

Biopsychosocial characteristics of patients with neuropathic pain following spinal cord trauma injury. Case reports*

Características biopsicossociais associadas a pacientes com dor neuropática por lesão medular traumática. Relato de casos

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ABSTRACT

BACKGROUND AND OBJECTIVES: Spinal cord injury is a change in spinal canal structures and may induce motor, sensory, autonomic and psychoaffective changes. Trauma injury is the most prevalent. Neuropathic pain is more frequent in people with spinal cord injury and may be disabling. Pain development mechanism is poorly known being its management difficult for both patients and health professionals. This study aimed at identifying biopsychosocial characteristics associated to neuropathic pain in spinal cord trauma injury patients.

CASE REPORTS: Sample was made up of 13 patients with spinal cord trauma injury and neuropathic pain, hospitalized for rehabilitation in a health institution. The following data collection tools were used: Douleur Neuropathique em 4 Questions Questionnaire and Brief Pain Inventory, in addition to demographic data. Most patients were male, mean age of 40 years, retired or unemployed. Most frequent cause of spinal cord injury was car accident, followed by firearm and falls. The thoracic segment was more commonly affected, with prevalence of incomplete injuries. Neuropathic pain onset was predominantly within six months after spinal cord injury. Pharmacological treatment was the most cited and considered very effective by 70% of those who use it. Cold and immobility were the most common factors worsening pain; physical activity and leisure were factors improving pain. Mood and general activities were those influenced the most by neuropathic pain.

CONCLUSION: Spinal cord trauma injury dramatically changes patients' lives, generating disastrous consequences for those

suffering the injury, their families and for society. In this series, most patients were young males, victims of car accidents and with neuropathic pain negatively impacting mood and general activities.

Keywords: Neuropathic pain, Rehabilitation, Spinal cord injury.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A lesão medular é uma alteração nas estruturas do canal medular, podendo ocasionar dificuldades motoras, sensitivas, autonômicas e psicoafetivas. A lesão traumática possui maior prevalência. A dor neuropática é a mais frequente em pessoas com lesão medular, podendo assumir aspecto incapacitante na vida dessas pessoas. É pouco compreendido o mecanismo de desenvolvimento dessa dor sendo seu tratamento de difícil manuseio para o indivíduo e para os profissionais de saúde. O objetivo deste estudo foi identificar as características biopsicossociais associadas à dor neuropática em pessoas com lesão medular traumática.

RELATO DOS CASOS: A amostra foi composta por 13 pacientes com lesão medular traumática e dor neuropática, internados para reabilitação em uma instituição de saúde. Foram utilizados os instrumentos de coleta de dados: Questionário *Douleur Neuropathique em 4 Questions*, Inventário Breve da Dor, acrescentando os dados demográficos. A maioria dos pacientes era do gênero masculino, idade média de 40 anos, aposentados ou desempregados. A causa predominante da lesão medular foi acidente de trânsito, seguido de arma de fogo e queda. O segmento torácico foi o mais acometido, com prevalência de lesões incompletas. Predominou o início da dor neuropática em até seis meses após a lesão medular. O tratamento farmacológico foi o mais citado e considerado muito efetivo por 70% dos que o utilizam. O frio e a imobilidade prevaleceram como fatores de piora da dor; a atividade física e o lazer como fatores que melhoraram a dor. O humor e a atividade geral foram os mais influenciados pela presença da dor neuropática.

CONCLUSÃO: A lesão medular traumática altera drasticamente a vida do paciente acometido, gerando consequências desastrosas para quem sofreu a lesão, para seus familiares e para a sociedade. Nesta série, a maioria foram homens jovens, vítimas de acidentes de trânsito e com dor neuropática que impactava negativamente o humor e as suas atividades gerais.

Descritores: Dor neuropática, Lesão medular, Reabilitação.

