corrêa[3]	Average age: 31.6 years. Individuals of both gender: 20 women and 5 men	Questionnaire on Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD). Evaluation records of joint noises presence, painful sensation of muscle and articulation regions, pressure pain threshold values in 16 muscles evaluated bilaterally: anterior, mid and posterior temporal, superior, mid and inferior masseter, sternocleidomastoid and upper trapezium, through pressure algometer.	Longitudinal study	Physiotherapy program included the combination of therapeutic modalities, focusing on the craniocervicomandibular system structures, such as therapeutic ultrasound, myofascial release, manual therapy, stretching and neuromuscular exercises, as well as self-care and home exercise guidelines.	76% presented no diagnosis of TMD soon after treatment. Of these, 17 (68%) maintained this result at the two-month follow-up, according to the RDC/TMD evaluation. Regarding the sensitivity of pain to pressure, there was no significant difference in pain threshold in the comparison of results shortly after treatment and after two months of its end. Joint noises kept absent in 60% of patients. Regarding pain during palpation, 21 of the 24 structures analyzed in RDC/TMD maintained post-treatment results in the follow-up period, except for the right lower masseter, right lateral pterygoid and left temporal tendon.

Continue...

Table 1. Description of selected studies that used physiotherapeutic techniques for temporomandibular disorders treatment – continuation

Study	Sample	Evaluated outcomes	Methodological design	Intervention	Effects found
Franco et al.[16]	A 35-year-old female patient 10 sessions, 1 time per week	Physiotherapeutic evaluation sheet, composed of ROM evaluation, inspection, palpation, physical exams.	Case report, evaluated before and after intervention and reassessed 15, 30 and 60 days after intervention.	Performed passive stretching of ECOM and trapezium, low-intensity laser application of gallium arsenide (AS-GA) 4J parameters for the area of the joint in a punctual form and 8J in the muscular area in the punctual form and scanning with 1mm, with pulsatile mode 1 min per point. Facial relaxation with slip techniques, guidelines for complementary home exercises, active stretching of the cervical muscles, extensors and flexors of the head and neck. MTP deactivation technique. Night maintenance of the myorelaxing occlusal plaque	There was a gradual reduction of painful sensations through VAS, the relief average of pain symptoms was 20% per session, reaching zero in the last sessions.
Freire et al.[6]	Average age: 34.5 years 24 individuals (21 females and 3 males)	Questionnaire on Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) Temporomandibular index (TMI) and its sub-indexes	Longitudinal study, 10 sessions. Evaluated before treatment (AV1), immediately after treatment (AV2) and two months after the end of treatment (AV3)	Continuous 3 MHz ultrasound, with the intensity of 1.3 W/cm2, for 3 minutes for chronic pain; in pulsed mode with an intensity of 0.5 W/cm 2, for 3 minutes for acute pain. Superficial thermotherapy with infrared radiation for 20 minutes. Myofascial release and stretching bilaterally. Techniques of distraction and therapeutic massage in the cervical spine and the TMJ. Exercise with silicone rubber tube	Reduction in diagnoses number in all subgroups and diagnosis absence in 41.7% of the 24 participants after treatment. Significant reduction of TMI in the comparison between AV1 and AV2 ($p = 0.000$). There was no difference between AV2 and AV3 ($p = 0.204$) in 13 participants evaluated two months after the end of treatment.
Amaral et al.[7]	Average age: 25.6 years. 50 individuals of both gender	Questionnaire on Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) Stabilometric evaluation on a force platform, with eyes open and closed.	Longitudinal study DTM Group (presenting TMD, mandibular deviation or deflection) and control group (not presenting TMD)	Non-specific mandibular mobilization (MMI). The patient is positioned in dorsal decubitus and disposable gloves were used by the therapist; the fifth chierodactyl positioned on top of the second or third molar (if present) to perform the MMI in a small degree intermittently for one minute, with five replicates being performed. Between each mobilization, a buccal opening with tongue was performed ten times on the incisive papilla, to promote local relaxation.	Statistically significant difference was only for the TMD group at the center of pressure oscillation ($p <0.03$) in the mediolateral displacement ($p <0.006$), in the mediolateral amplitude ($p <0.01$) and in the velocity variable in the anteroposterior directions, ($p <0.03$) and mediolateral ($p <0.03$).
Gomes et al.[5]	Average age: 22.5 years. 25 individuals of both gender.	RDC/TMD questionnaire. - Evaluation of pain through VAS.	Randomized, double-blind clinical trial. EG (experimental group): 10 applications of HVES and in PG (placebo group): 10 applications with the device switched off.	Electrodes placed bilaterally on the lateral portion of the temporalis muscle (channel 1), on the masseter (channel2) and the electrode dispersed in the cervical-thoracic (lower cervical high thoracic) region. Parameters used 10Hz frequency; pulse width fixed by the device in two twin pulses of 20us each with an interval of 100us voltage at 100 volts both channels lasting 30 min 2 to 3 times per week.	Intragroup comparison observed that 10 applications of cathodic HVES promoted the reduction of pain in the EG, while in the GP no difference was noticed. EG presented greater reduction of pain intensity compared to PG.

Continue...

Table 1. Description of selected studies that used physiotherapeutic techniques for temporomandibular disorders treatment – continuation

Study	Sample	Evaluated outcomes	Methodological design	Intervention	Effects found
Borin et al.[8]	40 women, aged between 20 and 40 years	RDC-TMD questionnaire, the severity of TMD was verified before and after treatment by Fonseca's Index. It was also evaluated the Craniomandibular Dysfunction Index. The pain was assessed before and after treatment, by VAS.	Randomized clinical trial. Individuals divided into two groups: AG: acupuncture, who performed intervention twice a week (n = 20); and control CG: who did not undergo treatment	AG participants underwent acupuncture twice a week for five uninterrupted weeks. The treatment was performed with disposable needles (0.25 x 0.15 mm) inserted in the respective points with the skin previously cleaned with cotton and ethylic alcohol at 70%. Acupuncture therapy amounted 10 assistances. The points selected for treatment were those referred to in the literature as points for the treatment of TMD and points for anxiety.	There was an improvement in the severity level by the craniomandibular index (p = 0.004) and by the Fonseca's Index (p = 0.000) of individuals with TMD after acupuncture treatment, and in the pain level (p = 0.000). According to the classification by Fonseca's Index. Before treatment, the individuals had the following classification for TMD: 6 with a moderate degree and 14 with a severe degree. After treatment, this classification was observed: 7 with a mild degree, 10 moderate and 3 severe.
Basso, Corrêa and Silva[4]	Participated in the study 20 individuals of both gender Average age: 27.5 years.	RDC/TMD questionnaire. Photography with a digital camera for postural evaluation.	Transversal, qualitative study, 10 weeks of intervention. GI: muscle disorder; GII: disk displacement; GIII: other joint conditions.	The intervention group was submitted to 10 sessions of GPR for 45 minutes, once a week adopting two postures per session of therapy. Postures without load and postures with load.	GII obtained an improvement in the reduction of chronic orofacial pain.
Calixtre et al.[12]	12 women with a mean age of 22.08 ± 2.23 years	The mandible's pain and function were evaluated with the MFIQ, in addition to the opening level of the mouth without pain and the GP of masseter and temporal muscle were evaluated.	Longitudinal study, pre-and post-evaluation 5 weeks of intervention.	Submitted to 10 sessions of approximately 35 min. Mobilization of cervical under flexion, anteroposterior and posteroanterior mobilization in C5, stabilization exercise of craniocervical flexion, stretching	Mandibular function increased by 7 points on the scale after the intervention (p = 0.019) and pain decreased significantly (p = 0.009). The mandible level of opening ranged from ± 8.8 to 38.8.8 mm to 38 ± 8.8 showing significant improvement (p = 0.017), pain on both masseters and temporalis improved
Machado et al.[11]	Participated in the study 82 individuals with chronic TMD and 20 healthy individuals (average age 30 ± 9.6 years)	DTM severity through Part II of ProDTMMulti Questionnaire, stress points due to palpation, and orofacial functionality by Orofacial Myofunctional Evaluation with Scores.	Randomized clinical trial. Participants were divided into GI: Laser and oromandibular exercises, GII: orofacial muscular therapy, GIII: placebo laser and oromandibular exercises, GIV: Laser, CG: healthy.	Submitted to 12 sessions of 45min. GI: continuous laser I = 60mW by 40s and D = 60 ± 1.0 J/cm^2 and exercises for tongue, cheeks and mandibular muscles, functional orofacial training; GII: exercises for tongue, cheeks and mandibular muscles, functional orofacial training; laser; strategies for pain reduction; GIII: placebo laser and exercises; GIV: laser.	There was an improvement in both groups in all scopes assessed with stability at follow-up when compared to each other all treated groups did not show differences in stress points due to palpation at follow-up. GI, GII and GIII showed no difference with the control over orofacial function, while they differed significantly from GIV (p <0.01).
Oliveira et al.[15]	32 young adults with an average age of 24.7 ± 6.8 years diagnosed with TMD.	Fonseca's questionnaire was used for the initial screening of patients; then VAS was used for pain and WHOQOL--BREF was used for Quality of Life.	Clinical trial, double-blind. The patients were divided into two groups: A - active submitted to exercise plus transcranial noninvasive stimulation and B - control who performed exercises plus false stimulation.	The treatment protocol lasted 4 weeks; all participants performed exercises that included myofascial release, muscle stretching, cervical traction, exercises to improve mandible's ROM, muscle strengthening, among others. In addition, Group A received 20 min of noninvasive transcranial stimulation with an amplitude of 2 mA, with electrodes located on C3 or C4 (motor cortex region); in the individuals of Group B the electrodes were positioned in the same place, but the current lasted 30 seconds.	The clinical characteristics of the disease in the two groups were the same after the treatment, and regarding the quality of life, it can be perceived that both groups obtained positive results. Groups' pain intensity decreased after the second day of treatment, but in different ways and, in the end, it was noticed that Group A had lower pain levels than Group B, but the difference was not statistically significant.

