JoCASS
Çukurova Anestezi ve Cerrahi Bilimler Dergisi
2018 Adana

NEUROPATHIC PAIN IN SPINAL CORD INJURY

Nilüfer Aygün Bilecik[1]

1. *Ministry of Health, Adana City Training & Research Hospital, Adana, Türkiye*

Abstract

Aim: Spinal cord injury (SCI) is a destructive condition causing additional physical, psychological, and social function disorders. Neuropathic pain (NP) following SCI is a common and challenging problem to treat. The addition of the NP following SCI increases the impairment of the sleep patterns, moods, and daily life activities of the patients. Treatment of NP following SCI is often difficult and often requires a long time to respond to treatment. The study aimed to investigate the neuropathic pain condition in patients with SCI.

Methods: The study included 52 patients with spinal cord injuries. Including the demographics and clinical characteristics, The Visual Analog Scale (VAS) was used to define the intensity of the pain, and a self-report version of the Leeds Assessment of Neuropathic Symptoms and Signs pain scale (S-LANSS) was used to assess the neuropathic symptoms and signs. The cases under the age of 18, and over 65 with conditions that might have neuropathic origins, ones with dermatological diseases in the symptomatic regions, and other clinical issues that may cause immobility besides SCI, were not included in the study.

Results: The mean age was 42,25±18,12 years. The median scores of VAS and S-LANSS were 6 (0-10) and 11 (0-24), respectively. The majority were male, ASIA A, and paraplegic (63.5%, 67.3%, and 67.3%, respectively). The rates of patients on pregabalin and gabapentin were 30.8% and 19.2%, respectively. The VAS scores of patients with a higher probability of neuropathic pain (S-LANSS≥12) were significantly increased (7 (4-10) vs 3,5 (0-9), $p<0.001$). There were no significant differences in terms of age and gender.

Conclusions: Among SCI patients, the frequency of NP detected by using S-LANSS were increased. Therefore, patients with SCI might require a more careful examination regarding neuropathic pain and thus receive appropriate treatments in routine clinical practice.

Keywords: *Spinal Cord Injuries, Neuralgia, S-LANSS*

Corresponding Author: Nilüfer Aygün Bilecik, e-mail: drnilaygun@gmail.com

Received: 28.01.2023, Accepted: 29.03.2023, Available Online Date: 30.04.2023

Cite this article as: Bilecik NA. Neuropathic Pain in Spinal Cord Injuries. J Cukurova Anesth Surg. 2023;6(1):140-6.

doi: 10.36516/jocass.1243810

Introduction

Spinal cord injury (SCI) incidence ranges between 15 to 40 cases per million[1]. The disadvantages caused by SCI in the life of a patient are not limited to the person`s life and have effects on the community[2]. Neuropathic pain (NP) following SCI is a frequently seen complication and impairs the sleep pattern, quality of life, and daily activities[3]. The prevalence of chronic pain following SCI ranges between 11 and 94 percent. The prevalence of NP following SCI has a relatively lower incidence varying between 18.3 and 53 percent[4-6]. The incidence rates for chronic pain and NP following SCI among Turkish people were 61 and 53 percent, respectively[6,7].

The International Association for the Study of Pain classifies the pain following SCI into two main groups, nociceptive pain and NP[8]. Nociceptive pain occurs when the pain receptors at the free nerve endings are stimulated. Nociceptive pain following SCI may be originated from musculoskeletal (trauma or inflammation of the bone, joint, or muscle tissue, muscle spasm, overuse or mechanical instability) or visceral (renal, enteral or sphincter dysfunction, or dysreflexia headache)[9]. NP, on the other hand, is defined as "the pain resulting from a disease or a lesion directly affecting the somatosensorial system"[10]. NP following SCI is classified into three groups according to the anatomical location of the injury, above, at the level of injury, and below. NP above the level of injury includes compressive mononeuropathies and complex regional pain syndrome. NP at the injury level class harbors nerve root compressions, posttraumatic syringomyelias, and the traumas and ischemia of the spinal cord. NP below the level of injury is attributed to traumas and ischemia of the spinal cord[9]. Patients with NP following SCI frequently report allodynia and hyperalgesia[11]. Many pathological changes occur as a result of the SCI and some may contribute to the development of NP. Reactive gliosis, spinal disinhibition, and spinal hyperexcitability are among the mechanisms accused to contribute in the generation of pain. NP has a high intensity and resistance to treatment, affecting the mood and the quality of life of the patients[12-16]. A report showed that patients indicated that pain relief was more important than walking[17]. Therefore, the identification and treatment of NP are crucial. NP is diagnosed by history and physical examination[18].

