

Neuropathic Pain in Patients with Spinal Cord Injury

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Abstract

Background: The aims of this study were to determine the prevalence of neuropathic pain in patients with spinal cord injury (SCI) during rehabilitation and follow-up, and to examine the relationship between neuropathic pain and the demographic and clinical characteristics of the patients.

Methods: The medical records of 93 patients who were admitted to our inpatient rehabilitation hospital with a diagnosis of SCI were evaluated. Patients with neuropathic pain were contacted by telephone after discharge and questioned whether the pain continued and whether they were on any medication.

Results: The mean age was 38.73 ± 15 years. Thirty-two percent of the group consisted of women. Based on neurological levels, 28 (30.4%) patients were tetraplegic, 49 (53.3%) were paraplegic and 15 (16.3%) had conus-cauda equina injury. Sixty-four patients (68.8%) had complete lesions and 28 patients had incomplete lesions (The American Spinal Injury Association Impairment Scale (AIS) grade B-D).

Neuropathic pain was present in 49 (52.7%) and absent in 44 (47.3%) patients during their hospital stay. While a statistically significant difference was found between the groups in terms of gender, there was no such difference for mean age, SCI etiology, neurological level and AIS grade ($p=0.021$, $p=0.151$, $p=0.368$, $p=0.686$, $p=0.340$). During follow-up, the pain continued in 36 (78.3%) patients and had resolved in 10 (21.7%) patients. The daily living activities were affected in 23 (55%) patients. When we questioned the treatment in the neuropathic pain group, 28 (77.8%) of the patients did not take any medication for neuropathic pain while 8 (22.2%) were on related medication.

Conclusion: Taking into account that neuropathic pain is an important factor that affects daily living activities, SCI patients should be evaluated in detail to determine the characteristic of any pain, and the medical treatment prescribed to the patient should be closely monitored.

Keywords: Neuropathic pain; Rehabilitation; Spinal cord injury

Abbreviations:

SCI: Spinal Cord Injury; AIS: The American Spinal Injury Association Impairment Scale

Introduction

Spinal cord injury (SCI) not only causes loss of motor and sensory function but can also lead to many complications. One of the greatest and most debilitating of these complications is chronic pain [1,2]. Reports of the pain prevalence differ between 18 to 96 percent, and approximately 30% of these manifest as neuropathic pain [3].

SCI related neuropathic pain is characterized by spontaneous persistent pain and described as abnormal sensations including burning, tingling, stabbing, shooting and aching [4]. It is often chronic and severe, resulting in a substantial negative impact on patient function and quality of life [5]. Several studies have described pain prevalence, risk factors, pain and medical variables in the SCI population but with varying results [6,7].

The primary objectives of this study was to determine the prevalence of neuropathic pain in patients with SCI during inpatient rehabilitation and follow-up, and define the relationship between

neuropathic pain and demographic and SCI characteristics of the patients. The secondary objective was to determine whether neuropathic pain continued after discharge and whether the patients were on any medication for this pain.

Materials and Methods

A total of 93 patients admitted to Baskent University Faculty of Medicine, Physical Medicine and Rehabilitation Clinic with a diagnosis of SCI between April 2004 and April 2009 were evaluated. Patients with any neurological, orthopedic, or rheumatologic disease, or additional disease such as diabetes mellitus that could cause neuropathic pain, concurrent traumatic brain damage, peripheral nerve injury, severe spasticity, heterotrophic ossification, or pressure sores and those suffering from spinal shock during the pre-morbid period were not included in the study.

The age, gender, employment status before injury, level of education, etiology and level and completeness of the lesion of the patients were recorded. The patients were divided by age at the time of injury into the following four groups; younger than 21, 21-41, 41-50 and over 51 years. The etiology of the injury was differentiated into traumatic and non-traumatic. Completeness of the injury was based on the "American Spinal Injury Association Impairment Scale" (AIS) as AIS A through AIS D. The level of injury was classified as follows;

tetraplegia (C4-T1), paraplegia (T2-T12) and cauda equina-conus syndrome (L1-S4/5).