Continue...

Table 1. Description of selected studies that used physiotherapeutic techniques for temporomandibular disorders treatment – continuation

Study	Sample	Evaluated outcomes	Methodological design	Intervention	Effects found
Tosato et al.[9]	n = 20 women, aged between 22 and 46 years, with an average of 31.75±8.71 years, with myogenic TMD, with masticatory muscle pain.	After this, RDC-TMD for pain used the VAS and surface electromyography to capture the electrical signal of the masseter and temporal muscles.	Randomized clinical study. Individuals divided into G1: control and G2: intervention	The sample was divided into 2 groups: Group 1 received a 30-minute session of massotherapy on the face, masseter and temporal region, while Group 2 received transcutaneous electrical nerve stimulation for 30 minutes in the region of the masseter and temporal muscles.	Both groups showed an increase in the electromyographic activity of the masseter and temporal muscles, both in isometric contractions and concentric isotonic. There was also a significant reduction in pain in both groups.
Freitas et al.[10]	1 patient, 37 years old, diagnosed with TMD for 5 years.	From the VAS, the pain was evaluated; mandibular ROM and postural clinical evaluation were measured.	Clinical case study	The laser was used in the TMJ region using ad-hoc technique with energy density (ΔE) 3J/cm² and reaching a final energy of 2.6 J, deactivation of myofascial trigger points in the masseter, pterygoid, temporal, occipital, scalene, ECOM and trapezius upper fibers, for 45 seconds at each point and joint mobilization using the longitudinal and anterior cephalic slide technique of TMJ grade II	The patient presented improvement in pain, increased the joint amplitude of TMJ and in the following postural alterations: prognata mandible, head in neutral position, cervical spine with physiological lordosis and shoulders aligned. In the muscular portion, there was an improvement in the time of muscular activation in the face muscles.

ROM = range of movement; VAS = visual analog scale; MTP = myofascial trigger points; TMD = temporomandibular dysfunction; HVES = high voltage electrical stimulation; GPR = global postural reeducation; RDC-DTM = diagnostic criteria for the investigation of temporomandibular disorders; MFIQ = Mandibular Functional Impairment Questionnaire.

DISCUSSION

This study revealed effective results in relation to the physiotherapeutic treatments used for TMD. Basso, Corrêa and Silva[4] and Gomes et al.[5] studies reported that physical therapy is capable of promoting improvement of clinical symptoms related to pain. Besides, in general, physiotherapy stimulates the proprioception and production of synovial fluid in the joint and improves the elasticity of adhered muscle fibers[3].

Analyzing the results obtained by the search strategy, it was observed a greater concentration of studies in 2015, with a single publication in 2010. It is worth mentioning that the surveys were developed in North and South American territory. It is also evidenced that the studies participants were volunteers of different age groups. However, the average age of the samples analyzed corresponded to the middle-aged population. These same studies indicate a high percentage of women. However, there is still no consensus in the literature about the reason for the higher prevalence in females than in males.

From the 11 articles that were used in this study, seven used the Questionnaire of Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) as an evaluation form. This questionnaire is recognized worldwide and aims to establish reliable and valid criteria for diagnosing and defining TMD subtypes[3-9]. In the case report studies, a physical therapy assessment sheet was used, which included: inspection, range of motion, palpation and physical examination[10].

Another important aspect in the treatment of TMD is the frequency and duration of physiotherapy sessions. Considering the number of sessions, in seven studies were performed 10. However, in the study by Freitas et al.[10], the author felt the need for a larger number of sessions, totaling 15 sessions. This shows that most authors agree with the number of sessions performed. When analyzing the sessions frequency, there was disagreement with the studies by Priebe et al.[3] and Basso, Corrêa and Silva[4] for example, where the number was once a week, while Borin et al.[8], Freitas et al.[10] performed twice a week.

It should be emphasized that TMD may be related to posture. In the studies by Basso, Corrêa and Silva[4] and Freitas et al.[10], the postural evaluation was carried out in order to find evidence such as head anterioration, cervical lordosis increase and no leveling of the shoulders. Amaral et al.[7] used stabilometry as an evaluation method. This test is a way to measure the static balance, which consists of quantifying the anteroposterior and lateral body oscillations, while the individual remains standing on a force platform. These parameters evaluation becomes important, as it is known that TMD can cause changes in balance.

TMD may present as muscular and/or articular pain, decreased buccal amplitude, headache, mandibular movement disorders, and articular cracking[5]. During the research process, it was noted that the pain variable was the only one unanimously selected in the studies. Pain is one of the main symptoms reported by patients with TMD, with 75% of them experiencing temporomandibular joint discomfort or dysfunction. One of the meth-

ods found for pain evaluation was through visual analogue scale (VAS)[5,9,10,16]. Only the study performed by Gomes at al.[5] presented a sample calculation based on the standard deviation values obtained by VAS, providing measurements of pain intensity. In turn, Priebe, Antunes and Corrêa3 used the pressure algometer – Force Dial® FDK/FDN Dynamometer (Wagner Instruments) – as a method to evaluate this item. Both were satisfactory for the evaluation of pain parameters in these patients.

The physiotherapeutic treatment aims at relieving the symptoms, seeking to restore the normal function of the patient's masticatory device, for which different techniques can be used. According to the studies, the devices like laser, ultrasound and cathodic current, are beneficial in the treatment. However, manual therapy through muscle stretching exercises, joint mobilizations and exercises for cervical segmental stabilization may be included in the rehabilitation process[7,10-12,16].

Tosato, Biazotto-Gonzalez and Caria[9] used electromyography to evaluate the electrical activation of the masseter muscles and anterior portion of the temporalis muscle and the VAS to measure the pain. The sample comprised of 20 women was divided into two groups. Both went through the evaluation process described. Then, group 1 was submitted to 30 minutes of massotherapy in the masseter region and anterior portion of the temporalis; group 2 received 30 minutes of transcutaneous electrical nerve stimulation in the same muscles. Then, both groups were reevaluated, and both presented greater muscle activation and statistically significant reduction of pain, showing that manual therapy is beneficial and can be used to reduce TMD pain. Machado et al.[11] investigated the combination efficacy of low-intensity therapeutic laser use with oral motor exercises in the rehabilitation of TMD-patients. 82 patients were selected with chronic TMD and 20 were considered healthy patients, who formed the control group. Individuals were randomly divided into 5 groups. GI: laser + orofacial exercises; GII: orofacial myofunctional therapy, which consisted of pain relief and orofacial exercises; GIII: placebo laser and orofacial exercises; GIV: laser. Laser aimed to analyze the analgesia (parameters used: 780-nm wave size, intensity of 60 mW, 40 and 60±1.0 J/cm²), and orofacial exercises were used to restore its functionality. All treated groups had a significant improvement over the control group. Comparing the treated groups, it was observed that the groups that used laser and orofacial exercises and orofacial myofunctional therapy obtained results that are more effective. Franco et al. [16] also used the low-intensity laser, associated with cervical's muscle stretching exercises and myorelaxing occlusal nocturnal plaque. The intervention lasted 10 sessions and reduced the pain.

Joint mobilization was chosen as a treatment in Amaral et al.[7], Freitas et al.[10] and Calixtre et al.[12] study. However, each study had its particularity. In the study by Amaral et al.[7], nonspecific mandibular mobilization (MMI) was used in order to promote improved postural control in individuals with TMD. Freitas et al.[10], in addition to joint mobilization, used the deactivation of myofascial trigger points and cervical stabilization exercise as a treatment for TMD, improving aspects such as pain, muscle balance, and posture. Calixtre et al.[12] performed C5 joint mobilization, cervical stabilization exercises and passive muscle stretching of the upper dorsal region, and obtained an increase in the mouth opening and pain reduction.

Basso, Corrêa and Silva[4] show that the posture in individuals with TMD is impaired. In this study was used the GPR, proposing a therapeutic action of stretching aiming at the balance of myofascial tensions and body posture as a whole. This treatment can reduce the orofacial pain intensity and improve psychological symptoms of TMD, as well as improved body alignment and symmetry.

