Descriptive Study

Neuropathic Pain in Spinal Cord Injury

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Background: Several studies have described pain prevalence, risk factors, pain and medical variables in spinal cord injury (SCI) populations. In this study on traumatic SCI in Turkey, we surveyed the neuropathic pain experiences during in-patient rehabilitation and defined the relationships between neuropathic pain and demographic and SCI characteristics of patients.

Objectives: To survey the neuropathic pain experiences during in-patient rehabilitation in traumatic SCI and to define the relationships between neuropathic pain and demographic and SCI-related characteristics of patients.

Study Design: Descriptive study.

Setting: Physicial Medicine and Rehabilitation inpatient clinic, Ankara, TUrkey

Methods: Sixty-nine SCI patients as inpatients were included in this descriptive study. All patients demographic and SCI-related characteristics were enrolled. The diagnosis of neuropathic pain was made with the Leeds Assessment of Neuropathic Symptoms and Signs (LANSS) Pain Scale. Location of pain and pain description, relation to time and severity according to McGill Pain Questionnaire (MPQ) were enrolled.

Results: The neuropathic pain localization was below the lesion level in 67 (97.1%) and at the lesion level in 2 (2.9%) patients. The pain was at the hip and leg regions in 36 (52.2%) patients. The neuropathic pain was defined as burning in 27 (39.1%), aching in 26 (37.7%), sharp in 4 (5.8%), stinging in 3 (4.3%), and cramping in 3 (4.3%). We did not find a significant difference between demographic and SCI-related characteristics and the localization of neuropathic pain for the patients ($P > 0.05$). There was no significant difference according to pain description by MPQ and pain localization ($P > 0.05$). We found a significant relationship between the patient's lesion level and the region of pain ($P < 0.05$).

Conclusion: We found the neuropathic pain due to SCI to be mostly below the lesion level with a burning or aching character and we did not find a significant relationship between the demographic and SCI-related characteristics of the patient and the pain characteristics.

Key words: Spinal cord injury, pain, neuropathic pain

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Spinal cord injury (SCI) is a complex disability, often requiring specialized knowledge and expertise to manage multisystem impairments. Pain is described by SCI patients as the worst problem, far more disabling than the loss of motor and sensory function. Reports of the pain prevalence differ between 18 and 96 percent (1), but is most often described as present in around 60 - 69% of the SCI population (2). Several studies have described pain prevalence, risk factors, pain and medical variables in SCI populations (3-6). In this study on traumatic SCI in Turkey, we surveyed the neuropathic pain experiences during

in-patient rehabilitation and defined the relationship between neuropathic pain and demographic and SCI characteristics of patients.

Methods

Participants

We included a total of 69 SCI patients chosen according to inclusion criteria from the 520 patients who took part in our rehabilitation program as in-patients at our hospital between June 2005 and June 2008. Study inclusion criteria were SCI for at least 6 months, age 18 years or older, presence of neuropathic pain, and consent to the study. A total of 451 patients were excluded from the study with 30 having non-traumatic SCI, 2 with concurrent traumatic brain injury, 272 not having pain, 88 with an SCI of less than 6 months, and 59 suffering from SCI with non-neuropathic pain (Fig. 1).

The study was approved by the Institutional Review Board of our hospital.

Demographic Characteristics

The patients' age, gender, marital status, educational status, and occupational data were recorded.

SCI Characteristics

SCI etiology was classified as traffic accident, fire-arm injury, buried in wreckage, or other causes. The SCI level was categorized as C1-4, C5-8, T1-5, T6-12, and L1-4. The grading of SCI as complete or incomplete was based on the American Spinal Injury Association's (ASIA) impairment scale (7). The length of time betwween surgery and the event was recorded. Spasticity of the lower extremity was estimated by the Ashworth scale (8). The patients' motor activity was also evaluated. The motor activity under the lesion level was assessed. The superficial pain sensation level, and vibration, position, and pressure sensation were recorded as normal or disturbed. The presence of involuntary movement, hyperalgesia, and allodynia was also evaluated.

Diagnosis of Neuropathic Pain

The diagnosis of neuropathic pain was made with the Leeds Assessment of Neuropathic Symptoms and Signs (LANSS) Pain Scale (9). This scale, as first used by Bennett, is a very useful tool that provides immediate information in the clinical setting and helps distinguish nociceptive pain from neuropathic pain. The validity and reliability study for the Turkish population has been performed by Yucel et al (10).