Neuropathic pain was diagnosed by examination of an experienced physiatrist when it met the criteria presented by the International Association for the Study of Pain (IASP) task force [8]. Criteria used were pain without primary relation to movements or sign of inflammation, presence of sensory disturbances to pinprick and touch within the painful territory, corresponding to the SCI. Clinical and radiological assessments were carried out for the differential diagnosis of nociceptive pain in suspected patients. The patients were divided into two groups as those with neuropathic pain and without neuropathic pain, and the demographic and clinical characteristics of the groups were compared. After discharge, the patients in the group with neuropathic pain were reached by phone and queried on whether the pain continued and affected their daily living activities and the medical treatment they used for pain.

The study was approved by the hospital's ethics committee and carried out according to the institutional guidelines and the principles of the Declaration of Helsinki. The patients were informed on the phone and the consent of patients was obtained.

Statistical Analysis

Statistical analysis was performed by using the Statistical Package for Social Sciences (SPSS) for Windows 20 (IBM SPSS Inc., Chicago, IL) package program. The normal distribution of data was evaluated with the Kolmogorov-Smirnov test. Data showing normal distribution in all populations were expressed as mean \pm standard deviation while those not showing normal distribution were expressed as min-max. Categorical variables were expressed as numbers and percentages. The sample number of the non-traumatic group was 8 and the Mann-Whitney U Test was therefore used for the comparisons of the two groups. The Chi-square test and Fisher's Exact Chi-square Test were used in the comparison of categorical data.

Results

A total of 93 patients, 63 males (67.7%) and 30 females (32.3%) were included in the study. The mean age of the patients included in the study was 38.73 ± 15.1 years. Only 2 patients (2.7%) were working actively after the injury. The etiology of the injury was traumatic in 85 patients (91.4%) and non-traumatic in 8 patients (8.6%). According to the AIS classification; 64 patients (68.8%) were evaluated as AIS A (complete) and 28 patients (31.2%) as AIS B-D (incomplete). The level of the lesion was tetraplegic in 28 patients (30.4%), paraplegic in 49 patients (53.3%), and cauda equina-conus syndrome in 15 patients (16.3%). In the traumatic group only 1 patient received conservative treatment, the rest received surgical treatment. And in the non-traumatic group; 3 patients received conservative treatment and 5 patients received surgical treatment. The demographic and clinical characteristics of all patients and of the traumatic and non-traumatic groups are presented in Table 1.

When the patients were evaluated in terms of neuropathic pain presence; neuropathic pain was present in 49 (52.7%) and absent in 44 (47.3%) patients during their hospital stay. The time interval between spinal cord injury and neuropathic pain diagnosis was 131.25 ± 222.54 days. The mean age of the patients in the group with neuropathic pain was 40.64 ± 14.29 years and the mean age of the patients in the group without neuropathic pain was 36.58 ± 15.85 years. While a statistically significant difference was found between the groups in terms of

gender, there was no such difference for the mean age and age groups, educational level, etiology, neurological level, and AIS grade ($p > 0.05$). The comparison of demographic and clinical characteristics of the groups is presented in Table 2.

Variables	Overall (n=93)	Traumatic (n=85)	Non-traumatic (n=8)	P
Age (years) (Mean \pm SD)	38.73 \pm 15.1	38.41 \pm 14.6	42.00 \pm 20.3	0.056
Gender, n (%)				0.211
Female	30 (32.3%)	29 (34.1%)	1 (12.5%)	
Male	63 (67.7%)	56 (65.9%)	7 (87.5%)	
Education, n (%)				0.884
Primary school	42 (51.8%)	38 (50.6%)	5 (62.5%)	
High school	23 (27.7%)	21 (28%)	2 (25.0%)	
University	17 (20.5%)	16 (21.3%)	1 (12.5%)	
Employment before injury, n (%)				0.017
Employed	54 (58.1%)	52 (61.2%)	2 (25.0%)	
Home maker	19 (20.4%)	18 (21.2%)	1 (12.5%)	
Retired	9 (9.7%)	6 (7.1%)	3 (37.5%)	
Student	11 (11.8%)	9 (10.6%)	2 (25.0%)	
Neurological level, n (%)				0.073
Tetraplegia	28 (30.4%)	28 (33.3%)	0	
Paraplegia	49 (53.3%)	44 (52.4%)	5 (62.5%)	
Cauda equina-Conus	15 (16.3%)	12 (14.3%)	3 (37.5%)	
AIS Grade, n (%)				0.008
A	64 (68.8%)	61 (72.6%)	3 (37.5%)	
B	19 (20.4%)	17 (20.2%)	2 (25%)	
C	2 (2.2%)	2 (2.4%)	0	
D	7 (7.5%)	4 (4.8%)	3 (37.5%)	

Table 1: Demographics and clinical characteristics overall and in the traumatic and non-traumatic groups.