The treatment can also be focused on the craniocervicomandibular system structures, as pointed out by studies by Priebe, Antunes and Corrêa[3] and Freire et al.[6]. The passive stretches of the ECOM and trapezium muscles, facial relaxation with slide techniques, active stretching of the cervical musculature, head and neck extensors and flexors were techniques used.

The application of acupuncture needles can also bring benefits to the TMD handling, which aims at controlling pain, especially that of muscular origin. Borin et al.[8] applied needles at specific points in the zygomatic arch region, in the masseter muscle and the mastoid process. After the intervention, it was observed that acupuncture promotes a significant reduction in the pain level and the severity of TMD, demonstrating a 75% reduction in pain grade ($p = 0.000$).

El Hage et al.[13] investigated the immediate effect of facial massage on static balance in individuals with TMD. In this study, 20 individuals diagnosed with TMD were evaluated using an equilibration platform that calculated the oscillations occurred in the anteroposterior and mid-lateral planes. The evaluations occurred with eyes closed and open, at the first moment before rest (baseline), after 10 minutes rest in dorsal decubitus (pre-massage) and after the application of the technique (post-massage). Results showed that there was only a significant difference in the evaluation performed with the eyes closed in the anteroposterior oscillations.

In other study performed by Amaral et al.[14], the same protocol was used to evaluate the effects of non-specific MMI. The participants were divided into two groups: 25 individuals with TMD and 25 individuals without TMD. The mobilization consisted of the therapist positioning the fifth chierodactyl on the second or third molar for a minute, in a small degree of amplitude, promoting the mandible in protrusion displacement by five times. Between each repetition, there was a local relaxation. According to the evaluation after MMI, there was an improvement of the postural control in both groups, suggesting a possible stimulation of the trigeminal system that, in turn, would influence the balance.

More current techniques for the TMD treatment were one of this review's outcomes. Noninvasive stimulation, including transcranial direct current stimulation (TDCS), [AS1] [RSM2] may be considered as an alternative for pain treatment. Oliveira et al.[15] evaluated pain and quality of life of TMD patients after being submitted to physiotherapeutic intervention and noninvasive stimulation during four weeks. Participants were divided into two groups (group A and group B) who performed exercises that included myofascial release, muscle stretching and strengthening, cervical traction, exercises to improve the range of mandible

motion. Also, group A received 20 min of TDCS with an amplitude of 2 mA, with electrodes located on C3 or C4 (motor cortex region), while group B received sham stimulation. Groups' pain intensity decreased differently, and at the end of treatment, it was noticed that group A had lower pain levels than group B, but the difference was not statistically significant.

Physiotherapy is effective and improves the physical function of individuals with TMD. From this review, it is noticed that several resources such as ultrasound, laser, cathodic current or manual therapies such as muscle stretching, and joint mobilization bring remarkable benefits. However, with the poor methodological quality, small number of individuals participating in most studies leaves a gap on the best treatment for TMD. Besides, more randomized clinical trial studies and follow-up evaluations are needed.

CONCLUSION

Physiotherapy may benefit TMD patients by reducing pain and increasing mobility, as well as rebalancing the TMJ.

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CASE REPORT

The use of oxytocin and relaxin in the treatment of refractory chronic pain with mixed characteristics (neuropathic and myofascial pain). Case report

O uso de oxitocina e relaxina para o tratamento de dor crônica refratária de características mistas (dor neuropática e miofascial). Relato de caso

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DOI 10.5935/1806-0013.20170130

ABSTRACT

BACKGROUND AND OBJECTIVES: Some studies have related the use of synthetic oxytocin for the treatment of painful syndromes that relies on central and peripheral modulation mechanisms of pain. Thus, the objective of this study was to report a case of a patient with a refractory chronic pain of mixed characteristics (myofascial and neuropathic pain) who responded to the treatment with synthetic oxytocin and relaxin.
CASE REPORT: Female patient, 41 years old, presenting a 10-year history of right hemifacial pain after dental surgery, with neuropathic characteristics, diagnosed as atypical facial pain (atypical trigeminal neuralgia). Later, she developed pain in the right cervical region, radiating to the shoulder, with several muscle trigger points in the pericranial region, suggestive of myofascial pain. After treatment with antidepressants, neuromodulators, anesthetic blockade, capsaicin and topical lidocaine, with partial results and pain recurrence, she started treatment with intramuscular oxytocin and oral relaxin. Over the year she followed the proposed treatment, she presented light pain, greater pain-free intervals, reduced need of pain blockade, improved tolerance to physical exercise and of the local face allodynia.
CONCLUSION: Despite the new drugs, procedures, and protocols to treat chronic pain, the patients often present unsatisfactory outcomes. Many times, there are situations of mixed pain (neuropathic and myofascial pain) with central and peripheral sensitization, resulting in worse prognostic and refractoriness. In this case, synthetic oxytocin and relaxin presented a satisfactory response.

Keywords: Chronic pain, Oxytocin, Relaxin.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Alguns estudos têm relacionado o uso de oxitocina sintética ao tratamento de síndromes dolorosas que se baseia em mecanismos de modulação central e periférica da dor. Assim, o objetivo deste estudo foi relatar um caso de uma paciente com dor crônica refratária de características mistas (dor neuropática e miofascial), que apresentou resposta ao tratamento com oxitocina e relaxina sintéticas.
RELATO DO CASO: Paciente do sexo feminino, 41 anos de idade, iniciou quadro de dor em hemiface direita há 10 anos, após uma cirurgia dentária, de características neuropáticas, diagnosticada como dor facial atípica (trigeminalgia atípica). Posteriormente, desenvolveu dor em região cervical direita, com irradiação para ombro, com múltiplos pontos-gatilho musculares em região pericraniana, sugestiva de dor miofascial. Após tratamento com antidepressivos, neuromoduladores, bloqueios anestésicos, capsaicina e lidocaína tópicas, com resultados parciais e recidiva de dor, foi submetida a tratamento com oxitocina por via intramuscular e relaxina por via oral. Durante um ano em que se submeteu ao tratamento proposto, apresentou dor leve, maiores intervalos livres de dor, diminuição da necessidade de bloqueios de dor, melhora da tolerância ao exercício físico e da alodínea local em face.
CONCLUSÃO: Embora se tenha novos fármacos, procedimentos e protocolos de tratamento para dores crônicas, frequentemente os pacientes apresentam resultados insatisfatórios. Muitas vezes, existem quadros de dores mistas (dor neuropática e miofascial) com sensibilização central e periférica, resultando em pior prognóstico e refratariedade. Neste caso, a oxitocina sintética e relaxina apresentaram uma resposta satisfatória.

Descritores: Dor crônica, Ocitocina, Relaxina.

INTRODUCTION

Painful syndromes continue to be a major challenge today, since they encompass varied aspects, such as their manifestations and intensity in time, as well as subjective and multidimensional factors[1-3]. Chronic pain generates physical and emotional stress for patients and their caregivers, as well as financial and social damage to the population, and all aspects of the patient's life (physical, emotional, social and spiritual) contribute to the pain generation and the suffering manifestation[4].
Chronic pain prevalence, defined in general population by World Health Organization (WHO), varies around 37% in de-

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Submitted in May 04, 2017.
Accepted for publication in October 29, 2017.
Conflict of interests: none – Sponsoring sources: none.

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veloped countries and around 41% in developing countries, with an average age between 45 and 65 years and a predominance in women[2]. In the United States, approximately $ 89 billion is spent annually on pain handling and benefits to workers resulting from their physical disability[5]. Although there are new drugs, procedures and treatment protocols for chronic pain, patients often have unsatisfactory results. Some studies have related the use of synthetic oxytocin to the treatment of painful syndromes, which is based on central and peripheral modulation mechanisms of pain[6].

Oxytocin

Oxytocin is a neuropeptide synthesized in the paraventricular and supraotic nuclei of the hypothalamus and released into the circulation via the neurohypophysis, acting as a neuromodulator. In humans, it acts as a modulator in the limbic system (amygdala), a region related to social behaviors, and also related to pregnancy and breastfeeding, inducing uterine contractions during childbirth and during lactation[6].

In non-human mammals, oxytocin receptors are then distributed across several brain regions, associated with central nervous control of stress and anxiety, as well as social behaviors (including parental care, bonding, social memory, and aggression to others)[7].

There are some hypotheses that corroborate the use of oxytocin as a treatment for chronic pain. Firstly, oxytocin acts on the hypothalamic-pituitary-adrenal axis, decreasing the production of the cortisol hormone, reducing symptoms related to stress and the perception of pain intensity[6]. In addition, oxytocin participates in the regulation of spinal cord dorsal horn neurons, modulating the sensory process, the pain perception and also endogenous opioid receptors[7-10].

