Frequency of Phantom Pain among patients with Spinal Cord Injury

Hadi Shojaei[1], Jafari A.[2*], Valaei, S.H.[3]*

[1] Board of physical medicine and rehabilitation, Research assistant professor of Janbazan Medical & Engineering Research Center. Tehran, Iran

[2] Orthopedic surgeon, assistant professor of Azad University of Tehran, Iran

[3] General physician, member of research group in Janbazan Medical & Engineering Research Center.

*** Corresponding Author:**

Janbazan Medical and Engineering Research Center, Tehran, Iran

Phone no: +98-21-22415367, Email: hadsho@yahoo.com

Abstract

Background: Patients with spinal cord injury (SCI) usually have permanent and often devastating neurologic deficits and disability and pain (1). According to the National Institutes of Health, "among neurological disorders, the cost to society of automotive SCI is exceeded only by the cost of mental retardation"(2). Neurogenic pain constitutes one of the enigmatic clinical syndromes faced by patients, clinicians, and researchers (3).

Materials and Methods: Current observational descriptive cross-sectional survey is performed among 270 patients with spinal cord injuries including veterans and non-veteran disabled subjects in Tehran-City during 2005.

Results: Mean age of the subjects was 37.8±12.2 years. 26.3% were female and 73.7% were male. 17.4% had spinal cord injury in cervical level, 41.5% thoracic, 38.1% lumbar, and 3% Quada Equina level. 76.3% had complete and 23.7% incomplete injuries. 19.3% had injury duration of less than 5 years, 11.9% between 5 to 10 years, and 68.9% upper than 10 years. Phantom pain below the lesion level was present in 89 patients (33%) that included 26% of veterans and 37% of non-veterans. There was a statistically significant association between age, marital status, and injury duration with having phantom pain ($P < 0.05$).

Conclusion: it is concluded that frequency of phantom pain in current study is less than all of previous studies and our patients were totally resistant to analgesic treatments which may be due to physiopathologic basis of such pains in comparison with other pains due to spinal cord injuries.

Keywords: Frequency, Phantom Pain, Spinal Cord Injury

Introduction

Pain is a very common after spinal cord injury. Several systematic surveys (mostly from Europe, particularly Scandinavia) and a few limited studies in the United States have reported that as many as 50% of all people with a spinal cord injury suffer from pain developing after the injury (4). Estimates of severe or disabling pain that is not adequately relieved by therapy range from 10 to 25% of the spinal cord injured population. Since most people equate spinal cord injury with loss of sensation and paralysis, the problem of pain and abnormal sensations was not adequately recognized or studied until fairly recently(5).

The following are four types of pain in spinal cord injury:

1. Musculoskeletal Pain

These are pains that can be localized to specific sites associated with identifiable muscle, ligament, or bony abnormalities. These include pain at the spinal fracture site, instrumentation (Harrington rods, etc.), resulting from stress and strain placed on remaining joints and ligaments by an injury (5). The spinal column normally distributes movement over many joints. Fixation of one or more spinal segments results in greater stress of remaining non-fixed segments (6). Also, due to paralysis, remaining muscles tend to move some joints more than others and thereby contributes additional stress on the operating joints. These occur in both paraplegics and quadriplegics. In paraplegics, especially those who are walking, hip and lower back pain is common. With quadriplegics, neck and arm pain is common. There is often tenderness at the involved site (6, 7).Treatment for musculoskeletal pains differ from person to person. An effective solution requires common sense and must include non-medical approaches (8). Prevention is the best cure, e.g. avoidance of too much spinal fixation, careful design of exercise that do not overstress bones and joints(9), adjusting your wheelchair and environment to reduce musculoskeletal stress when getting around, eschewing activities that may place too much stress on specific joints, etc(5,6). Musculoskeletal pains are often responsive to anti-inflammatory drugs such as aspirin, acetaminophen (Tylenol), and other mild analgesics (3, 8). It is important to point out that musculoskeletal pain and the consequent behavioral adaptations to that pain (i.e. not using a painful joint or a change in posture) often leads to more stress and (8) strain of remaining joints, ligaments, and muscles, and therefore more pain. Part of the aim of therapy is to break the cycle of pain (8).