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INTRODUCTION

Spinal cord injury (SCI) is defined as change in spinal canal structures which may cause motor, sensory, autonomic and psychoaffective changes¹. It may be classified as traumatic or non-traumatic. Non-traumatic SCIs correspond to approximately 20% of cases and may be caused by tumors, cardiovascular diseases, infections and autoimmune diseases, among others¹. Traumatic injuries are, in general, caused by car accidents, dives, falls and firearms. The prevalence of such causes may change depending on the geographic region. The frequency of traumatic SCI in Brazil is unknown and there are no accurate data about its incidence or prevalence, since this condition is not submitted to compulsory notification¹. The Single Health System (SUS) has recorded, in 2004, 15,700 admissions with 505 deaths caused by spinal fracture².

Among international classifications, the most widely used for traumatic SCIs is the American Spinal Injury Association Impairment Scale (AIS). It is based on sensory and motor evaluation to classify neurological injury level and SCI in A, B, C, D and E. Neurological motor and sensory level established by AIS refers to the most inferior spinal segment with preserved sensitivity and motor function, without changes, in both sides of the body. AIS lesion A is considered complete, without preserved sensory or motor function below the neurological level, including sacral segments S4-S5. AIS injuries B, C and D are considered incomplete. They have partially preserved sensory and motor function below the neurological level, including sacral segments S4-S5. AIS injury E is that in which, in spite of spinal trauma at evaluation time, motor and sensory functions were considered normal in all segments below the neurological level. AIS scale also has a classification for SCI-related spinal syndromes: central spinal cord syndrome, cauda equina syndrome; anterior spinal artery syndrome; Brown-Sequard syndrome and medullary cone syndrome³.

For being a generally acute and unexpected event, SCI dramatically changes patient's life, generating consequences often disastrous for those suffering the injury in addition to their families and to society⁴. In addition to gait difficulty, other changes may be present on sensitivity, pain perception, bladder, intestinal and sexual function. After SCI acute phase, the rehabilitation process may be started aiming at helping recovery, preventing complications and also inserting once more patients in their society activities. The interdisciplinary rehabilitation team must have a broad vision of this process. Assistance should be considered for patients not only during hospital stay, but especially in their context of life, interacting with society and with the environment.

Among several SCI-related changes, chronic pain (CP) is considered a major problem by most patients, directly interfering with the rehabilitation process and quality of life (QL)^{5,6}. Among types of SCI pain, neuropathic pain (NP) is the most frequent and may be disabling⁶. According to the International Association for the Study of Pain (IASP) NP, by definition, emerges as a direct consequence of an injury or disease affecting the somatosensory system. In central neuropathic

pain, injury may be located anywhere in the spinal cord or in the brain, affecting spinal-thalamic-cortical pathways⁷. In general, it starts in the first year after SCI and 65% of patients report NP, being that 1/3 of them define it as severe⁶. NP development mechanisms are poorly understood⁵ being its treatment difficult for patients and health professionals.

Some characteristics of this pain are well established, but there is major variation in studies evaluating its prevalence and interference with SCI patients. This study aimed at identifying biopsychosocial characteristics associated to NP in 13 traumatic SCI patients to better understand this phenomenon and help health professionals and patients in the rehabilitation process. This is a descriptive study with a series of cases which are part of the first stage of a future research which shall evaluate NP prevalence and characteristics in traumatic SCI patients.

CASE REPORTS

During August 12 to 24, 2014, 13 consecutive SCI and NP patients, admitted to the SCI rehabilitation program in a reference institute of the Federal District, were interviewed. In this institution, patients remain hospitalized for 30 to 40 days for the rehabilitation program. Interviews were carried out 15 days after admission when patients had already participated in educative groups to understand and handle major SCI changes. Inclusion criteria were adults, aged 18 years or above, with traumatic SCI, admitted to the Neuro-Rehabilitation Program for Spinal Cord Injury.

Because pain is subjective, two international tools validated for Brazil were used for NP measurement and perception, plus socio-demographic data of the studied population. Brief Pain Inventory (BPI) has evaluated NP intensity and its interference with some daily life activities. The Douler Neuro-pathique em 4 Questions (DN4), specific for NP evaluation, was used to confirm its diagnosis and identification of some of its characteristics.

Collected information was analyzed by the program SPSS 18.0 – Statistical Package for the Social Sciences. Categorical variables were analyzed by frequency distribution and continuous variables by central trend measures (mean and median) and variability (standard deviation).