Relaxin

Human relaxin is a hormone made up of 53 amino acids produced by corpus luteum and present in the blood in the last days of the menstrual cycle and during gestation. It is known due to its effects on reproduction and pregnancy, causing relaxation in musculoskeletal tissues such as the pelvis bones and in the woman's preparation for childbirth. Its action on other targets has now been demonstrated, including cardiovascular, central and peripheral nervous system, muscle system and skin. It plays an important role in extracellular matrix remodeling, inhibiting the fibrosis process, inflammatory activity, and the myofascial nociceptors sensitization. Most of these effects have been studied in animal models, but there is positive evidence in some studies in humans, suggesting their possible therapeutic fields of application[11].

This study aimed to report a case of a patient with refractory chronic pain of mixed characteristics (neuropathic and myofascial pain), who presented a response to treatment with synthetic oxytocin and relaxin.

CASE REPORT

A female patient, 41 years old, started with pain in the right hemiface 10 years ago, after dental surgery. The pain was located in the right hemiface, with sharp and burning characteristic, presence of local trigger points (TP) (gingival region), of intensity 8 in the numerical visual scale (NVS). The pain was continuous, without autonomic signs, without nausea, photophobia or phonophobia and in daily frequency. The patient denied a history of headaches. A few months later, she developed pain in the right cervical region, radiating to the right shoulder. At that moment, the physical examination showed pain in several pericranial and cervical muscles, besides mechanical allodynia in the face.

In the investigation, the nuclear magnetic resonance (NMR) of the encephalon and the electroneuromyography of upper limbs were normal. The cervical spine MNR revealed incipient disc protrusion between the 6th and 7th cervical vertebrae, which did not compress nerve structures. Thermography showed several myofascial TPs in right temporalis muscles, right splenius, right sternocleidomastoid and right trapezius.

As treatment, it was used venlafaxine (150mg daily), amitriptyline (50mg daily), nortriptyline (50mg daily), duloxetine (60mg daily), pregabalin (300mg daily), topiramate (100 mg daily), oxcarbazepine (900mg daily), topical capsaicin (0.025µg) and topical lidocaine at 5% local. All these drugs have been used for more than six months. Several pain blocks were performed: cervical epidural, Gasser, suprascapular nerve, pericranial and cervical muscle's TP, major and minor occipital nerves to the right, which presented partial response but recurrence of pain.

The hypothesis was atypical facial pain (atypical trigeminal neuralgia) after dental surgery and refractory chronic myofascial pain.

As an alternative, oxytocin treatment by intramuscular route and oral relaxin (oxytocin 10 intramuscular units every 3 days and relaxin - 20µg 2 times a day) was proposed. There were no adverse effects reported during the use of the drugs for one year.

During this period, prior to this treatment, she underwent 11 sessions of blockages at myofascial points and nerves. She obtained a partial response with short periods free of pain, but with recurrence. She also complained of sleep impairment, intolerance to physical exercise and impairment of daily and social activities, and maintained local allodynia in the face.

The following year, when she underwent oxytocin and relaxin treatment, she was submitted to 5 sessions of myofascial point blocks. She had milder pain, NVS=4, greater pain-free intervals, improved sleep and daily activities, and began regular physical exercises. There was also improvement of local allodynia in the face.

DISCUSSION

With regard to chronic pain treatment, there are often features of central and peripheral sensitization, resulting in worse prognosis and refractiveness. Thus, the description of new drugs that could potentially add to the already established treatments would be of fundamental importance.

Studies have related the use of synthetic oxytocin to the treatment of chronic pain syndromes. Cechetto and Saper[8] described that the oxydoninergic neurons of the hypothalamus paraventricular nucleus have projections to spinal cord dorsal horn neurons, regulating the sensory process and the pain perception[9,10]. On the other

hand, oxytocin also acts on endogenous opioid receptors. The oxytocin administration in animal models in the region of periaqueductal gray matter results in an antinociceptive effect. This effect can be reversed by naloxone application (an opioid antagonist)[10].

Peripherally, oxytocin modulates the inflammatory response, improving the healing of cutaneous wounds[12]. In acute postoperative pain, the mechanical allodynia in scar is reduced in an experimental model[13].

Another hypothesis concerns the psychological effects of oxytocin since this substance improves mood symptoms, such as anxious and depressive symptoms, as well as a decrease in the pain perception[14]. There is also a description that low serum levels of oxytocin in healthy women would be related to decreased pain tolerance for cold and ischemic stimuli[15].

The use of intranasal oxytocin in women with a chronic migraine has reduced the frequency and intensity of seizures, and it is suggested that new studies should better explore the potential of oxytocin as prophylaxis to migraine. The hypothesis is that oxytocin would inhibit painful impulses in the trigeminal nucleus and also in neurons modulated by CGRP (Calcitonin Gene Related Peptide)[16,17]. On the other hand, the subarachnoid administration of oxytocin induces analgesia in patients with lumbar pain[18], visceral pelvic and musculoskeletal pain with positive results[19,20]. Specific studies with neuropathic pain such as the present report have not been described.

Regarding the route of administration, some studies have attempted to standardize the intranasal use of oxytocin for the pain treatment; however, there is no consensus on adequate doses and routes of application, with nasal, subarachnoid, intravenous and intramuscular routes being described[21].

Also analyzing the relaxin use, Bani, Yue and Bigazzi[11] have suggested its use for chronic pain treatment, since some studies point to its role as a modulator of inflammatory activity and muscle relaxant action since it acts on receptors in muscles[11]. Another study has shown that fibroblasts located in muscle fascia express estrogen and relaxin sex hormone receptors. Thus, these hormones play a fundamental role in the extracellular matrix remodeling, fibrosis inhibition, inflammatory activity and muscle rigidity, and may help explain the link between hormonal factors and myofascial pain[22].

On the other hand, experimental studies in rats evidenced the presence of GPCR 135 (G-protein coupled receptor) receptor in areas of the somatosensory cortex, thalamus, and limbic system. The relaxin action in these regions could be related to central pain modulation[23].

Considering the patient in question, during the use of synthetic oxytocin and relaxin, there was improvement of chronic refractory pain during the period of use of these drugs, including the pain's neuropathic symptoms, translated by less need for anesthetic blocks, lighter intensity of pain, longer pain-free intervals, improved sleep and daily activities. It remains to be described that this patient had undergone several pharmacological and invasive treatments, with partial and insufficient answers.

CONCLUSION

In the present case, synthetic oxytocin and relaxin promoted analgesia, being a therapeutic option that has to be better studied and explored.

ACKNOWLEDGEMENTS

The authors thank Dr. Samuel K. Yue for sharing his clinical experience with oxytocin and relaxin for this work.

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Physiotherapeutic intervention in pain and quality of life of women with rheumatoid arthritis. Case reports

Intervenção fisioterapêutica na dor e na qualidade de vida em mulheres com artrite reumatoide. Relato de casos

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DOI 10.5935/1806-0013.20170131

ABSTRACT

BACKGROUND AND OBJECTIVES: Rheumatoid arthritis is an autoimmune, chronic, idiopathic and inflammatory disease that symmetrically affects the tissues, organs and peripheral joints causing pain, swelling, stiffness and decreased the quality of life. The objective of this study was to confirm the effects of a physiotherapeutic intervention program on pain and quality of life of women with rheumatoid arthritis.

CASE REPORTS: Study of a series of cases of five female patients, with average age ± 54 years. The initial assessment consisted of data collection, pain assessment by visual analog scale and evaluation of the quality of life by the Medical Outcomes Study36 Item Short-Form Health Survey SF-36. After the initial assessment, patients were subjected to a physiotherapeutic intervention program based on kinesiotherapy, which was conducted in groups, consisting of two sessions per week and duration of 50 minutes per session, totaling 10 sessions. The pain showed no statistically significant results when analyzed by the visual analog scale. However, when assessing the quality of life related to pain and vitality, there were statistically significant results ($p \leq 0.05$) in post-intervention.

CONCLUSION: The proposed intervention program has been effective in improving the pain and vitality domains regarding the analysis of the quality of life in women with rheumatoid arthritis.

Keywords: Pain, Physical therapy, Quality of life, Rheumatoid arthritis.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A artrite reumatoide é uma doença autoimune, crônica, idiopática e inflamatória que atinge simetricamente os tecidos, órgãos e as articulações periféricas causando dor, edema, rigidez e diminuição da qualidade de vida. O objetivo deste estudo foi verificar os efeitos de um programa de intervenção fisioterapêutica na dor e na qualidade de vida de mulheres com artrite reumatoide.

RELATO DOS CASOS: Estudo de uma série de casos de cinco pacientes do sexo feminino, com idade média de ±54 anos. A avaliação inicial consistiu na coleta de dados, na avaliação da dor pela escala analógica visual e na avaliação da qualidade de vida pelo Questionário *Medical Outcomes Study* 36 - *Item Short-Form Health Survey* SF-36. Após a avaliação inicial as pacientes foram submetidas a um programa de intervenção fisioterapêutica baseado em cinesioterapia, que foi realizado em grupo, com frequência de duas sessões semanais e duração de 50 minutos por sessão, totalizando 10 sessões. Quando analisada a dor pela escala analógica visual não houve resultados estatisticamente significativos. No entanto, na avaliação da qualidade de vida relacionada aos domínios dor e vitalidade, verificou-se resultados estatisticamente significativos ($p \leq 0,05$) na pós-intervenção.