In this study, we aimed to determine the frequency of NP in SCI patients using the S-LANSS pain scale. Also, we wanted to look for the differences between the patients with NP and the ones without NP regarding the demographics.

Materials and Methods

The study included 52 patients diagnosed with complete and incomplete SCI according to the American Spinal Injury Association (ASIA) scale hospitalized for rehabilitation at Adana City Physical Therapy and Rehabilitation Clinic between July 1 and August 31, 2022. Patients under the age of 18 and over 65, having diseases that might originate neuropathy including diabetes mellitus, and peripheric neuropathy, additional dermal conditions at the symptomatic sites, osteoarthritis, fractures, deep vein thrombosis, heterotopic ossification, NP before SCI, and patients with immobility caused by other problems than SCI were not included in the study.

The demographics, ASIA classification, diagnosis based on the level of the injury, and medication data were recorded.

The S-LANSS scale was used to assess neuropathic pain. The S-LANSS pain scoring system consists of 7 items. The lowest score is zero and the highest is 24. A score equal to or above 12 indicates that the patient is most probably suffering from NP.

Visual analogue scale-VAS was used to define the pain intensity, and the past lowest, highest, and current pain scores were recorded.

Statistical analysis

Continuous variables, mean, standard deviation, median, minimum, maximum, and cate-

gorical data were expressed as numbers and percentages. Kolmogorov-Smirnov adaptation goodness of fit test was used for normality analyses of continuous variables. For the comparison between the groups of the non-normal distributed data, Mann Whitney U Test was used for the comparison between two groups, and Kruskal Wallis Test was used for three or more groups (for advanced analysis Bonferroni corrected Mann Whitney U Test was used). The chi-square test was used in the comparison of the categorical data. Analysis was performed using IBM SPSS version 26.0 (IBM Corporation, Armonk, NY, USA). Results, where the type 1 error level was below 5%, were considered significant.

Table 1. The main demographic and clinical characteristics of the study group.

	Study group (n=52)
Age (years) (Mean±Std)	42,25±18,12
VAS [median (min-max)]	6 (0-10)
S-Lanns [median (min-max)]	11 (0-24)
Gender (n, %)	
Female	19 (36,5)
Male	33 (63,5)
ASIA (n, %)	
A	35 (67,3)
B	11 (21,2)
C	6 (11,5)
Diagnosis (n, %)	
Paraplegic	35 (67,3)
Tetraplegic	17 (32,7)
Medication (n, %)	
None	15 (28,8)
Pregabalin	16 (30,8)
Gabapentin	10 (19,2)
Baklofen	3 (5,8)
Magnesium	5 (9,6)
Parasetamol	2 (3,8)
Duloxetine	1 (1,9)
Systemic disease (n, %)	
Present	23 (44,2)
None	29 (55,8)

Results

The mean age was 42.25±18.12. The median VAS ve S-LANSS scores were 6 (0-10) and 11 (0-24), respectively. 63.5% were male, 67.3% were ASIA A, 67.3% were paraplegic, 44.2% had at least one systemic disease, 30.8% were on pregabalin, and 19.2% were on gabapentin (Table 1).

The VAS scores of patients on pregabalin were significantly higher compared to the scores of patients not using any medication or using medication other than gabapentin (Mg, paracetamol, etc.) (p<0.001 for both). The VAS scores of patients on gabapentin were significantly higher than the no-medication group (p=0.008). The S-LANSS score results were similar, the scores of patients on pregabalin were significantly higher compared to the scores of patients not using any medication or using medication other than gabapentin (Mg, paracetamol, etc.) (p<0.001, and p=0.002, respectively). The S-LANSS scores of patients on gabapentin were significantly higher than the no-medication group (p=0.001) (Table 2).

The VAS scores of patients suffering most probably from NP (S-LANSS score ≥12) were significantly higher [7 (4-10) vs 3,5 (0-9), p<0.001]. There were no differences in terms of age and gender (p=0.558 and p=0.773, respectively).