The Box Plot figure was shown to evaluate BPI results. ANOVA test with Bonferroni correction was applied for multiple comparisons and *t* test was applied for paired comparisons. Significance level was 0.05.

With regard to gender, 85% are males and 15% females. As to patients' origin, 38% are from the Southeastern region, 23% from the Midwest region, 23% from the Southern region, 8% from the Northern region and 8% from the Northeastern region. Mean age was 41 years, varying from 26 to 65 years. From respondents, 46% were single, 46% married and 8% widow/ers. As to family relations, 92% of patients have reported living with relatives such as spouse, father, mother or grandmother and just one patient lives with a hired caregiver (case 6). Mean body mass index was 24.54, varying

from 19.03 to 29.44. As to religion, most patients are catholic (38%), followed by evangelists (31%), spiritualists (15%) and other or atheists (16%).

With regard to education level, 23% had incomplete high school, 23% complete high school, 23% incomplete college, 15% complete college, 8% post-graduation and 8% incomplete basic education.

About current job, 38% reported being retired, 31% unemployed, 15% informal jobs, 8% students and 8% formal job. Among the three patients who worked, weekly workload was between 21 and 40h. As to the student, he reported dedicating 20 weekly hours to this activity. Most patients (54%) reported mean monthly income between R\$ 1,001.00 and R\$ 3,000.00, followed by R\$ 5,000.00 to R\$ 10,000.00 (15%), up to R\$ 1,000.00 (15%), above R\$ 10,000.00 (8%), R\$

3,001.00 to R\$ 5,000.00 (8%).

Specific data for each case are described in table 1.

Major SCI etiology was motorcycle accident (46%), followed by firearm (23%), fall (23%) and car accident (8%). Minimum time elapsed between interview and injury dates was 2 months and maximum was 14 years and 6 months, with mean of 4 years and 3 months. Most patients (54%) had incomplete SCI and 46% had complete SCI. Arthrodesis was performed in 61% of patients and two (15%) have used collar or brace. Specific data for each patient are described in table 2. Among SCI-associated comorbidities, results have indicated that all patients had neurogenic bowel and neurogenic bladder, 77% spasticity, 15% heterotrophic ossification and 8% autonomic dysreflexia.

With regard to other associated diseases, two patients (15%)

Table 1. Socio-demographic characteristics of the sample. Brasilia, 2015

Case	Gender	Age (complete years)	Marital status	Religion	Education	Primary job
1	Female	38	Single	Practicing catholic	Complete high school	Informal job
2	Male	64	Married	Practicing catholic	Incomplete high school	Retired
3	Male	35	Married	Non-practicing catholic	Post-graduation	Student
4	Male	34	Single	Christian	Incomplete college	Formal job
5	Male	26	Single	Practicing catholic	Incomplete high school	Unemployed
6	Female	43	Widow	Practicing spiritualist	Complete college	Informal job
7	Male	26	Single	Practicing protestant	Incomplete college	Retired
8	Male	65	Married	Non-practicing spiritualist	Complete college	Retired
9	Male	27	Single	No religion	Incomplete high school	Unemployed
10	Male	31	Single	Practicing evangelist	Incomplete college	Unemployed
11	Male	36	Married	Practicing evangelist	Complete high school	Unemployed
12	Male	63	Married	Practicing catholic	Complete high school	Retired
13	Male	48	Married	Practicing adventist	Complete basic education	Retired

Table 2. Sample distribution of spinal cord injury characteristics. Brasilia, 2015

Case	Etiology	Time of spinal cord injury	AIS classification	Sensory level	Motor level	Arthrodesis
1	Motorcycle accident	14 years & 4 months	B	C5-6	C5-6	Yes
2	Car accident	2 years & 1 month	A	T10	T10	No
3	Motorcycle accident	14 years & 6 months	A	T4	T4	Yes
4	Firearm	10 years & 2 months	A	T7	T7	No
5	Firearm	2 years & 7 months	Medullary cone/cauda syndrome	T11	T11	No
6	Motorcycle accident	1 year & 1 month	B	T8	T8	Yes
7	Motorcycle accident	3 years	A	T4	T4	Yes
8	Fall	6 months	Brown Sequard syndrome	T1	C5	Yes
9	Firearm	1 year & 7 months	A	T8	T8	No
10	Motorcycle accident	2 months	A	T5	T5	Yes
11	Motorcycle accident	3 years & 2 months	B	C8	C8	No
12	Fall	7 months	Syndrome medullary center	C7	C5	Yes
13	Fall	9 years & 3 months	Medullary cone/cauda syndrome	L1	L3	Yes