CONCLUSÃO: O programa de intervenção proposto foi eficaz na melhora dos domínios dor e vitalidade referentes à análise da qualidade de vida em mulheres com artrite reumatoide.

Descritores: Artrite reumatoide, Dor, Fisioterapia, Qualidade de vida.

INTRODUCTION

Rheumatoid arthritis (RA) is an autoimmune, chronic, idiopathic and inflammatory disease that symmetrically affects tissues, organs and, especially, peripheral joints[1]. Its worldwide prevalence ranges from 0.5 to 1%, similar to Brazilian literature, and may occur in all ethnic groups. It affects, especially, the female gender in the age group between 20 and 60 years old[2,3].

The main features of RA are chronic synovial inflammation and the presence of palpable rheumatoid nodules on physical examination, which conditions involve symmetrical joint edema, bone erosion, and joint cartilage destruction[4,5]. Laboratory tests evidenced the rheumatoid factor presence, and radiographic examinations evidenced erosions and/or periarticular osteopenia in hands and wrists joints[5].

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Submitted in February 03, 2017.
Accepted for publication in October 27, 2017.
Conflict of interests: none – Sponsoring sources: none.

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Individuals' clinical features present, mainly, strong morning or night pain in the proximal interphalangeal joints of hands, metacarpal and metatarsophalangeal joints in the wrists, shoulders, and knees. Other symptoms accompany the painful phenomenon, such as joint stiffness lasting at least one hour (morning or after long periods of immobilization), fatigue, discomfort, decreased strength and muscular endurance and physical deconditioning[5-7].

Symptoms arising from the disease imply joint deformities and functional disability, which can lead individuals to functional dependence and limitations of their daily living activities. The more advanced the disease stage, the shorter the survival becomes[8]. Pain and inflammation associated with musculoskeletal disorders are the main factors responsible for the impact on the subject's quality of life (QoL), both in physical aspects and in mental aspects[9,10].

Physical conditions presented imply the need to develop strategies for RA treatment. Currently, several methods allow a satisfactory disease's handling. Among these, physiotherapy, especially kinesiotherapy, becomes a beneficial and viable strategy, aiming to relieve pain and combat inflammatory processes, to allow restoring articular movement amplitude and muscle activity, preventing new deformities onset, promoting physical, psychic and social well-being and, consequently, improving patients' QoL[10-14].

This study aimed to verify the effects of a physiotherapeutic intervention program in pain and QoL of women with RA.

CASE REPORTS

It is a case-study that is part of a project called "Effects of physiotherapeutic treatment in patients with rheumatic diseases," approved by Ethics and Research Committee in Human Beings of *University of Passo Fundo (UPF)* under Protocol No. 348,381, which is in accordance with the Declaration of Helsinki of 1975.

Initially, the waiting list for ambulatory care in the UPF's Rheumatologic Physiotherapy Sector was consulted, which included 12 individuals with RA. Were considered eligible those with a RA clinical diagnosis, female, 18 years old or older, with physical and mental abilities to understand and perform the dynamics of the proposed physiotherapeutic exercises, that were not in an acute period of the disease, that were not performing physical therapy or any other form of therapeutic intervention for at least three months prior to data collection.

Among the individuals that were on the waiting list, only seven were able to integrate this study's casuistry. Physiotherapy sessions were held at the Physiotherapy Clinic of the School of Physical Education and Physiotherapy of the UPF between May and June 2015. All participants signed the Free Informed Consent Form (FICF), through prior explanation and clarification of doubts, agreeing to participate in the study.

Evaluator A performed data collection and other information regarding disease conditions and pain assessment using visual analog pain scale (VAS). This is a numerical scale from zero (absence of pain) to 10 (worst pain imaginable), in which the individual is asked to quantitatively indicate the pain present at the time of evaluation[15]. Evaluator B performed the QoL evaluation by means of Quality of Life Questionnaire - Medical Outcomes Study 36 - Item Short-Form Health Survey (SF-36), gathering physical components (functional capacity, physical aspects, pain and the general state of health) and mental (vitality, social aspects, emotional aspects and mental health). The final score of each domain ranges from zero (worse general state of health) to 100 (best general state of health)[16].

After evaluations and initial data collection, the subjects performed 10 sessions of physiotherapy in a group, with a frequency of 2 times a week and average duration of 50 minutes. In total, including the initial and final meetings for evaluation and re-evaluation, 12 meetings were held with the study participants.

The physiotherapeutic technique choice adopted in this study was based on literature-referenced data[10,17]. Kinesiotherapy was the technique chosen, and the intervention program was designed aiming its effects on pain and QoL of patients with RA. Based on the foregoing, the exercises listed in this study followed the order:

1. Slow and maintained muscle stretching in an active-assisted or passive way of the main muscle groups of upper limbs, lower limbs, and trunk (20 seconds for each muscle group);
2. Strengthening of upper limbs (muscle groups: flexors, extensors and shoulder abductors and flexors and elbow extensors) and lower limbs (muscle groups: plantiflexors, dorsiflexors, inversors and ankles evertors) with pink elastic band progressing to green and blue (3 sets of 10 repetitions for each muscle group);
3. Pulmonary expansion exercise, in diaphragmatic pattern, with the aid of a stick (3 respiratory cycles of 5 repetitions);
4. Strengthening of posterior trunk muscles with elastic bands in pink, green, blue or purple (3 sets of 10 repetitions);
5. Strengthening of muscles responsible for flexion, extension, ulnar deviation and radial deviation of wrists with elastic bands in pink, green or blue (3 sets of 15 repetitions);
6. Strengthening of hands and fingers with wrist and finger strengthener, whose resistance varied from 1.4 to 4.1kgf (2 sets of 15 repetitions), and proprioceptive pellets with light and moderate resistance (3 sets of 20 repetitions);
7. Fine-motor exercise with therapeutic masses of modeling, where the patients performed tweezers movements with all fingers (5 minutes performing this movement);
8. Weight transfer exercise for upper limbs on a mat (3 sets of 5 repetitions per side);
9. Balance and proprioception exercises, by means of mini-squats in bipodal and unipodal support and displacement of body weight on the lower limbs, initially in soil and, later, on destabilizing platforms (foam balance pad, rubberized balance pad with disc shaped proprioceptive surface and trampolines) (3 sets of 10 repetitions);
10. Relaxation in 65cm Swiss balls, to lengthen the trunk's muscular chains and the neck's muscles. Circulation movements of head and shoulders were also performed (20 seconds each muscle group).

After the sessions, the pain and QoL parameters were reassessed and the data collected in the pre- and post-intervention phases were cataloged in Windows Microsoft Excel 2013.
Two patients initially selected were excluded. The first one was due to a surgical procedure performed during the physiotherapeutic intervention (which was not related to the study) and the second due not performing the 10 proposed physiotherapy sessions, both of which performed only seven physiotherapy sessions. Thus, five women with RA (patients A, B, C, D, and E) concluded the study. The average age of participants was 54.0±3.8 years, the diagnosis time of the disease was 15.0±2.9 years, and the main complaint reported by them was a chronic pain in the hands, where they had articular deformities. Selected patients' characterization is described in table 1.

Table 1. Selected patients' characterization

	Variables	Representation (n and %)
Schooling	Elementary school	3 (60)
	High school	1 (20)
	Higher education	1 (20)
Children	No children	0 (20)
	1	-
	2	1 (20)
	3 or more	3 (60)
Marital state	Married	2 (40)
	Single	3 (60)
Occupation	Inactive	3 (60)
	Active	2 (40)
Drug use	Yes	5 (100)
	No	-
Associated diseases	Yes	5 (100)
	No	-
Family history of rheumatic disease	Yes	4 (80)
	No	1 (20)

n = absolute value; % = relative value.

Regarding the patients' profile, it was observed that the majority of the sample had three or more children (60%) and was single (60%). As for schooling and their work activities, the majority reported having elementary education only (60%) and being inactive in the labor market (60%). All patients used continuous drugs and reported having associated diseases. Moreover, the majority of the sample had a family history of rheumatic disease (80%).
Table 2 presents the data on pain measured by VAS, before and after the physiotherapeutic intervention.
Through VAS, it was observed that three patients (A, C and D) presented a decrease in pain intensity. Although two other patients (B and E) did not present a decrease in this parameter, they did not present an increase in the symptomatic picture.
Table 3 presents the data regarding QoL according to SF-36, pre- and post-intervention physiotherapeutic.
In general, two patients (A and C) showed improvement in all QoL domains, two patients (B and D) presented improvement of domains, with the exception of functional capacity (B), limitations by physical aspects (B) and social aspects (D), and one patient presented QoL improvement in only three domains (E). Still, it is observed that only pain and vitality domains showed improvement in all cases presented.