The patients with neuropathic pain were called to complete the follow up questionnaire at an average of 17.09 ± 17.01 months after hospital discharge. Evaluation of 49 patients revealed that the pain continued in 36 (73.3%) patients and did not continue in 10 (21.7%) patients. Three patients were lost to follow-up. The mean pain duration was 459 ± 1300 days. The daily living activities had been affected by the pain in 24 (54.5%) patients. The medical treatment used for neuropathic pain was one or more drugs in 8 patients (22.2%) while 28 patients (77.8%) said they no longer used medication for neuropathic pain (Table 3).

Discussion

We evaluated the prevalence of neuropathic pain in patients with SCI during inpatient rehabilitation and follow-up, and define the relationship between neuropathic pain and demographic and SCI characteristics of the patients. According to our results, neuropathic pain was found in 49 (53%) patients with SCI during inpatient rehabilitation. We found no relationship between neuropathic pain presence and age, educational level, SCI etiology, neurological level or AIS grade, but it showed a difference according to gender. In addition, after discharge, neuropathic pain was found to continue in 36 patients (78.3%) and 28 patients (77.8%) received no treatment despite neuropathic pain.

Variables	Group with pain n=49	Group without pain n=44	P
Age groups (Years), n (%)			0.231
<21	2 (22.2)	7 (77.8)	
21-40	23 (51.1)	22 (48.9)	
41-50	60 (40)	40 (40)	
≥51	14 (60.9)	9 (39.1)	
Gender, n (%)			0.021
Female	21 (42.9)	9 (20.5)	
Male	28 (57.1)	35 (79.5)	
Educational level, n (%)			0.454
Primary school	22 (48.9)	21 (55.3)	
High school	15 (33.3)	8 (21.1)	
University	8 (17.8)	9 (23.7)	
Etiology, n (%)			0.368
Traumatic	46 (93.9)	39 (86.6)	
Non-traumatic	3 (6.1)	5 (11.4)	
Neurological level n (%)			0.686
Tetraplegia	13 (27.1)	15 (34.1)	
Paraplegia	26 (54.2)	23 (52.3)	
Conus, cauda equina	9 (18.8)	6 (13.6)	
AIS grade, n (%)			0.340
A	31 (64.6)	33 (75)	
B	12 (25)	7 (15.9)	
C	2 (4.2)	0	
D	3 (6.3)	4 (9.1)	

Table 2: Characteristic of SCI patients with or without neuropathic pain symptoms.

Neuropathic pain, a major complication of SCI, has been reported to develop at a rate of about 40-50% [9,10] and to emerge usually

within the first year, mostly within the first six months [11]. We found that 84% of our patients who developed neuropathic pain in the first year and this was consistent with the literature.

Pain is reported to be more prevalent in female SCI patients in some studies [12] while others suggest similar rates for females and males [9,13,14]. A study evaluating the relationship between gender and pain severity in SCI patients revealed that the pain severity was the same in females and males during the prepubertal period but more severe in females in the postpubertal period, thought to be due to the effect of gonadal hormones. Another factor was that pain in women was socially acceptable. Another group reported that women felt more severe pain due to increased sensory pain memory [6,15]). Comparison of our male and female patients regarding the presence of pain showed that neuropathic pain was statistically significantly more common in females (p=0.021).

	N	%
Onset of neuropathic pain		
Within 3 months	26	57.8
3-6 months	10	22.2
6-12 months	2	4.4
More than 12 months	7	15.6
Effect on daily living activities		
Affected	24	54.5
Not affected	20	45.5
Use of analgesics		
Yes	8	22.2
No	28	77.8

Table 3: The characteristics of neuropathic pain of patients with SCI.