AIS = ASIA Impairment Scale: AIS A = complete injury. Without motor and sensory sensation below the neurological level, including sacral segments S4-5; AIS B = Incomplete injury. Without motor sensation and with sensory sensation below the neurological level, including sacral segments S4-5.

had depression (cases 2 and 6), 23% had other comorbidities such as diabetes (cases 2 and 8) dyslipidemia (cases 2 and 8), and hypertension (cases 2 and 4). All patients denied smoking or using illicit drugs. As to alcohol, 31% of patients have reported using it occasionally during weekends.

With regard to pain characteristics, most patients started with pain one to six months after SCI (69%), 8% between 6 months and 1 year, 8% between 1 year and 3 years and 15% after 3 years. DN4 questionnaire was used to describe pain-associated symptoms. For 85% of patients, DN4 questionnaire has shown scores above 4, indicating NP.

Among referred symptoms – according to their position in the questionnaire, 85% have referred burning, 92% cold, 31% electric shock, 85% tingling, 31% pricking 46% numbness, 92% hypoesthesia at touch and needle pricking. About pain location, 62% had pain below spinal cord injury level and 38% have referred mixed pain – at the level and below the level of SCI. No patient has reported pain above SCI. In 77% there has been predominance of pharmacological treatment. Most common drugs were gabapentin and amitriptyline, just one patient has reported occasional use of tramadol (case 3) and 3 patients used no drug. With regard to pain control effectiveness, from 10 patients under pharmacological treatment, 7 have referred that treatment is very effective, 2 that treatment is partially effective and 1 patient has reported that treatment is poorly effective. No patient referred surgery to treat NP and just one patient (case 6) has informed alternative treatment with Pilates and that it is effective.

Pain characteristics for each patient are shown in table 3.

Among factors interfering with worsening of pain, the following results were found: immobility (77%), cold (54%), mood (46%), anxiety (31%), night (31%), day (15%) and hot weather (8%). Factors improving pain were: physical activity (85%), leisure (85%), physiotherapy (69%), rest (31%), day (15%), work (15%) and night, study, mood and relaxation (8%).

BPI was used to evaluate pain intensity and its interference with activities performed in the last 24 hours. BPI is a multi-dimensional tool with a scale from zero to 10 to measure pain, except for one item using scale from 0% to 100%. Pain evaluated by patients is that felt at the moment the questionnaire is being filled and also in the last 24 hours. Results have shown that mean pain score was 4.38, with statistically significant difference when comparing worst and least reported pain.

Figure 1 shows BPI results with regard to pain impact on general activities, mood, ability to move with wheelchair, relationship with other people, sleep and enjoy life. Results have indicated that general activity was influenced the most by pain (mean=3.23) and relationship was influenced the least by pain. There has been no statistically significant difference when comparing mean scores of each aspect.

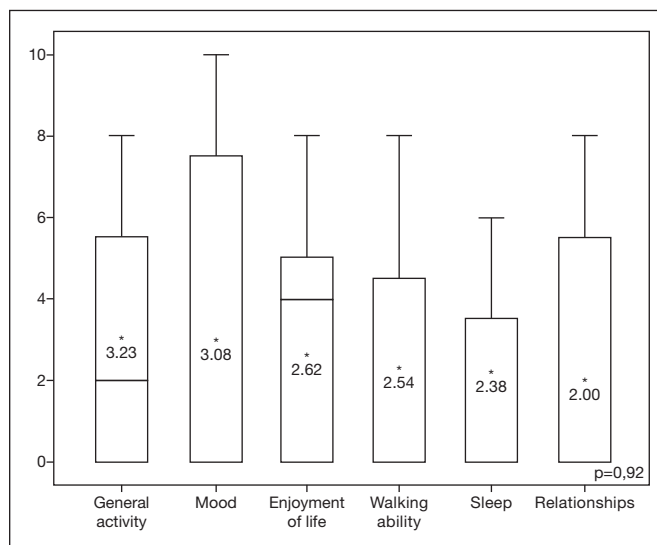


Figure 1. Interference of pain in the last 24 hours. Brasília, 2015
p=probability of significance (ANOVA Test).