2. Visceral Pain and Pressure Sores

People with spinal cord injuries have a high risk for problems of the bowel, bladder, kidney, gallbladder, stomach, and other deep organs. Kidney stones, for example, are common (9). Likewise, bladder infections occur regularly in a large majority of people with a spinal cord injury (3). Diagnosis of such problems is often complicated because the presentations of symptoms do not follow typical patterns (8). The pain is often referred to another place of the body. For example, gall bladder pain can appear to be localized in the right shoulder. Pressure sores or decubitous ulcers also can contribute to pain, although often not at the site of the skin breakdown, in addition the current treatment of pressure ulcers accompanies pain (10). Visceral pain is often associated with sweats, blood pressure changes, and increased spasticity. The medical approach is of course to identify such causes of pain and eliminate them (3).

3. Neuropathic Pain

A.Above-level neuropathic pain

Neuropathic pain can occur above the level of injury and includes pains that are not specific to SCI such as complex regional pain syndromes (sometimes referred to as reflex sympathetic dystrophy, causalgia or shoulder hand syndrome) and pain due to peripheral nerve compression (3,8). Although present in the general population, people with SCI may be more susceptible to some of these pains because of the activity associated with wheelchair use or transfers. People with SCI, particularly those with cervical injuries, are at risk of developing complex regional pain syndromes affecting the upper limbs (11, 12). If the pain is due to nerve compression in affected extremities, electrophysiological and MR studies can aid in diagnosis (3, 8).

B. At-level neuropathic pain

At-level neuropathic pain refers to pain with the features typical of neuropathic pain described above and present in a segmental or dermatomal pattern within two segments above or below the level of injury. This type of pain has also been referred to as segmental, transitional zone, border zone, end zone and girdle zone pain, names that reflect its characteristic location in the dermatomes close to the level of injury (3). It is often associated with allodynia or hyperaesthesia of the affected dermatomes (1, 3, and 8).

Neuropathic at-level pain may be due to damage to either nerve roots or the spinal cord itself. Pain arising from nerve root damage is usually unilateral and suggested by characteristics such as increased pain in relation to spinal movement (13). The pain may be due to direct damage to the nerve root during the initial injury or it may be secondary to spinal column instability and impingement by facet or disc material (16). There may be electromyographic (EMG) or somatosensory evoked potential (SSEP) abnormalities (8). Diagnosis is assisted by radiographic, CT or MR evidence of compression of the nerve root in the foramen by bone or disc that correlates with the location of the pain (14).

In the past, pain that occurs at the level of the lesion and that has features of nerve root pain has often been classified as radicular even in the absence of definitive evidence of nerve root damage. However, segmental neuropathic pain may occur in the absence of nerve root damage and may be due to spinal cord rather than nerve root pathology (13). Although this type of pain may be difficult to distinguish from nerve root pain on the basis of descriptors, it is important because the underlying mechanisms and therefore treatment may be different.

Syringomyelia must always be considered in the person who has delayed onset of segmental pain especially where there is a rising level of sensory loss (3, 8,17). The loss of pain and temperature sensation is typical, but all sensory and motor functions can be affected (8). People describe a constant, burning pain that may be associated with allodynia or hyperalgesia. Diagnosis is established by MR scan (5).

An important variant of at-level neuropathic pain is seen after injury to the cauda equina (14). The pain is reported in the lower lumbar and sacral dermatomes and is usually described as burning, stabbing and hot. It is constant but may fluctuate with activity or autonomic activation (8). There are several potential etiologies for pain after such an injury. First, the spinal cord may have lost inputs, leading to changes in central connectivity and neuronal activity that could cause pain. Second, the damaged roots of the cauda equina could be spontaneously active and generate signals that are interpreted as pain. The arachnoiditis that follows major injury to the cauda equina may limit the normal movement of the nerve roots and lead to mechanical irritation of the roots with very slight movements. Third, peripheral stimuli could lead to abnormal activity at the site of axonal injury (5, 8, 13)