Location of Pain

Pain location was assessed by a pain location checklist that asked respondents to rate the presence of pain

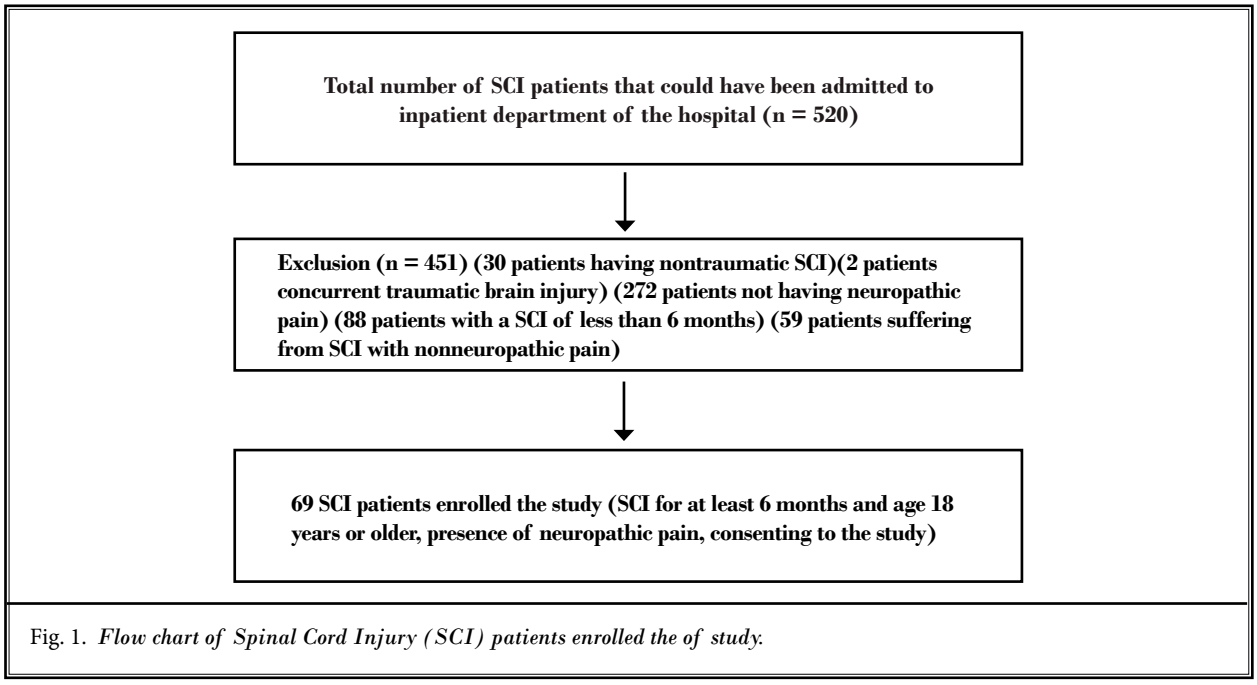

Fig. 1. *Flow chart of Spinal Cord Injury (SCI) patients enrolled the of study.*

in 11 different locations including the neck, shoulder, arm-hand, upper back-lower back, hip-thigh, abdomen, and leg-foot. The localization of pain was also classified according to International Association for the Study of Pain criteria as neuropathic pain at the lesion level or below the lesion level (11).

Pain Description, Relation to Time and Severity

The McGill Pain Questionnaire (MPQ) was used to evaluate the sensory and perceptive description of pain, its relation with time, and its severity (12). The Turkish reliability and validity study of the MPQ has been performed by Kuguoglu and Aslan in 2003 (13).

Pain Occurance

Patients were asked if pain occurred during sleep, work, or daily activities.

General Condition

Patients were asked if they were sad, tired, or anxious due to the pain.

Functional Status

The patient's functional status on admission to and discharge from rehabilitation was assessed using the Functional Independence Measurement (FIM). The Turkish reliability and validity study has been performed by Kucukdeveci et al in 2001 (14).

Treatment

The treatments administered to the patients for neuropathic pain were also recorded.

Complications

SCI-related complications such as neurogenic bladder, neurogenic bowel, spasticity, decubitus ulcer, deep vein thrombosis, pulmonary embolism, and sexual problems were recorded.

Statistical Analyses

Statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) 11.0 software. The x2 was used to analyze the association between categorical variables. For continuous variables with normal distribution and non-normal distribution, the t test and Mann-Whitney test were used, respectively. The level of statistical significance was set as $P < 0.05$ for all tests.

Results

Demographic Characteristics

The mean age of the SCI patients included in the study was 38.09 + 11.12 (18 - 78) with 15 (21.7%) women and 54 (78.3%) men. Fifty-two (75.4%) were married and 16 (23.2%) single. The educational status was primary school in 52 (75.4%), high school in 8 (11.6%), and secondary school in 6 (8.7%). Forty-eight patients were employed (69.6%), 11 were housewives (15.9%), 3 were students (4.3%), and 2 were retired (2.9%).