Studies on the relationship of SCI related pain and age have not provided clear results [6,16,17]. Siddal et al. reported the mean age of SCI patients with chronic pain as 40 ± 16 years [18]. The mean age in our group with neuropathic pain was 38.73 ± 15 years. Werhagen et al. suggested that the prevalence of neuropathic pain increased in the third, fifth and higher decades of life [19]. We found no statistically significant difference in terms of age distribution between the groups with and without neuropathic pain in our study (p=0.231).

Ulrich et al. examined chronic pain in patients with SCI and found no relationship between the pain and patient demographic or SCI characteristics. However, neuropathic pain was not evaluated in particular in this study [7]. Siddall et al. reported no relationship between the presence of pain and lesion level and severity, while neuropathic pain under the lesion level was more common in tetraplegic patients than in paraplegic patients in a study with 5 years of follow-up [18]). Werhagen et al. found no statistically significant difference in neuropathic pain prevalence between tetraplegic and paraplegic patients and those with complete and incomplete lesions [19]. Other studies suggest no significant relationship between the level of injury and the presence of pain and pain severity [20,21]. When the groups with or without pain were compared, we found no

statistically significant difference in terms of lesion level or severity ($p=0.686$, $p=0.340$, respectively).

Several studies have reported that the most important factor preventing daily living activities in patients with SCI is pain [19,22,23]. SCI patients described neuropathic pain as very disturbing and found it to be more intensive and with more influence on their daily living activities than musculoskeletal pain [24]. A strong relationship was found between neuropathic pain after SCI and decreased daily living activities, sleep disorder, depression and anxiety [25,26]. Ravenscroft et al. suggested that the worst medical problem as seen in 50% of SCI patients was pain and this affected the quality of life, social life, relationships with others and general activities negatively [2]. The daily living activities were found to be affected from the pain in 54.5% of the patients during follow-up after discharge in our study and this is consistent with the literature.

The treatment of neuropathic pain is difficult. There are many pharmacological treatment options including anticonvulsants, antidepressants, analgesics and antispasticity treatments. However, their effectiveness is limited and they can cause severe side effects. Finnerup et al. have reported the distribution of medication use in neuropathic pain patients as analgesics in 43% and antidepressant or anticonvulsants in 7% [14]. We found that a large proportion (77.8%) of the patients in the group with neuropathic pain discontinued the treatment after discharge despite their pain.

The most important limitation of our study is its retrospective nature. Other limitations are the inability to apply the neuropathic pain evaluation scales in this retrospective study and small sample size, especially in the non-traumatic group. It may be possible that some of the negative findings (no differences due to age, SCI etiology, level or severity of injury) were due to the small sample size, but it is unknown what the impact of the small sample size was because power analyses were not presented to justify the sample size.

In conclusion, neuropathic pain after SCI is a common complication and also an important problem affecting the daily living activities of patients and causing disability. Detailed pain evaluation should be performed in these patients to determine the characteristic of the pain, and the treatment of neuropathic pain should be performed appropriately and early by a multidisciplinary team. It should be not forgotten that the effectiveness of the medication used for neuropathic pain treatment may not be adequate or the patients may quit the treatment due to side effects of which they should be informed. The patients should be monitored closely after discharge in terms of the continuation of the neuropathic pain, and the proper implementation and effectiveness of the recommended treatment.