C. Below-level neuropathic pain

This type of pain, which is also referred to as central dysesthesia syndrome, central pain, phantom pain or deafferentation pain, presents with spontaneous and/or evoked pain which is present often diffusely caudal to the level of SCI(3). It is characterised by sensations of burning, aching, stabbing or electric shocks, often with hyperalgesia and it often develops some time after the initial injury (16, 17). It is constant, but may fluctuate with mood, being occupied, infections or other factors and is not related to position or movement (8). Sudden noises or jarring movements may trigger this type of pain. Differences in the nature of below-level neuropathic pain may be apparent between those with complete and incomplete lesions. Both complete and partial injuries may be associated with the diffuse, burning pain that appears to be associated with spinothalamic tract damage. However, incomplete injuries are more likely to have an allodynic component due to sparing of tracts conveying touch sensations.

There is no single intervention, invasive or noninvasive, that is reliably effective in the treatment of segmental or deafferential central pain (3).

Psychological aspects of pain

There is no doubt that psychological issues have tremendous importance in the experience and expression of pain. Persistent pain following SCI is associated with more depressive symptoms and greater perceived stress. There is also a strong relationship between pain, spasticity, 'abnormal nonpainful sensations' and sadness. Some authors have included psychological or psychogenic as a type of pain that occurs following SCI. However, applying a psychological label to the pain may be unhelpful. Rather, psychological factors should be considered as a contribution which may act to modify any of these pain types rather than considering 'psychogenic pain' as an entity in its own right. Therefore, any treatment approach needs to take into account the psychological, social and environmental factors that may be contributing to the person's experience of pain. (3, 8, 18)

According to above-mentioned points we performed this survey to determine prevalence of phantom pain among disabled patients due to spinal cord injuries.

Methods & Materials

Design: Current study is a prospective observational descriptive cross-sectional survey with sample volume of 270 disabled subjects as a result of spinal cord injury. 100 out of these 270 patients had disabled during Iran-Iraq war and 170 subjects had experienced spinal cord injury in non-war related accidents or even congenitally.

Objectives: Our major objective was to determine the frequency of phantom pain among patients with spinal cord injuries in Tehran-City during 2005**.**

Minor Objectives: Determination of frequency distribution of Variables among subjects with spinal cord injuries

Variables: The variables included gender, age, lesion type, lesion severity, pain intensity, pain location, pain description, pain trigger, used analgesic treatment, lesion onset time, duration of injury, cause of injury, hospitalization history for pain, marital status, education level, lesion level, job and having phantom pain below the lesion level.

Data Collection: We collected our data by a questionnaire (see the enclosed part) which filled by researcher and limited to those variables mentioned in proposal. We used face to face asking to collect our required data.

Ethical Issue: We considered both Nuremberg and Helsinki Statements in our study and patients' secret information were not distributed or published. Also any unsatisfied patients are included in our study.

Data Analysis: Finally we performed data analysis by SPSS-13 statistical software and used Chi-Square, T, and Fisher tests to evaluate the associations between our variables. P values less than 0.05 are considered to be statistically significant in current study

Results

Mean age of the subjects was 37.8±12.2 years. 26.3% were female. 17.4% had spinal cord injury in cervical level, 41.5% thoracic, 38.1% lumbar, and 3% Cauda Equina syndrome. 76.3% had complete and 23.7% incomplete injuries.

19.3% had injury duration of less than 5 years, 11.9% between 5 to 10 years, and 68.9% upper than 10 years.

Phantom pain (below the lesion level) was present in 33% that included 26% of Veterans and 37% of non-veterans (table 1). Severity of phantom pain was compared between these two groups as is shown in table 2.

Table 1-Frequency of Phantom Pain between two groups of study

	Veterans		Non-Veterans	
	Frequency	Percent	Frequency	Percent
Positive	26	26	63	37.1
Negative	74	74	107	62
Total	100	100	170	100

Table 2-Frequency of Phantom Pain severity between two groups of study

	Veterans		Non-Veterans	
	Frequency	Percent	Frequency	Percent
Low	4	4	7	4.1
Medium	3	3	22	12.9
Severe	13	13	30	17.6
Bothersome	14	14	4	2.4
No pain	74	74	107	107
Total	100	100	170	100

