Pain assessment in patients undergoing lumbar spine arthrodesis: application of unidimensional and multidimensional scale

Avaliação da dor pós-operatória em pacientes submetidos à artrodese de coluna lombar: aplicação de escala unidimensional e multidimensional

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ABSTRACT

BACKGROUND AND OBJECTIVES: It is possible that patients submitted to lumbar spine surgery present chronic pain and need a multidimensional assessment of postoperative pain due to the variables that influence pain. The objective of this study was to evaluate the correlation between uni and multidimensional scales for postoperative pain assessment.
METHODS: Longitudinal and observational study carried out in the inpatient units of an orthopedic reference hospital in São Paulo. 53 patients were selected in the preoperative period of lumbar spine arthrodesis, 28 were excluded and 25 were evaluated with the numerical verbal scale and Brief Pain Inventory on the preoperative day and on postoperative day 2.
RESULTS: In the sample, all patients had chronic pain with a mean previous pain time of 9.24 years. There was variation between the pre and postoperative periods on the Brief Pain Inventory in almost all items, but only the item regarding the amount of pain ''right now" (in the moment) was equivalent to the numerical verbal scale (Kappa=almost complete correlation).
CONCLUSION: The numerical verbal scale and Brief Pain Inventory were not comparable since the Numerical Verbal Scale showed a worsening of postoperative pain, while the Brief Pain Inventory reflected improvement in the perception of postoperative pain. The Brief Pain Inventory seemed to be a better tool for pain assessment in this study
Keywords: Arthrodesis, Chronic pain, Low back pain, Pain, Pain measurement, Postoperative pain.

RESUMO

JUSTIFICATIVA E OBJETIVOS: É possível que pacientes submetidos às cirurgias de coluna lombar apresentem dor crônica e necessitem de avaliação multidimensional da dor pós-operatória devido às variáveis que influenciam a dor. O objetivo deste estudo foi avaliar a correlação entre as escalas uni e multidimensional para avaliação de dor pós-operatória.
MÉTODOS*:* Estudo longitudinal e observacional desenvolvido nas unidades de internação de um hospital ortopédico de referência em São Paulo. Foram selecionados 53 pacientes no pré-operatório de artrodese da coluna lombar, 28 foram excluídos e 25 avaliados com a escala verbal numérica e o Inventário Breve de Dor no dia do pré-operatório e no 2º dia de pós-operatório.
RESULTADOS: Na amostra todos os pacientes apresentavam dor crônica com tempo médio de dor prévia de 9,24 anos. Observou-se variação entre o pré e pós-operatório no Inventário Breve de Dor em quase todos os itens, mas apenas o item sobre a dor ''neste momento" se equiparou à escala verbal numérica (Kappa=correlação quase completa).
CONCLUSÃO*:* A Escala Verbal Numérica e o Inventário Breve de Dor não foram equiparáveis uma vez que a escala verbal numérica evidenciou piora da dor pós-operatória, enquanto o Inventário Breve de Dor refletiu melhora na percepção da dor pós-operatória. O Inventário Breve de Dor pareceu ser melhor instrumento para avaliação de dor neste estudo.
Descritores: Artrodese, Dor, Dor crônica, Dor lombar, Dor pós-operatória, Medição da dor.

INTRODUCTION

Pain is currently defined as ''an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage". When acute, it acts as an alert to the need for assistance and, when it becomes chronic (CP), ceases to be a symptom and becomes a disease[1-3].
According to the International Association for the Study of Pain (IASP), CP is defined as pain that persists for a period longer than 3 months and the estimation is, according to data from the World Health Organization (WHO), that 22% of the world population is affected by this condition. Low back pain is one of the most frequent in the general population and a large part of the reasons that lead patients to be treated surgically due to the pain chronicity and decrease in the individuals' quality of life[4,5].