The ratio of S-LANSS≥12 among patients on pregabalin and gabapentin was 81.2% and 80%, respectively, and the remaining ratio of 18.8% and 20% for S-LANSS<12 for both groups was statistically significant (p<0.001). There were 26 patients with S-LANSS≥12.

The ratios of S-LANSS≥12 in ASIA-A, ASIA-B, and ASIA-C were 54.3%, 45.5%, and 33.3%, respectively, and there were no statistically significant differences detected (p=0.602).

The ratios of S-LANSS≥12 in the paraplegic and tetraplegic group were 42.9% and 64.7%, respectively, and the difference was not statistically significant (p=0.139) (Table 3).

Table 2. The comparison of VAS and S-Lanns scores based on main characteristics.

	VAS	*p*	S-Lanns	*P*
Age (years)				
<40	6 (0-10)	0.632*	12 (0-24)	0.330*
≥40	5 (0-10)		6 (0-24)	
Gender (n, %)				
Female	5 (2-10)	0.534*	9 (0-24)	0.939*
Male	6 (0-10)		12 (0-24)	
ASIA (n, %)				
A	6 (0-10)	0.231**	12 (0-24)	0.772**
B	5 (0-8)		5 (0-19)	
C	4,5 (2-9)		7 (0-24)	
Diagnosis (n, %)				
Paraplegic	5 (2-10)	0.356*	8 (0-24)	0.411*
Tetraplegic	6 (0-10)		15 (0-24)	
Medication (n, %)				
None	3 (0-9)		1 (0-19)	
Pregabalin	8 (5-10)[a]	<0.001**	16 (1-24)[a]	<0.001**
Gabapentin	6 (3-10)[a]		13,5 (3-24)[a]	
Other	4 (2-7)		6 (0-18)	
Systemic disease (n, %)				
Present	5 (2-10)	0.948*	12 (0-24)	0.592*
None	6 (0-10)		9 (0-24)	

* Mann Whitney U Test
** Kruskal Wallis Test (Bonferroni corrected Mann Whitney U Test; the difference between the two groups was statistically significant, p<0.012)

Discussion

The link between NP and demographics, diagnosis based on the injury level, and medication data of the patients hospitalized for rehabilitation was analyzed. The results showed that 50% of the patients had NP.

The reports indicate that the rate of NP development among SCI patients in the first year, especially in the first six months was 40 to 50 percent[19-21].

In a study conducted on rats with SCI, the hyperalgesia and increased mechanical sensitivity were underlined and pointing to the fact that loci specific to the gender located on chromosomes 2, 6, and 15 have effects on mechanical sensitivity[22]. Contrary to the report, there were no significant differences between the genders among the SCI patients regarding NP development. Nevertheless, Savas et al. showed no significant difference between the genders in their study on NP in SCI patients[23].

Werhagen et al. suggested that the prevalence of NP in SCI patients increases in the third and fifth decades of life[24]. In this study, the probability of NP development was higher for patients under the age of 40, compared to the ones over 40.

Siddall et al. reported that, compared to paraplegic cases, despite the increased pain below the lesion level in tetraplegic patients, there was no association between pain presence and the level of injury[25]. In this study, the ratios of S-LANSS≥12 in the paraplegic and tetraplegic group were 42.9% and 64.7%. But that the differences are not statistically significant, even if there is a difference between the paraplegic and tetraplegic patients. In the aforementioned study conducted by Werhagen et al. there was no relation detected between the SCI patients with complete and incomplete lesions regarding NP prevalence[24].

Table 3. The comparison of the S-lanns≥12 patients (high probability of NP) to S-lanss<12 (high probability of nociceptive pain) based on main characteristics.