Lesion Type * Phantom Pain Crosstabulation

			Phantom Pain		Total
			Pos	Neg	
Lesion Type	Complete	Count	63	143	206
		% within Lesion Type	30.6%	69.4%	100.0%
	Incomplete	Count	26	38	64
		% within Lesion Type	40.6%	59.4%	100.0%
Total		Count	89	181	270
		% within Lesion Type	33.0%	67.0%	100.0%

Lesion Level * Phantom Pain Crosstabulation

			Phantom Pain		Total
			Pos	Neg	
Lesion Level	Cervical	Count	16	31	47
		% within Lesion Leve	34.0%	66.0%	100.0%
	Thoracic	Count	46	66	112
		% within Lesion Leve	41.1%	58.9%	100.0%
	Lumbar	Count	26	77	103
		% within Lesion Leve	25.2%	74.8%	100.0%
	Cuada Equina	Count	1	7	8
		% within Lesion Leve	12.5%	87.5%	100.0%
Total		Count	89	181	270
		% within Lesion Leve	33.0%	67.0%	100.0%

Discussion

Although, women were more reported phantom pain comparing with men (35.2% vs 32.2%), but no statistically significant correlation was found between sex and having phantom pain (P=0.639). Same association was observed between having job and phantom pain (P=0.487). Those patients who had no job were more complaining from phantom pain rather than others (34.2% vs 29.7%). More report of phantom pain was in divorced patients (66.7%), and also widows and widowers (66.7%), and then married (39.3%) and finally single patients (24.3%). There was a statistically significant association between marital status and having pain (P=0.005).

More pain reports were contributed to those patients in two final point of range of education level who illiterate patients (43.5%) or those with academic educations (38.5%). However, no statistically significant correlation was found (P=0.448). Patients with lesion in Quada Equina level had less phantom pain (12.5%) and those with cervical lesions had more pain (34%). 25.2% of lumbar cases and 41.1% of thoracic ones were reported phantom pain. There was no statistically significant correlation between lesion level and phantom pain (P=0.054). 59.4% of patients with duration of 5-10 years of spinal cord injury, 32.7% of those with less than 5 years, and 28.5% of cases with more than 10 years of disease had phantom pain and there was a significant correlation between duration of disease and having phantom pain (P=0.003). Mean age of patients reporting pain was significantly (P=0.039) higher than other patients (40.01% vs 36.75%).

Although veterans had less phantom pain in comparison with non-veteran disabled patients (26% vs 37.1%), but no significant correlation was found (P=0.062). 34.2% of patients with paraplegia and 36.1% of those with quadriplegia had phantom pain and no significant association was observed (P=0.642). 30.6% of patients with complete lesion and 40.6% of incomplete cases had phantom pain (P=0.135). Patients who were experienced their injuries during traumatic accidents had most (50.6%) and surgery induced cases the less report of phantom pain and there was a significant correlation between the initial cause and having phantom pain (P=0.0001).

Medical treatment was used in 21% of veterans including muscle relaxants, anti-depressants and analgesics. Also 5% of them were used surgery and 22% physical therapy. Any of non-veteran disabled people used surgical-therapy to relieve their pain, 28% were used physical therapy and 39% medical therapy including 19.4% analgesics, 1.8% muscle relaxants, 0.6% anesthetic Gel, 0.6% Carbamazepine, 0.6% anti-anxiety and 16% a combination of these drugs. Although totally, 30% of 270 patients were used medical therapy, 2.9% surgery and 25.9% physical therapy, but any of them could achieve pain relief.

Prevalence of phantom pain among disabled patients in our study (33%) is less than previous investigations such as and Rintala (75%) (1), Young (50%) (11), Bonica (69%) (19), we found less report of pain among patients who had injury duration of more than 10 years. It will be explained by theory of accommodation with inevitable an inappropriate conditions which determines the causes of less complaints and higher quality of life among those patients with spinal cord injuries who have older lesions. Although exercise (twice a week) and Massage and Heat-therapy were certificated as effective therapeutic methods in previous studies, but our investigation demonstrated that no useful treatment is available for pain relief among Iranian patients. It may be explained by physiopathologic basis of this pain and requires to more researches in this category.

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