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In the hospital context, pain assessment is a routine, however its inadequate evaluation, especially in patients with CP, can result in the inadequate management of postoperative pain (POP) and persistence of pain, increasing hospital stay, since pain seems to be a predictor of immobility in postoperative (PO) situations[6,7].
The gold standard for pain assessment is self-report and the most commonly used scales in this environment are the unidimensional ones. However, during pain assessment processes, the teams encounter enigmatic situations. For example, when using the scales ranging from zero to 10, the patient may say he/she has pain 10, but show a calm face, fast movements and no apparent signs that could define a patient with intense pain. This happens because it's possible that in patients with a history of CP the unidimensional scales are not able to adequately assess pain, since they do not contemplate the biopsychosocial aspects of the previous pain and, thus, the multidimensional scales are more appropriate because they contemplate other aspects of pain, which go beyond intensity and can more reliably portray the patient's state of pain[8,9].
It's possible that patients with a history of CP submitted to spinal arthrodesis surgery require an evaluation of pain that considers the biopsychosocial aspects, in order to adapt the analgesic management through specific and individualized care protocols.
The objective of this study was to evaluate patients submitted to lumbar spine arthrodesis using the uni and multidimensional pain scales, respectively: numerical verbal scale (NVS) and Brief Pain Inventory (BPI), and to observe if there was a correlation between them.

METHODS

A longitudinal, prospective, observational study conducted between July and September 2019 at the Hospital of the Association for Assistance to Disabled Children (AACD), in São Paulo.
A convenience sample was used, with initial data from 53 adult patients, of both genders, admitted for posterior via lumbar arthrodesis surgery in up to 4 levels. The exclusion criteria were patients with no physical therapy prescription, patients submitted to other associated surgical procedures, patients discharged from the hospital early before the 2nd PO day, with medical restrictions for leaving the bed, previous lumbar spine surgery review with less than 3 months of PO, infection, muscle strength grade less than 3 for the muscle groups of the hip and knee extensor apparatus, and difficulty or inability to understand the proposed pain scales. The selection of patients was made through the daily surgery forecast report, via the TASY® system. Personal and hospitalization data were collected from the patient's electronic medical records. The evaluator applied the pain scales in two moments, the same day before surgery and on the 2nd PO day.
The tools used for pain assessment were the NVS and the BPI. The NVS is a unidimensional scale widely used in hospital environments which evaluates the presence and intensity of pain, being zero absence of pain, 1-3 mild pain, 4-6 moderate, 7-9 intense and 10 unbearable. The BPI is a multidimensional scale with good psychometric properties, consisting of 15 items that assess: existence, intensity, location, functional interference, applied therapeutic strategies and treatment efficacy[10,11].
The drugs prescribed for POP control were also noted and respected the WHO recommendations as to the analgesic ladder: for mild pain, dipyrone and non-hormonal anti-inflammatory (NHAI); moderate, weak opioids (tramadol, codeine) and dipyrone and NHAI; intense/unbearable, strong opioids (morphine, methadone), dipyrone and non-hormonal anti-inflammatory and adjuvants (pregabalin or gabapentin); and refractory pain, which did not respond to pharmacological strategies for intense pain and evaluation for interventional measures and/or installation of patient-controlled analgesia (PCA).
This study was conducted after approval by the Research Ethics Committee of the institution, opinion number 3.412.093.

Statistical analysis

Statistical tests and figures were run in the R 3.5.0 GUI 1.70 software, El Capitan build (1) and RStudio (Version 1.1.453 - © 2009-2018 RStudio, Inc.). Qualitative variables were described by frequency and confidence interval. Quantitative variables were described by measures of central tendency (mean and median) and dispersion. The association between qualitative variables was assessed using the Chi-square test. Agreement between pain scales was assessed by the Cohen's Kappa test, with qualitative classification given by Landis (2) as absent (=0), poor (0.00 to 0.19), weak (0.20 to 0.39), moderate (0.40 to 0.59), substantial (0.60 to 0.79) and almost complete (above 0.60). The test used to search for the association between the analgesic strength of the drug and the responses to the pain scales was Kruskal-Wallys. All results with a descriptive level less than 5% (p-value <0.05) were considered significant.

RESULTS

Fifty-three patients were included in the study, all presenting history of CP. Twenty-eight were excluded from the analysis of POP equivalence for: not understanding the questions asked by the observer, early hospital discharge, bed constraint and canceled surgery. Twenty-five patients met the study criteria for POP assessment and correlation between the scales. The profile observed in this group regarding sex: 52% were women and 48% men. The mean age was 49.5 years, the mean time of previous pain 9.24 years and the mean hospital stay 4 days.