	S-LANSS <12 (n=26)	S-LANSS ≥12 (n=26)	*P*
Age (years) [median (min-max)]	40 (13-70)	39,5 (17-83)	0.558*
VAS [median (min-max)]	3,5 (0-9)	7 (4-10)	<0.001*
Gender (n, %)			
Female	10 (52,6)	9 (47,4)	0.773**
Male	16 (48,5)	17 (51,5)	
ASIA (n, %)			
A	16 (45,7)	19 (54,3)	0.602**
B	6 (54,5)	5 (45,5)	
C	4 (66,7)	2 (33,3)	
Diagnosis (n, %)			
Paraplegic	20 (57,1)	15 (42,9)	0.139**
Tetraplegic	6 (35,3)	11 (64,7)	
Medication (n, %)			
None	13 (86,7)	2 (13,3)	
Pregabalin	3 (18,8)	13 (81,2)	<0.001**
Gabapentin	2 (20,0)	8 (80,0)	
Other	8 (72,7)	3 (27,3)	
Systemic Disease (n, %)			
Present	10 (43,5)	13 (56,5)	0.402**
None	16 (55,2)	13 (44,8)	

* Mann Whitney U Test
** Chi-square Test

In the current study, on the other hand, in the complete lesion group with ASIA-A scoring, the probability of NP development was higher compared to the incomplete lesion group.

Furthermore, in this study, the S-LANSS scores demonstrated a positive correlation with VAS scores. In the NP group, the average of the most severe level of pain felt was scored as 7 in VAS. The study performed by Texeira et al. on 213 SCI patients using VAS showed that the mean pain level scores were 8 and higher[26]. However, the study of Texeira et al. was conducted in a pain center and the patients might have been resistant to treatments and expressed more severe pain in comparison to the current study population. In the study of Savas et al., the mean VAS was reported as 6.7, similar to our findings[23]. The treatment of NP is extremely difficult. The regimen includes antiepileptics, antidepressants, analgesics, and antispasticity drugs. Finnerup et al. reported that 43% of the patients were on analgesics, and only 7% on antidepressants or antiepileptics[11]. Much differently, in nearly half of the cases in the present study, patients were on pregabalin or gabapentin.

The most important limitation of the study was the low number of participants. Moreover, the quality of life assessment might have provided more data and increased the quality of the interpretation.

Conclusion

Among SCI patients, the frequency of NP, a very important factor in the quality of life, detected by using the S-LANSS was increased. In patients classified in the ASIA-A group, the high rate of NP probability should be kept in mind. Therefore, patients with SCI might require a more careful examination regarding neuropathic pain and thus receive appropriate treatments in routine clinical practice.

Conflict of interest
The author declare that they have no conflict of interest.

Funding
Author declared no financial support.

Ethical approval
Adana City Training & Research Hospital Ethical Committee approved the research protocol.