SCI Characteristics

The SCI etiology and level are given in Table 1 and Table 2, respectively. The lesion was complete in 25 (36.2%) and incomplete in 44 (63.8%), according to the ASIA scale. The number of patients that had undergone surgery the same month was 40 (58%). The tonus was Ashworth 2 in 11 (15.9%), normal in 14 (20.3%), Ashworth 3 in 8 (11.6%), Ashworth 1 in 6 (8.7%), Ashworth 4 in 1 (1.4%), and flaccid in 29 (42%). Active movement under the lesion level was absent in 26 (37.7%) patients and present in 43 (62.3%).

The superficial touch pain sensation was disturbed below T12 in 12 (17.4%), below T10 in 8 (11.6%), and below L1 in 6 (8.7%) patients. Vibration and position sensation was disturbed in 48 (69.6%) and normal in 21 (30.4%) patients. Pressure sensation was disturbed in 47 (68.1%) patients and normal in 22 (31.9%). There was no involuntary movement in 68 (98.6%) of our

Table 1. *Etiologies of spinal cord injury in our patients.*

Etiology	N	%
Traffic Accident	22	31.9
Firearm Injury	12	17.4
Falls	14	20.3
Buried in wreckage	11	15.9
Other Causes	10	14.5

Table 2. *The Spinal Cord Injury(SCI) Levels of Patients*

SCI Level	N	%
C1-4	4	5.8
C5-8	10	14.5
T1-5	7	10.1
T6-12	35	50.7
L1-S4	13	18.8

patients. None of our patients had hyperalgesia or allodynia.

Diagnosis of Neuropathic Pain

The mean LANSS score was 15.65 ± 3.03 (10-21). (min-max)

Pain Location

The neuropathic pain localization was below the lesion level in 67 (97.1%) and at the lesion level in 2 (2.9%) patients. The pain was at the hip and leg regions in 36 (52.2%), the back in 6 (8.7%), and the legs and feet in 6 (8.7%).

Pain Definition, Relation to Time and Severity

The neuropathic pain definitions are given in Table 3. We found the neuropathic pain developing as a result of SCI to mostly have a burning and aching character. The relation to time was chronic in 34 (49.3%), intermittent in 27 (39.1%), and acute in 8 (11.6%). The intensity was discomforting in 38 (55.1%), distressing in 16 (23.2%), horrible in 13 (18.8%), mild in one (1.4%), and excruciating in one (1.4%).

The Occurance of the Pain

When the patients were asked about the time of occurance of the pain, 32 (46.4%) had constant pain, 16 (23.2%) had pain during exercise, 13 (18.8%) had pain during exercise and sleep, and 8 (11.6%) had pain during sleep.

General Condition

The patients' general state was sad in 25 (36.2%), tired in 2 (2.9%), and anxious in one (1.4%).

Functional Status

Fifty (72.5%) were ambulatory while 19 (27.5%) were using a wheelchair. The mean entry FIM was 79.6 + 11.58 and the mean exit FIM 88.31 + 12.68.

Table 3. *Pain description according to McGill Pain Questionnaire in our patients.*

Pain description	N	%
Burning	27	39.1
Aching	26	37.7
Sharp	4	5.8
Stinging	3	4.3
Cramping	3	4.3
Other	6	8.4

Treatment

The medication used was amitriptyline and non-steroidal anti-inflammatory drugs (NSAIDs) in 13 (18.8%), NSAID in 10 (14.5%), amitriptyline in 9 (13%), NSAID and gabapentin in 7 (10.1%), and amitriptyline, NSAID, and gabapentin in 6 (8.7%).

Complications

The complications were neurogenic bladder and bowel in 16 (23.2%), neurogenic bladder and bowel and decubitus ulcer in 12 (17.4%), neurogenic bowel and bladder and spasticity in 10 (14.5%), and neurogenic bladder and bowel and deep vein thrombosis in 8 (11.6%).

We did not find a significant difference between demographic characteristics and the localization of neuropathic pain for the patients included in the study ($P > 0.05$).

We did not find a significant difference between the patient groups younger and older than 38 and the neuropathic pain localization ($P > 0.05$).

There was also no statistically significant difference between the cause of the SCI, whether it was complete or incomplete according to the ASIA disability scale, the injury level, and the neuropathic pain localization ($P > 0.05$).

There was no statistically significant difference according to pain localization by MPQ and pain localization ($P > 0.05$).

There was no statistically significant difference between the paraplegic and tetraplegic patients for pain definition according to the MPQ, its relation with time, and its severity ($P > 0.05$).

We found a statistically significant relationship between the patient's lesion level and the region of pain ($P < 0.05$). Hip-thigh and leg-feet pain was present in 32 paraplegic and 4 tetraplegic patients.