Pain variation in the numerical verbal scale in the pre and postoperative periods

Regarding the intensity of pain measured by the NVS, an increase in pain intensity was observed in the PO, with statistically significant variation between the observed times, and the most observed intensity was moderate to strong, that is, it was above 5 with p=0.00044 (Figure 1).

Relationship between pre and postoperative variables of the Brief Pain Inventory

When the results of the BPI were compared pre and postoperatively, it was determined that there was an improvement in the

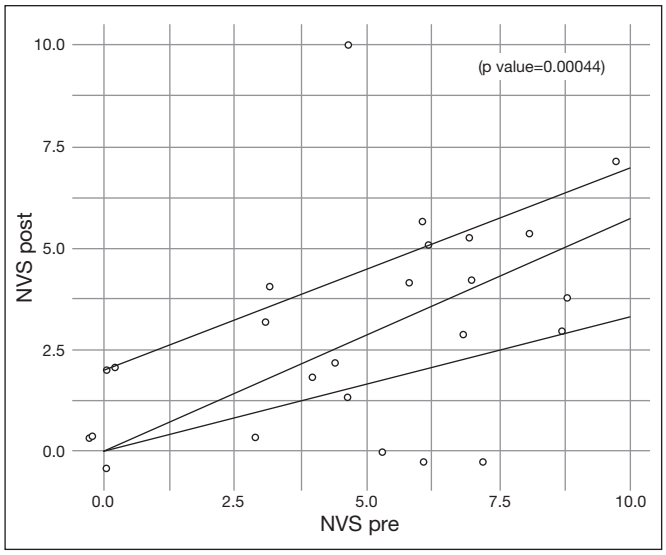

Figure 1. Pain by the numerical verbal scale in the pre and postoperative periods

condition of patients for almost all the items evaluated between the times, as the reduction of the mean pain score and increase in the percentage of improvement of pain after the intervention. The items with greater statistical relevance were: mild pain p=0.0001, mean pain p<0.0001 and percentage of improvement p=0.0001. No differences were observed in the items regarding work, walking, sleep, enjoyment of life, and presence of pain in an unusual location (Table 1).

Accordance between the numerical verbal scale and the Brief Pain Inventory

The NVS uses a single measure, and to establish its agreement with the BPI, which has multiple components, the choice was to evaluate the agreement between the NVS and the BPI for each item using Kappa's test. It was observed that some BPI items have a relationship with NVS pain intensity, but the only variable that showed a strong agreement relationship was the item regarding the amount of pain ''right now" (in the moment) (Table 2).

Results of the numerical verbal scale and Brief Pain Inventory regarding the routine analgesic regimen used

Regarding the patient's perception of items evaluated in both NVS and BPI regarding the analgesic potency of the drugs used, the groups were compared according to the received analgesic regimen; drugs for mild, moderate, intense pain and the pain scales. The conclusion was that, although most received drugs for intense pain, 68% (Table 2), none of the items in the scales showed significant variation, i.e., regardless of drug potency, there was no significant change in pain levels even with stronger analgesics, there was no refusal of drugs by patients, nor cases of patients with refractory pain in the sample (Table 3).

Table 1. Pre and postoperative Brief Pain Inventory variables

		Pre			Post		
	n	Mean	SD	n	Mean	SD	p-value
Presence of pain unrelated to the previous	17	68% no	32% yes	19	76% no	24% yes	0.7
	8	32% yes		6	24% yes		
Diagram		56% up to 5 areas			88% up to 5 areas		0.0039
		28% up to 10 areas			4% up to 10 areas		
		12% above 10 areas			18% above 10 areas		
Intense pain		7.2	2.65		5.2	3.21	0.0047
Mild pain		3.8	2.54		1.48	1.47	0.0001
Mean of pain		6.28	2.32		2.92	2.09	0
Amount of pain in the moment		4.76	2.97		2.68	2.55	0.0016
Pharmacological treatment**	For intense pain	42%			68%		
	For moderate pain	29%			28%		
	For mild pain	29%			4%		
Pain improvement %		54	23		89	15	0.0001
General activities		7	2.82		4.68	3.13	0.0054
Mood		6.64	4.05		2.08	3.45	0.0008
Ability to walk		7.16	2.73		3.72	3.29	*
Work		7.92	2.66		7.64	3.24	0.7
Relationship with people		4.36	4.01		1.04	2.12	0.0022
Sleep		5.16	4.26		3.16	3.31	0.07
Enjoyment of life		6.52	4.09		5.44	3.8	0.2