Table 3. Pain characteristics of the sample. Brasília, 2015

Case	Pain onset after injury	Pain characteristic	General pain location	DN4 (Score)	Pharmacological pain treatment	Effectiveness of pharmacological treatment
1	More than 3 years	Continuous	Below injury level	3	Amitriptyline, gabapentin	Very effective
2	1 to 6 months	Continuous	At and below injury level	5	Gabapentin	Partially effective
3	1 to 6 months	Intermittent	Below injury level	7	Amitriptyline, gabapentin	Very effective
4	1 to 6 months	Continuous	At and below injury level	4	No drug	Not applicable
5	6 to 12 months	Intermittent	At and below injury level	6	Amitriptyline	Very effective
6	1 to 6 months	Intermittent	At and below injury level	5	Amitriptyline, gabapentin	Partially effective
7	1 to 6 months	Continuous	Below injury level	5	Amitriptyline	Very effective
8	1 to 6 months	Intermittent	Below injury level	5	Gabapentin	Very effective
9	1 to 6 months	Intermittent	At and below injury level	7	Amitriptyline, gabapentin	Very effective
10	1 to 6 months	Intermittent	Below injury level	4	Amitriptyline	Poorly effective
11	1 to 3 years	Intermittent	Below injury level	4	Amitriptyline	Very effective
12	1 to 6 months	Intermittent	Below injury level	5	No drug	Not applicable
13	More than 3 years	Continuous	Below injury level	1	No drug	Not applicable

DN4 Questionnaire = Douleur Neuropathique em 4 Questions.

DISCUSSION

Our findings are in line with other studies: male individuals, with mean age of 40 years, retired or unemployed, family income up to R\$ 3,000.00 with vehicle accidents (car and motorcycles) as predominant SCI cause, followed by firearm perforations and falls, being thoracic vertebral the most commonly affected segment. In a demographic study to identify the frequency of spinal cord trauma in a health institution of the State of São Paulo, authors have shown that 72% of cases were males, with predominance of age group between 21 and 30 years (22.5%). Among SCI causes, car accident was the most common (38.9%), followed by falls (27.4%), motorcycle accidents (15.3%), sports (6.5%), diving (4%) and firearm wound (2.5%). Most affected vertebral segment in this study was the thoracolumbar region, with 51.7% of cases⁸.

A different study has evaluated NP characteristics in 109 SCI individuals⁹. Pain was diagnosed according to DN4 questionnaire in 20 patients. Results have also shown that most affected individuals by this pain were male, young adults with 40 years of age, single or married, retired, with basic education and paraplegic with incomplete injury⁹.

In 77% of patients of this series, NP has started up to one year after SCI; 69% in up to six months. These results are similar to other study where NP onset was reported by most patients in up to 6 months after spinal cord injury⁶.

In our study, pharmacological treatment was considered very effective by 70% of patients. There has been prevalence of gabapentin and amitriptyline. The efficacy of gabapentin and carbamazepine was shown in a study evaluating NP in SCI patients¹⁰. However, this improvement was poorer as compared to other types of surgical procedures – implantable morphine infusion pump; epidural stimulator; DREZ surgery or Lissauer Tract and spinal cord posterior horn injury¹⁰.

Some authors have shown that social and emotional factors,

in addition to physical factors – weather changes and cold, are associated to chronic pain, although this relationship is still not well defined^{3,6}. In this case series, cold and immobility were major factors worsening NP and physical activity and leisure were factors helping pain improvement. The evaluation of the influence of NP in the lives of those patients has identified that general activity and mood were impaired the most by NP.

CONCLUSION

SCI dramatically changes patients' lives, generating disastrous consequences for them, their families and society. In our series, most were young males, victims of traffic accidents and with neuropathic pain negatively impacting mood and general activities.

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