Discussion

Norrbrink Budh et al (5) have found aching pain to be the most commonly used descriptor in their study aiming to define pain and determine the related values in SCI patients. Widerström-Noga et al (15) have reported that 55.4% of patients with SCI-related neuropathic pain are tetraplegic, with the pain felt in multiple regions, but most commonly in the back region. The pain was most commonly described as burning or aching pain. Burning pain was found to be related to the frontal section of the torso and genitals together with the buttocks and lower extremities while aching pain was

associated with the neck, shoulders, and upper back. Rintala et al (16) have evaluated the characteristics of individuals with chronic pain in the SCI population and its prevalence. They found the most common pain descriptors to be aching, sharp, hot-burning, and tiring-exhausting. The distribution of our neuropathic pain patients was 21 (30.4%) tetraplegics and 48 (69.6%) paraplegics. In accordance with literature we found the neuropathic pain developing as a result of SCI to mostly have a burning and aching character. Unlike the literature, pain was reported in the hip and leg regions by 36 (52.2%), the back by 6 (8.7%), and the leg-feet by 6 (8.7%) of our patients. We found no statistically significant difference for pain definition or the pain regions according to the MPQ.

Siddall et al (17) did not find a relationship between the presence of pain and the lesion level or completeness of injury or the type of injury, but neuropathic pain below the lesion level was more common in tetraplegic patients. Ulrich et al (3) found no relationship between the demographic and SCI features and the pain score, localization, or severity. Werhagen et al (18) found a lower incidence of neuropathic pain in patients below 20 years of age. They found neuropathic pain below the lesion level to be more frequent until the age of 39, and neuropathic pain at the lesion level more frequent at the 40 and over group. They found no correlation between gender, injury level, and injury completeness. They only found a relationship between neuropathic pain below the lesion level and complete injury. Contrary to this literature, we did not find a significant difference between the patient groups younger and older than 38 years of age for neuropathic pain localization. Yap et al (19) did not find any relationship between injury completeness and the type of pain. Werhagen et al (20) have reported neuropathic pain below the lesion level to be more common in women.

Norrbrink Budh et al (2) did not find an effect on the number of painful body regions, pain severity, localization, occurance, and distribution. Yap et al (19) did not find a relationship between injury completeness, spinal surgery, and the type of pain in traumatic SCI. Norrbrink Budh et al (5) have found a correlation between pain and mean injury age and gender in SCI patients and have reported neuropathic pain to be more common in patients with incomplete lesions. In line with most of literature, we did not find a statistically significant difference between demographic features and the localization of neuropathic pain in the patients included in our study. We found no statistically significant difference between the SCI cause, whether the injury was complete or incomplete according to the ASIA disability scale, the injury level, and the neuropathic pain localization.

Yap et al (19) have reported an increased incidence of musculoskeletal and neuropathic pain in paraplegic patients. Ulrich et al (3) have found upper extremity pain to be more common in patients with high-level injury compared to paraplegic patients. Pain was most commonly seen in the shoulders, lower back, neck, and arm in high cervical injuries and in the lower back, leg, and shoulders in paraplegics. They found neck pain to be more common in lower cervical injuries than in higher cervical injuries or paraplegics. Our patients with neuropathic pain were distributed as 48 (69.6%) paraplegic and 21 (30.4%) tetraplegics. There was no statistically significant difference between our paraplegic and tetraplegic patients regarding the MPQ results. We found a statistically significant difference between the patient's lesion level and the pain region. Hip-thigh and leg-feet pain was present in 32 paraplegics and 4 tetraplegics.

Finnerup et al (21) have reported the use of medication in neuropathic pain patients as 43% analgesic and 7% antidepressant or anticonvulsant. Our patients were using the following medical treatment: amitriptyline and NSAIDs in 13 (18.8%), NSAIDs in 10 (14.5%), amitriptyline in 9 (13%), NSAIDs and gabapentin in 7 (10.1%), and amitriptyline, NSAIDs, and gabapentin in 6 (8.7%).

Werhagen et al (18) have reported pain at the lesion level in 15% and below the lesion level in 23% of neuropathic pain patients and that daily life was affected in 67% of those with pain. Norrbrink Budh et al (5) have found the neuropathic pain to be below the lesion level in 70.4% of the patients. The quality of life had been affected by the pain in 94 (32.3%) of the 276 patients. Similar to the literature, neuropathic pain was below the lesion level in 67 (97.1%) and at the lesion level in 2 (2.9%) of the patients included in our study. When the patients were asked about the time of occurance of the pain, 32 (46.4%) had constant pain, 16 (23.2%) had pain during exercise, 13 (18.8%) had pain during exercise and sleep, and 8 (11.6%) had pain during sleep. The general state was sad in 25 (36.2%), tired in 2 (2.9%), and anxious in one (1.4%).

Conclusion

We found neuropathic pain due to SCI to be mostly below the lesion level with a burning or aching char-

acter and we did not find a significant relationship between the demographic and SCI-related features of the patient and the pain characteristics in accordance the literature. More research is needed to identify better ways to prevent, assess, and treat chronic pain in the SCI population.

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