Table 2. Pain pre- and post-intervention physiotherapeutic

	Pre-intervention	Post-intervention
Patient A	8	6
Patient B	6	6
Patient C	7	3
Patient D	5	3
Patient E	6	6

DISCUSSION

RA is a disease with unknown etiology attacking women preferentially. Although it can start at any age, there is a predisposition to the onset of symptoms around 40 years old[18]. Pain is the most common complaint among the patients, manifested by acute polyarthritis (70% of cases) and persistent synovitis in hands (91% of cases), accompanied by edema of distal joints (proximal interphalangeal and metacarpophalangeal in more than 90% of cases), by prolonged morning stiffness and muscle weakness[1,19-21]. In addition, individuals with RA have lower oxygen concentrations in the muscles of hands and arms, whi-

Table 3. Quality of life pre- and post-intervention physiotherapeutic

	Patient A		Patient B		Patient C		Patient D		Patient E	
Domains	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Functional capacity	35	45	05	20	25	50	10	25	65	60
Physical aspects limitation	25	100	0	0	25	100	0	100	0	0
Pain	10	20	20	61	30	51	31	41	10	20
General health status	40	55	40	57	55	67	32	35	45	0
Vitality	25	50	50	70	40	65	30	70	30	45
Social aspects	25	50	50	100	50	65.2	75	62.5	65.2	87.5
Emotional aspects limitation	0	33.3	100	66.6	33.3	100	0	100	100	66.6
Mental health	24	28	96	100	40	68	32	76	56	52

Pre = pre-intervention; Post = post-intervention.

ch can lead to soft tissue changes, tendons degeneration and deformities' exacerbation[22]. Which is in line with the present study, since the patients reported chronic pain in hands as the main complaint, where they also presented deformities.

Chronic pain affects 54.2% of people between 60 and 64 years old, 55.9% of people between 65 and 69 years old, 65.7% of people between the ages of 70 and 74 and 62.5% of people with more than 75 years old. In addition, 35% of people with chronic pain report a moderate or severe disability and impact mainly on domestic, leisure and occupational activities and sleep quality[23]. The chronicity condition persists beyond the physiological recovery period of the injured tissue, generating a negative impact on the individual's physical and cognitive abilities, well-being and QoL. Chronic pain treatment, unlike the therapies for acute pain (rest and drugs), is composed of physical exercise and multidisciplinary treatment[4].

It was observed that besides reporting the chronic pain as a major complaint, the patients of this study were going to the third decade of life. Thus, it is possible to justify the physiotherapeutic intervention program proposal, which sought to keep them moving, as the painful condition seems to have exerted an influence on the QoL, since individuals who presented a decrease in pain had an increase in the scores of QoL's domains (A, C and D). Although patient B showed no decrease in pain by VAS, there was an increase in six domains of QoL, including the pain domain.

As a complement to physical therapy, patients were taking methotrexate, one of the drugs most commonly used to treat individuals with RA. It is a drug that modifies the disease course and is well tolerated by its patients, which in addition to reducing the signs and symptoms of disease activity, blocks the radiographic lesions progression, and may help improve the functionality of its users[24].

According to the patients, the cold can act as an exacerbator of the painful symptoms. Numerous mechanisms and effects may be influenced by cognitive, physical and behavioral artifices during physical therapy, which may interfere with the treatment of individuals with arthralgias[25]. The physiotherapeutic intervention was performed in late autumn and early winter in a region of southern Brazil, a cold place at this time of year. Perhaps, this may justify the fact that there was no change in the pain intensity of B and E patients, and improvement of most domains of QoL of patient E after the intervention.

Another factor that may have contributed to the pain of VAS not having decreased in B and E patients in the post-intervention phase would be the fact that joint and ligament instability are consequences arising from the painful situation and can have a significant impact on the individual's biomechanical and directly influence the rehabilitation process[26]. In addition, perhaps the number of kinesiotherapy sessions performed may not have been enough to attenuate musculoskeletal instability and to obtain satisfactory results of these patients with exacerbated symptoms.

Given that individuals with chronic inflammatory arthritis have conditions of hypotrophy and muscle weakness, often due to the reduction of physical capacity and the continuous use of glucocorticoids[27], physiotherapy is a beneficial resource that can be used in all phases of the disease, aiming to improving joint mobility, muscle strength and coordination, flexibility, fatigue resistance, aerobic capacity and, finally, preserving and/or restoring general functional ability. In this sense, kinesiotherapy uses the movement of the human body to provide such benefits[28,29]. This suggests the idea of an alternative therapy establishment, such as physical exercise (especially kinesiotherapy) in the daily life of the individual with RA, allowing him to remain as functional as possible within the limitations imposed by the disease.

It is recommended that physical exercise lasts for 20 minutes or more, being performed at least twice a week and leads to an increase of 60% of the predicted heart rate for the age, to present positive clinical effects and without detriment to the disease, that is, without worsening the disease's activity and without causing pain. When the dynamic exercise is compared to the conventional joint rehabilitation program, it can be observed that dynamic exercise significantly improves the QoL of individuals with RA[30,31]. Although interventions were carried out with a frequency of two weekly sessions (averaging 50 minutes each), the present study used a rehabilitation program through physical exercise and found beneficial results on patients' pain and QoL, especially in the pain domains and vitality.

This study's results with regard to pain and QoL of RA patients submitted to a physiotherapeutic intervention program based on kinesiotherapy agree with other reports presented in the literature. A woman with RA was submitted to a physiotherapeutic intervention program based on kinesiotherapy with elastic bands, hand strengthening, global stretching, joint mobilizations, and balance and proprioception exercises. After 15 sessions of physiotherapy, there was a considerable decrease in pain and improvement or maintenance of QoL (especially in the pain domain)[10]. Another case study involving a man with RA revealed that after performing 15 sessions of kinesiotherapy, significant improvement of pain occurred, resulting in improvement of QoL without worsening the clinical picture[17]. Twenty women with RA and those with deformities were submitted to a protocol of muscle strengthening exercises. The study was randomized into an experimental group, which performed 20 physiotherapy sessions with muscle strengthening exercises, and in a control group. After physiotherapy sessions, the experimental group achieved significant gains in the functionality and muscular strength of the studied individuals[6]. Since the patients in the present study had deformities, they chose muscle-strengthening exercises, allowing them to remain functional and in order to improve their QoL.

CONCLUSION

The proposed intervention program was beneficial in improving pain and QoL in RA women.

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Effect of a physiotherapy program in patient with persistent polyarthralgia after chikungunya fever. Case report

Efeito de um programa de tratamento fisioterapêutico em paciente com poliartralgia persistente pós-febre de chikungunya. Relato de caso

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DOI 10.5935/1806-0013.20170132

ABSTRACT

BACKGROUND AND OBJECTIVES: Chikungunya fever is caused by the chikungunya virus, but with characteristics similar to the dengue fever. The main clinical manifestation that differs from dengue is the strong joint pains, which can remain for long periods, and that is found at lower intensity and duration with dengue. The objective of this study was to contribute to the physical therapy in patients with persistent polyarthralgia after chikungunya fever.

CASE REPORT: Female patient, 35 years old, diagnosed with persistent polyarthralgia after chikungunya fever. When admitted to the physiotherapy service, she complained of severe pain in the knee, wrist and right ankle, mainly in the morning. For the physiotherapeutic evaluation, the following parameters were used: visual analog scale, use of painkillers, goniometry, modified sphygmomanometer test, and perimetry. The functional assessment was done through a 10m walking test, *Quick Dash* and Lequesne scales, Portuguese version, for the upper and lower limbs, respectively. The proposed physiotherapeutic program was based on therapeutic exercises and manual therapy for 4 weeks. The results showed that the proposed physical therapy was effective in decreasing the pain, increasing muscle strength, the range of motion, decreasing edema and improving functional capacity.

CONCLUSION: The physiotherapeutic treatment proved to be effective in treating a patient with persistent polyarthralgia after chikungunya fever, improving the subjective pain and functional capacity.

Keywords: Arthralgia, Chikungunya fever, Physical therapy.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A febre de chikungunya é causada pelo vírus chikungunya, porém apresenta características parecidas com a dengue. A principal manifestação clínica que a difere da dengue são as fortes dores articulares, que podem permanecer por longos períodos, e que são encontradas em menor intensidade e tempo de duração na dengue. O objetivo deste estudo foi contribuir para o tratamento fisioterapêutico em pacientes com poliartralgia persistente pós-febre de chikungunya.

RELATO DO CASO: Paciente do sexo feminino, 35 anos de idade, diagnosticada com poliartralgia persistente pós-febre de chikungunya. Ao ser admitida no serviço de fisioterapia, queixava-se de dor intensa no joelho, punho e tornozelo direito, principalmente pela manhã. Para avaliação fisioterapêutica foram usados os seguintes parâmetros: escala analógica visual, ingestão de analgésicos, goniometria, teste do esfigmomanômetro modificado e perimetria. A avaliação funcional foi feita por meio do teste de caminhada de 10m, escalas *Quick Dash* e Lequesne versão em português, para o membro superior e inferior, respectivamente. O programa de tratamento fisioterapêutico proposto foi baseado em condutas de exercícios terapêuticos e de terapia manual durante 4 semanas. Os resultados apontaram que a proposta de tratamento fisioterapêutico foi eficaz na diminuição do quadro álgico, aumento da força muscular, aumento da amplitude de movimento, diminuição do edema e melhora da capacidade funcional.