References

1. Sekhon L, Fehlings MG. Epidemiology, demographics and pathophysiology of acute spinal cord injury. Spine. 2001;26:2-12. https://doi.org/10.1097/00007632-200112151-00002
2. Dursun E, Çakıcı A. Medulla Spinalis Yaralanmaları. Oğuz H (editör). Tıbbi Rehabilitasyon. İstanbul: Nobel Tıp 1. Baskı, 1995.
3. Defrin R, Ohry A, Blumen N, et al. Characterization of chronic pain and somatosensory function in spinal cord injury subjects. Pain. 2001;89(2-3):253-63. https://doi.org/10.1016/S0304-3959(00)00369-9
4. Vall J, Costa CM, Santos Tde J, et al. Neuropathic pain characteristics in patients from Curitiba (Brazil) with spinal cord injury. Arq Neuropsiquiatr. 2011;69(1):64-8. https://doi.org/10.1590/S0004-282X2011000100013
5. Werhagen L, Budh CN, Hultling C, et al. Neuropathic pain after traumatic spinal cord injury-relations to gender, spinal level, completeness, and age at the time of injury. Spinal Cord 2004;42(12):665-73. https://doi.org/10.1038/sj.sc.3101641
6. Afsar SI, Cosar SNS, YemiSKY OU, et al. Neuropathic pain in patients with spinal cord injury. Int J Phys Med Rehabil 2014;2(228):2-5.
7. Ataoğlu E, Tiftik T, Kara M, et al. Effects of chronic pain on quality of life and depression in patients with spinal cord injury. Spinal Cord. 2013;51(1):23-6. https://doi.org/10.1038/sc.2012.51
8. Siddall PJ, Loeser JD. Pain following spinal cord injury. Spinal Cord. 2001;39(2):63- 73. https://doi.org/10.1038/sj.sc.3101116
9. Siddall PJ. Management of neuropathic pain following spinal cord injury: now and in the future. Spinal Cord. 2009;47(5):352-9. https://doi.org/10.1038/sc.2008.136
10. Treede RD, Jensen TS, Campbell JN, et al. Neuropathic pain: redefinition and a grading system for clinical and research purposes. Neurology. 2008;70(18):1630-5. https://doi.org/10.1212/01.wnl.0000282763.29778.59
11. Finnerup NB, Johannesen IL, Fuglsang-Frederiksen A, et al. Sensory function in spinal cord injury patients with and without central pain. Brain. 2003;126(1):57-70. https://doi.org/10.1093/brain/awg007
12. Widerström-Noga EG, Turk DC. Types and effectiveness of treatments used by people with chronic pain associated with spinal cord injuries: influence of pain and psychosocial characteristics. Spinal Cord. 2003;41(11):600-9. https://doi.org/10.1038/sj.sc.3101511
13. Warms CA, Turner JA, Marshall HM, et al. Treatments for chronic pain associated with spinal cord injuries: many are tried, few are helpful. Clin J Pain 2002;18(3):154-63. https://doi.org/10.1097/00002508-200205000-00004
14. Cardenas DD, Jensen MP. Treatments for chronic pain in persons with spinal cord injury: A survey study. J Spinal Cord Med. 2006;29(2):109-17. https://doi.org/10.1080/10790268.2006.11753864
15. Störmer S, Gerner HJ, Grüninger W, et al. Chronic pain/dysaesthesiae in spinal cord injury patients: results of a multicentre study. SpinalCord 1997;35(7):446- 55. https://doi.org/10.1038/sj.sc.3100411
16. Westgren N, Levi R. Quality of life and traumatic spinal cord injury. Arch Phys Med Rehabil. 1998;79(11):1433-9. https://doi.org/10.1016/S0003-9993(98)90240-4
17. Baastrup C, Finnerup NB. Pharmacological management of neuropathic pain following spinal cord injury. CNS Drugs. 2008;22(6):455-75. https://doi.org/10.2165/00023210-200822060-00002
18. Haanpää M, Attal N, Backonja M, et al. NeuPSIG guidelines on neuropathic pain assessment. Pain. 2011;152(1):14-27. https://doi.org/10.1016/j.pain.2010.07.031
19. Norrbrink Budh C, Lund I, Ertzgaard P, et al.Pain in a Swedish spinal cord injury population. Clin Rehabil 2003;17: 685-690. https://doi.org/10.1191/0269215503cr664oa
20. Siddall PJ, Loeser JD. Pain following spinal cord injury. Spinal Cord. 2001;39: 63-73. https://doi.org/10.1038/sj.sc.3101116
21. Celik EC, Erhan B, Lakse E. The clinical characteristics of neuropathic pain in patients with spinal cord injury. Spinal Cord. 2012;50: 585-589. https://doi.org/10.1038/sc.2012.26
22. Dominguez CA, Ström M, Gao T, et al.Genetic and sex influence on neuropathic pain-like behaviour after spinal cord injury in the rat. Eur J. Pain 2012;16(10):1368-77. https://doi.org/10.1002/j.1532-2149.2012.00144.x

23. Savaş F, Erhan B. Medulla spinalis yaralanması sonrası nöropatik ağrı değerlendirilmesi. Uzmanlık tezi. İstanbul, Sağlık Bakanlığı İstanbul Fizik Tedavi Rehabilitasyon Eğitim ve Araştırma Hastanesi 1. Klinik, 2009.
24. Werhagen L, Budh CN, Hultling C, et al.Neuropathic pain after traumatic spinal cord injury--relations to gender, spinal level, completeness, and age at the time of injury. Spinal Cord. 2004;42: 665-73. https://doi.org/10.1038/sj.sc.3101641
25. Siddall PJ, McClelland JM, Rutkowski SB, et al. A longitudinal study of the prevalence and characteristics of pain in the first 5 years following spinal cord injury. Pain. 2003;103: 249-57. https://doi.org/10.1016/S0304-3959(02)00452-9
26. Teixeira MJ, Paiva WS, Assis MS, et al. Neuropathic pain in patients with spinal cord injury: report of 213 patients. Arq Neuropsiquiatr. 2013;71(9A):600-3. https://doi.org/10.1590/0004-282X20130103