SD = standard deviation; * The item "Ability to walk" presented no variation and therefore statistics were not computed; ** Pharmacological categories for intense, moderate and mild pain respect the analgesic ladder according to the institutional pain protocol and WHO guidelines.

Table 2. Agreement between variables of the Numerical Verbal Scale and Brief Pain Inventory

	BPI variables	Kappa	Inferior CI	Superior CI	Significance	Accordance
NVS pre	Total of areas pre	-0.0159	-0.1333	0.1015		
	Most intense pain pre	0.2504	0.0489	0.452	*	Weak
	Most mild pain pre	0.4069	0.1836	0.6303	*	Moderate
	Mean of pain pre	0.2424	0.0387	0.4461	*	Weak
	Amount of pain in the moment	0.9537	0.8648	1.0426	*	Almost complete
	Improvement % pre	-0.0081	-0.0081	-0.0081	*	Inconclusive
	General activity pre	0.1243	-0.0473	0.296		
	Mood pre	0.0854	-0.0711	0.2418		
	Walking pre	0.1637	-0.0205	0.3479		
	Work pre	0.0017	-0.1137	0.1171		
	Relationship pre	0.1788	-0.0219	0.3796		
	Sleep pre	0.0489	-0.1138	0.2116		
	Enjoyment of life pre	0.0196	-0.1223	0.1615		
NVS post	Total of areas post	0.0054	-0.1385	0.1494		
	Most intense pain post	0.2133	0.021	0.4056	*	Weak
	Most mild pain post	0.1968	-0.0394	0.4329		
	Mean of pain post	0.4455	0.2192	0.6717	*	Moderate
	Amount of pain in the moment	0.6735	0.4683	0.8787	*	Substantial
	Improvement % post	-0.0196	-0.0196	-0.0196	*	Inconclusive
	General activity post	0.0575	-0.1038	0.2187		
	Mood post	-0.0142	-0.213	0.1846		
	Walking post	0.1171	-0.0774	0.3116		
	Work post	0.0614	-0.0744	0.1973		
	Relationship post	0.0625	-0.1667	0.2917		
	Sleep post	0.0865	-0.1147	0.2878		
	Enjoyment of life post	0.0036	-0.1406	0.1479		

Variables for which the 95% CI does not include a zero value were marked with * - the p-value for this test is 0.05. The data presented in the accordance column correspond to the classification of the Kappa correlation value (absent, poor, weak, moderate, almost complete, substantial).

Table 3. Analgesic regimen used and the variables of the Numerical Verbal Scale and Brief Pain Inventory in the postoperative period

Variables	p-value
Numerical verbal scale	0.7986
Total of areas	0.7614
Intense pain	0.6112
Most mild pain	0.7893
Mean of pain	0.1494
Amount of pain in the moment	0.1875
Improvement %	0.4506
General activity	0.7296
Mood	0.5068
Walking	0.2177
Work	0.1966
Relationship	0.8244
Sleep	0.8185
Enjoyment of life	0.593

DISCUSSION

The data presented refer to a specific profile composed of individuals submitted to spinal arthrodesis, all with a history of CP and a mean time of previous pain of more than 9 years.

According to study[4], about 39% of the Brazilian population suffers from CP, which, according to the IASP, is characterized when the individual has pain persisting for more than 3 months[4].

Nevertheless, epidemiological data from other countries are variable regarding the prevalence of CP. In the United Kingdom, 59% of the population presented chronic low back pain[12], in Greece the prevalence was 31.7%[13], and in the United States 74.5% of the people with CP had high-impact low back pain[14]. The lack of methodological rigor and standardization of the criteria adopted for the definition and classification of chronic low back pain were some of the explanations for the differences found[15].