CONCLUSÃO: O tratamento fisioterapêutico mostrou-se efetivo no tratamento de uma paciente com poliartralgia persistente pós-febre de chikungunya melhorando a dor subjetiva e a capacidade funcional.

Descritores: Artralgia, Febre chikungunya, Fisioterapia.

INTRODUCTION

The chikungunya fever (CF) is an arbovirosis caused by the chikungunya virus (CHIKV), transmitted through the bite of the *Aedes aegypti* female mosquitos infected by *Aedes albopictus*. The viremia can persist for up to 10 days, after the onset of the clinical manifestations that are similar to dengue, namely: acute fever, joint and muscle pain, headache, nausea, fatigue, and rash[1,2].

The CF has two phases: acute and chronic. At first, patients usually have a high fever, chills, headache, nausea, vomiting, fatigue, back pain, myalgia, and polyarthralgia. This last one can be intense and disabling, mainly affecting the ankles, fists, and hands.

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Submitted in July 19, 2017.
Accepted for publication in October 25, 2017.
Conflict of interests: none – Sponsoring sources: none.

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Concerning the characteristics of arthralgia, it does not have a pattern, although it tends to be more intense in the morning[3].
The duration of arthralgia is still uncertain, lasting for months and years. The chronic symptoms may decrease with time, after an initial infection, being of 88 to 100% during first the six weeks[1]. The full recovery time is still uncertain, and some infected patients can still remain symptomatic six to eight years after the initial infection, in which the polyarthralgia considerably compromises the quality of life and functional capacity of the individual[4].
Given to the similarity of the clinical signs between dengue and CF, it is important that healthcare professionals are attentive to the differential diagnosis. The main clinical manifestation that distinguishes the infection by CHIKV from dengue is the strong joint pain, usually present in lower intensity in dengue with a faster resolution[4].
The epidemiological aspects point to an increasing number of people affected with the CF in last the 10 year[2]. Of these, it is estimated that the cumulative number of infected individuals suffering from disabling and long-lasting pain is of approximately 1 to 2 million, generating high costs to the health systems[4,5].
Different predictor factors have been involved in the development of this more delayed picture of the CF, mainly characterized by the presence of persistent musculoskeletal pain. Among them are age above 45 years, high-intensity initial pain, previous osteoarthritis and strong IgG-specific response to the CHIKV in the recovery period and in the chronic phase[3].
The pathophysiological mechanisms of musculoskeletal pain and arthritis, after the infection by the CHIKV, are not very are well defined yet. It is believed that these symptoms are caused by the virus early escape located inside the monocytes, with a consequent replacement within the synovial macrophages. This fact is reinforced by the observation of the persistence of the virus in muscle, joints, hepatic and lymphoid tissues[3].
It is worth mentioning that in spite of the increasing number of people diagnosed with CF, so far there is no kind of recommendation based on *guidelines* for its treatment. In general, the treatment is with drugs (antipyretics and analgesics), in order to control the fever, reduce the impact of the immune process, decrease pain and prevent the development of chronic joint lesions[2-4,6].
When the pharmacological treatment of the CF does not present a satisfactory result, mainly in relation to the persistent arthralgia (chronic), many individuals end up needing a physiotherapeutic treatment[2]. The focus of the physiotherapeutic intervention is to decrease pain, regain functional capacity and, consequently, improve the quality of life[1,2,4,6]. However, no study was not found in the literature addressing the physiotherapeutic intervention in individuals with persistent polyarthralgia after the infection by the CHIKV. This fact led to the elaboration and presentation of the present report.

CASE REPORT

Female patient, 35 years, 1.68m tall, 86kg, brown, administrative assistant, native from Rio de Janeiro. Admitted to the physiotherapy service in August 2016, reporting as main complaint "a lot of pain in the wrists and knees, especially when waking up."
The patient reported that on December 6, 2015, she had a sudden onset of high fever (40°), edema on the distal joints (feet and hands) and disabling polyarthralgia with symmetric characteristics, with more intense pain in ankle and wrist bilaterally. She immediately sought medical care at the public health network. She underwent laboratory tests, being medicated with painkillers (dipyrone) and anti-inflammatory drugs (paracetamol). About three days later, she was clinically diagnosed with CF, confirmed by positive serology. She was oriented to keep on taking dipyrone and paracetamol, to remain at rest with no labor activity and to ingest liquids to improve her clinical picture. The patient followed the instructions for six months. However, the polyarthralgia remained. Due to the difficulty to schedule a new medical appointment on the public health network, she only managed to return to the doctor after seven months of the onset of the symptoms, in July of 2016. She was told to stay with the drugs and to look for physiotherapeutic care to reduce her pain. She had a previous pathological history of systemic arterial hypertension (SAH) and a non-diagnosed gonalgia in the right lower limb. Regarding the social history, she reported not being alcoholic or smoker, living in an easily accessible place, as well as holding back her social, labor and physical activities due to the intense pain, being quite dissatisfied with this situation. At the time of the assessment, she was making continued use of painkillers and anti-inflammatory drugs (paracetamol and dipyrone), reporting constant abdominal pain, associating the pain to the continuous use of drugs.
When admitted to the physiotherapy service, the patient complained of severe pain in knee, wrist and right ankle, mainly in the morning. During the examination, it was noticed limping gait - with no auxiliary gait device - antalgic posture when sitting, painful facial expression at rest, edema in the wrist (++/4+), knee (++/4+) and ankle (+/4+). All the previously mentioned joints - knee, ankle, and wrist - presented pain on palpation, with greater intensity in the right wrist. The sensitivity was perfect in all body segments, with discreet hyperesthesia in the wrist and right knee. As evaluation parameters to identify the pre-and post-intervention effects the following instruments were used: the visual analog scale (VAS)[7] and the intake of analgesics reported by the patient to measure the subjective pain, goniometry to quantify the range of motion (ROM)[8], the modified sphygmomanometer test (MST) to evaluate muscle strength[9] and perimetry for edema volume[10]. The functional assessment was done through the 10m walking test, (TC10)[11], Quick Dash[12] and Lequesne[13] scales, Portuguese version, for the upper and lower limbs, respectively.
Previously to the first intervention protocol, it was briefly explained to the patient the harmful effects to the body from the prolonged use of analgesic and anti-inflammatory drugs, and she was advised to try to gradually reduce the use, daily writing down the amount of ingested drugs. No specific explanation was provided on the neurophysiological mechanisms of the pain. However, it was explained that the exercises should be done even when in pain, provided it was tolerable[14]. The proposed physiotherapeutic program was based on the kine-

siotherapy approach and manual therapy for 4 weeks. Table 1 shows the description of the approach.

The comparison of the variables values before and after the treatment protocol, allowed to confirm the presence of considerable alterations with the applied intervention. To follow-up the results after the treatment period, the patient was reevaluated one month after concluding the protocol. The values of each variable are shown table 2.

Table 1. Description of physiotherapeutic approach adopted during 4 weeks of intervention

Week of treatment	Intervention
Weeks 1-2*	UL: 1 - Radio-carpica articular decoaptation/traction (40-60 repetitions/minute); 2- Myofascial release of the wrist extensors/flexors retinaculum (3 minutes each region); 3- Grade I-II articular mobilization for wrist flexion/extension (40-60 oscillations/minute); 4- Stretching technique for wrist extension/flexion + passive stretching of wrist extensors/flexors (60 oscillations/minute + 1 minute of stretching); 5- Passive mobilization for wrist flexion/extension (12 repetitions for each movement); Home Cryotherapy in the painful areas (20 min 3x/day). Patient's positioning: 1, 2 and 3-supine position (SP) with UL along the body; 4 and 5-SP with 90° elbow flexion. LL: 1-Decoaptation/femorotibial articular traction (60 repetitions per minute); 2- Grade I-II articular mobilization for knee flexion (40-60 oscillations/minute); 3- Ankle pump associated to draining position; 4- Passive stretching of the triceps sural muscle (1 minute); Patient's position: 1-Sitting on the stretcher; 2-SP with the lower limbs with the maximum range of motion of knee flexion; 3-SP with the lower limbs in elevation on the triangle; 4-SP.
Week 3-4 **	UL: 1-Active exercise with a stick for bilateral flexion/extension movements of the wrist (2 x/12 repeats); 2-Strengthening with 1kg halter for wrist extensors/flexors (2 x/12 repeats); 3-Palmar prehension isometric exercise with visual feedback from the sphygmomanometer with 70% of maximum voluntary isometric contractions (2x/10 repetitions with 3-5 seconds); Patient's position: 1- SP with 90° of UL flexion; 2- Sit on the stretcher with 90° flexion of elbow and forearm prone/supine; LL: 1-Active movement of triple flexion of LL with the aid of the Swiss ball; 2- Strengthening of the quadriceps with 1kg shin pads (2x/12 repetitions) + evolution to strengthening of the quadriceps sitting on the stretcher (2x/12 repetitions); 3- SLR with no additional weight + evolution with 1kg shin pad; Patient's position: 1-SP with a 35cm Swiss ball under the distal extremities of the LL; 2- SP with a triangle under the knee; 3- SP.