References

- Budh CN, Osteraker AL (2007) Life satisfaction in individuals with a spinal cord injury and pain. *Clin Rehabil* 21: 89-96.
- Ravenscroft A, Ahmed YS, Burnside IG (2000) Chronic pain after SCI. A patient survey. *Spinal Cord* 38: 611-614.
- Putzke J, Richards JS, Hicken BL, Ness TJ, Kezar L, et al. (2002) Pain classification following spinal cord injury: the utility of verbal descriptors. *Spinal Cord* 40: 118-127.
- Ataoaylu EI, Tiftik T, Kara M, Tuna H, Ersaz M, et al. (2013) Effects of chronic pain on quality of life and depression in patients with spinal cord injury. *Spinal Cord* 51: 23-26.
- Demirel G, Yllmaz H, GenÅşosmanoÅŸlu B, KesiktaÅŸ N (1998) Pain following spinal cord injury. *Spinal Cord* 36: 25-28.
- Ullrich PM, Jensen MP, Loeser JD, Cardenas DD (2008) Pain intensity, pain interference and characteristics of spinal cord injury. *Spinal Cord* 46: 451-455.
- Siddall JP, Yeziarski RP, Loeser JD (2000) Pain following spinal cord injury: clinical features, prevalence, and taxonomy, Technical corner. *IASP Newsletter* 3-7.
- Norrbrink Budh C, Lund I, Ertzgaard P, Holtz A, Hultling C, et al. (2003) Pain in a Swedish spinal cord injury population. *Clin Rehabil* 17: 685-690.
- Siddall PJ, Loeser JD (2001) Pain following spinal cord injury. *Spinal Cord* 39: 63-73.
- Celik EC, Erhan B, Lakse E (2012) The clinical characteristics of neuropathic pain in patients with spinal cord injury. *Spinal Cord* 50: 585-589.
- Werhagen L, Hultling C, Molander C (2007) The prevalence of neuropathic pain after non-traumatic spinal cord lesion. *Spinal Cord* 45: 609-615.
- Norrbrink Budh C, Lund I, Hultling C, Levi R, Werhagen L, et al. (2003) Gender related differences in pain in spinal cord injured individuals. *Spinal Cord* 41: 122-128.
- Finnerup NB, Johannesen IL, Sindrup SH, Bach FW, Jensen TS (2001) Pain and dysesthesia in patients with spinal cord injury: A postal survey. *Spinal Cord* 39: 256-262.
- Norrbrink Budh C, Lund I, Hultling C, Levi R, Werhagen L, et al. (2003) Gender related differences in pain in spinal cord injured individuals. *Spinal Cord* 41: 122-128.
- Turner JA, Cardenas DD, Warms CA, McClellan CB (2001) Chronic pain associated with spinal cord injuries: a community survey. *Arch Phys Med Rehabil* 82: 501-509.
- Turner JA, Cardenas DD (1999) Chronic pain problems in individuals with spinal cord injuries. *Semin Clin Neuropsychiatry* 4: 186-194.
- Siddall PJ, McClelland JM, Rutkowski SB, Cousins MJ (2003) A longitudinal study of the prevalence and characteristics of pain in the first 5 years following spinal cord injury. *Pain* 103: 249-257.
- Werhagen L, Budh CN, Hultling C, Molander C (2004) Neuropathic pain after traumatic spinal cord injury--relations to gender, spinal level, completeness, and age at the time of injury. *Spinal Cord* 42: 665-673.
- Siddall PJ, Taylor DA, McClelland JM, Rutkowski SB, Cousins MJ (1999) Pain report and the relationship of pain to physical factors in the first 6 months following spinal cord injury. *Pain* 81: 187-197.
- Yap EC, Tow A, Menon EB, Chan KF, Kong KH (2003) Pain during in-patient rehabilitation after traumatic spinal cord injury. *Int J Rehabil Res* 26: 137-140.
- Calmels P, Mick G, Perrouin-Verbe B, Ventura M; SOFMER (French Society for Physical Medicine and Rehabilitation) (2009) Neuropathic pain in spinal cord injury: identification, classification, evaluation. *Ann Phys Rehabil Med* 52: 83-102.
- Nicholson Perry K, Nicholas MK, Middleton J (2009) Spinal cord injury-related pain in rehabilitation: a cross-sectional study of relationships with cognitions, mood and physical function. *Eur J Pain* 13: 511-517.
- Felix ER, Cruz-Almeida Y, Widerström-Noga EG (2007) Chronic pain after spinal cord injury: what characteristics make some pains more disturbing than others? *J Rehabil Res Dev* 44: 703-715.
- Gustorff B, Dorner T, Likar R, Grisold W, Lawrence K, et al. (2008) Prevalence of self-reported neuropathic pain and impact on quality of life: a prospective representative survey. *Acta Anaesthesiol Scand* 52: 132-136.
- Elliott TR, Frank RG (1996) Depression following spinal cord injury. *Arch Phys Med Rehabil* 77: 816-823.

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