Regarding POP after lumbar arthrodesis, its evolution seems variable. The study[16] observed that patients submitted to lumbar arthrodesis surgery showed a reduction in pain one week

after surgery and an improvement in quality of life was observed after six weeks. Another study[17] observed an improvement in POP in patients undergoing lumbar arthrodesis surgery only after 6 months.

The findings in the present study are not similar to the literature regarding the evolution and temporality of POP. Patients with CP reported worse POP compared to the pain before surgery when evaluated by the NVS, on the other hand, they reported improvement in pain perception ($p<0.0001$) and other aspects that reflect functionality and quality of life such as mood and relationship with people when evaluated by the BPI. According to authors[18], the inflammatory response and pain management in CP patients are more complex.

In addition, these findings seem to suggest that the multidimensional nature of CP is not reflected only by definitions based on pain duration and intensity[14] but requires tools that contemplate the other aspects of pain for a more reliable evaluation in order to adequate the analgesic management through specific and individualized care protocols.

Although the work, walking, sleep and enjoyment of life items did not present a significant variation, these aspects are related to the patient's daily life and maybe the time needed for the patient to perceive the impact of these items in the medium and long term, considering the patients' life style, must be longer than the evaluated period[19].

To understand the need for individualization in the treatment of patients with CP is essential, including in the pharmacological approach, which must be more directed to the mechanism of pain than to its cause[20]. The present study observed that, even when an institutional protocol for POP was applied, the administration of drugs, regardless of the class or potency, did not change the perception of patients regarding the items of the multidimensional scale. According to authors[21], among the possible factors that contribute to the inadequate treatment of POP are previous CP, opioid-induced hyperalgesia in chronic users of these drugs, and opioid tolerance.

In a 2017 review study[22], clinical trials pointed to pain relief through the use of opioids, but did not report other pain-related outcomes, including quality of life, functionality, or return to work. On the contrary, the present study concluded that POP in CP patients was not fully related to the potency of the analgesic drugs used, since pain may be related to other factors not responsive to analgesia, such as psychological ones[23].

In this scenario, caution about pain management is necessary, since its intensity may or may not be indicative of insufficient analgesic drugs; therefore, it's important to consider the history of pain, the surgical complexity and the whole biopsychosocial context of pain, since these are parameters for the differentiated analgesic approach of these patients[24,25].

The attention to assessment by specific instruments and adequate treatment with the objective of promoting pain relief even in the hospital context is essential. Knowing how to identify these aspects which impact the patient's pain modulation can lead to a better understanding, direction for specific institutional protocols for different types of pain, and better approaches for these patients. When pain is not evaluated right, it can result in inappropriate treatment that is associated with increased PO complications and higher morbidity and mortality[26], on the other hand, the assessment and adequate control of pain, including in the perioperative period, is associated with improved clinical outcomes, as well as reduced hospital stay and less complications[27,28].

For a better understanding of the subject, more scientific data on these issues is necessary, the authors suggest the development of studies with a larger sample size, other diseases of origin and higher frequency of reassessments with instruments that also consider the total pain context and evaluative items adapted for the hospital setting. As for the limitations of the study, the sample size and the reassessment time may not have been enough to point out other significant variables of biopsychosocial aspect.

CONCLUSION

The results obtained have demonstrated that using a multidimensional scale like the BPI seems to better reflect the evolution of the CP patient's pain perception in the lumbar arthrodesis PO when compared to the unidimensional scale, since, even though the NVS presented an increase in POP intensity, the patients reported a perception of general improvement in the PO, as evidenced by most of the BPI items.

AUTHORS' CONTRIBUTIONS

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Data Collection, Writing - Preparation of the original
Márcia de Almeida Lima
Data Collection, Writing, Review, Supervision
José Carlos Baldocchi Pontin
Conceptualization, Writing - Review and Editing
Luciana Sousa Conceição
Writing - Review and Editing
Andrea Dias Lamas Mafra
Review and Editing

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