* = at the beginning of the treatment the patient was instructed to remain physically active and to perform active movements for knee, ankle, and wrist in the morning, when waking up; ** = after week 4, the patient was instructed to gradually start physical activity (walking), in accordance with the pain tolerance) until reaching the goal of 150 minutes/week; UL = upper limbs; LL = lower limbs; SLR = straight-leg raising; SP = supine position.

Table 2. Results of the variables before and after 4 weeks of the physiotherapy protocol and one-month follow-up

Variables	Pre-treatment	Post-treatment	Follow-up (1 month)	Difference pre/post treatment
Visual analog scale				
Wrist	8	7	3	-5
Knee	8	5	3	-5
Ankle	6	3	1	-5
Range of motion (degrees)				
Knee flexion	64	102	120	+56
Wrist extension	40	62	74	+34
Wrist flexion	26	54	74	+48
Dorsiflexion	6	10	16	+10
Plantarflexion	26	38	38	+12
FM-TEM (mmHg)				
Palmar prehension	19,3	40,6	79,3	+60
Knee extension	100	168	186,6	+86,6
Perimetry (cm)				
Wrist	19	17	17	-2
Knee	46	45	45	-1
Ankle	52,5	52	52	-0,5
Functional scales				
Quick Dash	73	34	7	-39
Lequesne	13	7	1,5	-11,5
Drugs				
Dipyrone	Continuous use	Continuous use	1/day	Not using
Paracetamol	Continuous use	Not using	Not using	Not using
TC10M (seconds)	15,4	12	7,1	-8,3

MS = muscle strength; MST =modified sphygmomanometer test; TC10m = 10m walking test.

DISCUSSION

The persistent polyarthralgia associated to the functional limitation is often considered one of the main complications of the CF[1,2,4-6]. Due to this, many patients end up needing physiotherapy follow-up to improve the algesic picture and the quality of life[2,4].

The results of the present study show that the proposal of a physiotherapy treatment with kinesiotherapy and manual therapy had a positive influence on several aspects for a patient with persistent polyarthralgia (Table 1), namely the reduction of the algesic picture; increase in muscle strength; increase the range of motion; reduction of edema and improvement of the functional capacity.

The physiotherapy approach, by means of a well-structured treatment program, is widely indicated for patients with chronic-degenerative joint diseases. There are strong evidences that a rehab program based on motivation and orientation to self-care, muscle strengthening, low-impact aerobic exercises and neuromuscular education help to decrease the symptoms of patients with osteoarthritis[15].

In this context, the present results corroborate the literature since with a treatment program with these characteristics, mainly based on kinesiotherapy together with manual techniques and orientation about self-care, it was possible to decrease the algesic picture considerably and to improve the functional capacity of a patient with persistent polyarthralgia after CF.

It is believed that such effects may be related to the hypoalgesia induced by comprehensive therapeutic exercises and by the activation of the endogenous pain descending inhibitory pathways activated by the manual therapy techniques, as already observed in other studies[16-18]. In the present study, the reduction in pain was noticeable, especially on the VAS pre-and post-intervention, as well as by the decreased intake of analgesics (Table 2).

In this context, having the pain variable as predominant, it is possible that the secondary outcomes such as ROM, muscle strength and functional capacity have been positively influenced due to the reduction of the algesic picture (Table 2). It is worth mentioning that all exercises were performed gradually, taking into consideration the patient's tolerance to pain during its performance.

It is also important to highlight the recommendation to the patient to do a regular physical activity (walking) after the outpatient follow-up period to maintain the obtained results and the encouragement to self-care. The regular physical activity has been considered an excellent treatment option for some types of chronic pain such as the fibromyalgia, non-specific chronic back pain, osteoarthritis and rheumatoid arthritis[16], in addition to strongly contribute to the general health[16,19]. In the present study, the patient was very engaged and motivated during all the rehab process, and she was the one who chose walking as the preferred exercise. Recent studies have demonstrated that when encouraging the practice of physical exercises to patients with chronic pain, it is of crucial importance to take into consideration the preferences of the patient[16]. This makes it easier to have the patient's compliance and the continuity of the exercise program with short, medium and long-term results, and also to strengthen the therapeutical alliance[20.21].

CONCLUSION

The treatment program proposed in the present study can benefit patients with persistent polyarthralgia after the chikungunya fever, decreasing the pain perception and improving the functional capacity.

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EXAMPLES OF REFERENCES

Journal articles:

- 1 author - Wall PD. The prevention of postoperative pain. Pain 1988;33(1):289-90.
- 2 authors - Dahl JB, Kehlet H. The value of pre-emptive analgesia in the treatment of postoperative pain. Br J Anaesth 1993;70(1):434-9.
- More than 6 authors - Barreto RF, Gomes CZ, Silva RM, Signorelli AA, Oliveira LF, Cavellani CL, et al. Pain and epidemiologic evaluation of patients seen by the first aid unit of a teaching hospital. Rev Dor. 2012;13(3):213-9.

Article with published erratum:

Sousa AM, Cutait MM, Ashmawi HA. Avaliação da adição do tramadol sobre o tempo de regressão do bloqueio motor induzido pela lidocaína. Estudo experimental em ratos Avaliação da adição do tramadol sobre o tempo de regressão do bloqueio motor induzido pela lidocaína. Estudo experimental em ratos. Rev Dor. 2013;14(2):130-3. Erratum in: Rev Dor. 2013;14(3):234.

Supplement article:

Walker LK. Use of extracorporeal membrane oxygenation for preoperative stabilization of congenital diaphragmatic hernia. Crit Care Med. 1993;2(2Suppl1):S379-80.

Book: (when strictly necessary)

Doyle AC, editor. Biological mysteries solved, 2nd ed. London: Science Press; 1991. 477 80p.

Book chapter:

Lachmann B, van Daal GJ. Adult respiratory distress syndrome: animal models. In: Robertson B, van Golde LMG, editors. Pulmonary surfactant. Amsterdam, 2nd ed. Batenburg: Elsevier; 1992. 635-63p.

Theses and dissertations: Shall not be accepted.

ILLUSTRATIONS AND TABLES

All illustrations (including figures, tables and pictures), shall be compulsorily mentioned in the text in the preferred place for their inclusion. Please number them in Arabic numbers. All shall have title and captions. Please use pictures and figures in black and white and restrict their number to a maximum of three. The same result shall not be expressed by more than one illustration. Graphic signs, figures of acronysms used in tables or figures shall have their correlation mentioned as footnote. Figures and tables shall be sent separately from the text and in format allowing for edition, according to the following recommendations.

Digital Format

Submission Letter, Manuscript and Figures shall be forwarded in DOC format (Windows Word standard); figures in bars or lines shall be forwarded in Excel (extension XLS). Pictures shall be digitalized with minimum resolution of 300 DPI, in JPEG format. File name shall express illustration type and number (Figure 1, Table 2, for example). Copies or reproductions of other publications shall be allowed only after attachment of express authorization of the Editing Company or of the Author of the original article.

Ethics:

When reporting experiments with human beings, please indicate whether procedures were in compliance with ethic standards of the Committee in charge of the human experiment (institutional or regional), and with the Declaration of Helsinki from 1975, amended in 1983. The number of the Research Ethics Committee approval shall be mentioned.

Registry of Clinical Trial:

Revista Dor respects World Health Organization and International Committee of Medical Journal Editors – ICMJE policies for the registry of clinical trials, acknowledging the importance of such initiatives for international disclosure of information about clinical research with open access. So, as from 2012, preference shall be given to the publication of articles or studies previously registered before a Platform of Clinical Trials Registry meeting the requirements of the World Health Organization and of the International Committee of Medical Journal Editors. The list of Platforms of Clinical Trials Registry may be found at http://www.who.int/ictrp/en, from the International Clinical Trials Registry Platform (ICTRP). Among them there is the Brazilian Registry of Clinical Trials (ReBEC), which is a virtual platform with free access for the registry of experimental and non-experimental studies carried out with human beings, in process or closed, by Brazilian and foreign researchers, which may be accessed at http://www.ensaiosclinicos.gov.br. The registry number of the study shall be published at the end of the abstract.

Use of Abbreviations:

Title, summary and abstract shall not contain abbreviations. When long expressions are present in the text, they do not have to be repeated after INTRODUCTION.

After their first mention in the text, which shall be followed by the initials in brackets, it is recommended that their initials in capital letters replace them.