

The Pattern of Peripheral Nerve Injuries Among Pakistani Soldiers in the War Against Terror

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ABSTRACT

Objective: To determine the pattern of peripheral nerve injuries in Pakistani soldiers in the War against terror.

Study Design: Case series.

Place and Duration of Study: Department of Electrodiagnosis at Armed Forces Institute of Rehabilitation Medicine (AFIRM), Rawalpindi, Pakistan, from June 2008 to June 2011.

Methodology: All new cases of war wounded soldiers with peripheral nerve injuries were consecutively enrolled. Physical examination and electrodiagnostic study was carried out by experienced physiatrists. Data was entered in pretested especially designed questionnaire which was analysed using SPSS version 17.0. Seddon's classification system was used to assess the severity of injury.

Results: There were 418 cases of peripheral nerve injuries with 504 different nerve segments. Mean age was 29.41 ± 8 years. Blast was the main cause of nerve injury in 244 (48.5%) cases followed by gunshot in 215 (42.7%) and 45 (8.9%) cases had nerve injuries secondary to fall, burial under debris and motor vehicle accidents. Eighty six (17%) cases had multiple nerve injuries. Most commonly injured nerve was ulnar (20.6%) followed by sciatic (16.7%), median (16.5%), radial (16.3%), peroneal (8.7%), brachial plexus (8.5%), axillary (4.8%), tibial (2%), femoral (1.8%), long thoracic (0.4%) and others (3.8%). Axonotmesis was seen in 459 (91.1%) cases, 44 (8.7%) cases revealed neurotmesis and 1 (0.2%) case had neuropraxia.

Conclusion: Peripheral nerve injuries are a major component of war related injuries mainly involving the upper limbs. Electrodiagnostic studies help in assessing severity and determining prognosis. Precise documentation of severity of nerve injuries is important to estimate the burden on our resources and to extend rehabilitation services.

Key Words: War injuries. Peripheral nerve injuries. Nerve conduction studies. War-on-terror.

INTRODUCTION

Acute traumatic peripheral nerve injuries result from penetrating injuries, crush, stretch and ischemia.¹ The basic knowledge about peripheral nerve injuries epidemiology and their outcomes came from the American Civil War, World Wars I and II, and subsequently in Vietnam, Korea and Gulf war.² The incidence of peripheral nerve injuries among those injured in combat was 2% during World War I, and 5% to 8% in World War II.³ Nerve injuries accounted for 3% of total injuries in Operation Iraqi Freedom in American combatants.⁴ The incidence of nerve injuries was directly related to extremity injuries.⁵

In the recent unconventional War-on-terror, the widespread use of Improvised Explosive Devices (IEDs) and suicide bombs has resulted in new pattern of

injuries amongst combat casualties compared to the previous conflicts.⁶⁻⁸ This pattern needs to be known for developing appropriate management protocols.

Electrodiagnosis is considered to be the most important diagnostic method for evaluating peripheral nerve injuries, and same is used in this study. These techniques are well established and routinely used.⁹ These help in precise localization of lesion and to assess the severity of the nerve injury, thus facilitating the selection of treatment options and determining the prognosis.²

Since nerve injuries are one of the most important causes of war related disability due to long-term functional impairment, documentation of such data is valuable for medical planning, focus of further investigation, resource management and determining rehabilitative needs. To our knowledge, no such data is available regarding Pakistan Armed Forces in the War-on-terror. The study was conducted to determine the frequency and severity of peripheral nerve injuries to present a baseline for further research.

METHODOLOGY

This was a case-series based study conducted at Department of Electrodiagnosis at AFIRM, Rawalpindi, Pakistan, from June 2008 to Jun 2011. Verbal informed consent was obtained from the patients. Ethical approval

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was obtained from the institutional review board. All consecutive cases fulfilling the inclusion criteria were enrolled in the study. The patients included were male, serving military personnel of all age groups and ranks (who got injured while fighting in war against terror) presenting with weakness or sensory loss and a suspected nerve injury. Civilian patients were excluded from this study.

The standard protocol for injured soldiers is immediate evacuation from the site of attack to field hospitals, where basic first aid treatment is given and then referred to nearest combined military hospital where detailed evaluation is carried out. The nerve injuries often get secondary importance after management of life threatening injuries. Once stable, the patients with nerve injuries are then sent to rehabilitation setup for electrodiagnostic studies and management.

At the time of arrival, patients were evaluated in detail by obtaining a complete history, demographic data, identification of mechanism of injury, level and nature of injury. Specially designed proforma was used to collect data from each patient. A clinical diagnosis was made which was confirmed by nerve conduction study and electromyography. The segment of nerve involved, level of injury and severity was recorded.

Seddon's classification system-10 was used to categorize the severity into three main groups as neuropraxia, axonotmesis and neurotmesis. Data was compiled and results were analyzed using SPSS, version 17. The percentages were calculated and no other statistical test was applied due to the nature of study.

RESULTS

During the study period, 418 patients were enrolled showing a total of 504 peripheral nerve injuries. The mean age was 29.41 ± 8 years. Blast was the main cause of nerve injury in 244 (48.5%) cases, 215 (42.7%) patients had gunshot wounds and 45 (8.9%) cases had nerve injuries secondary to fall, burial under debris and motor vehicle accidents (Figure 1).

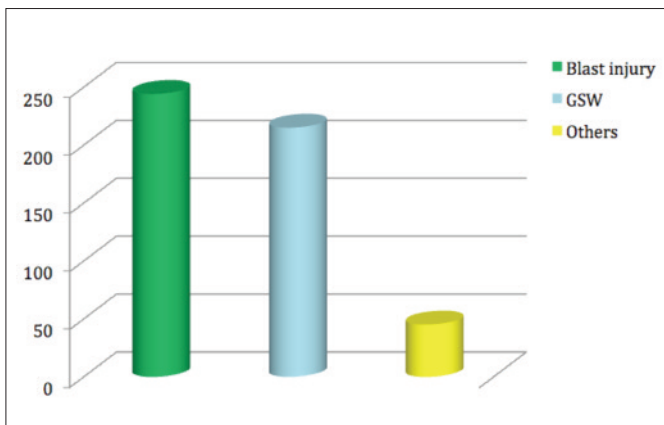


Figure 1: Causes of nerve injury.

Table I: Frequency of peripheral nerve injuries.

Nerve	Frequency	Percentage
Ulnar	104	20.6
Sciatic	84	16.7
Median	83	16.5
Radial	82	16.3
Peroneal	44	8.7
Brachial plexus	43	8.5
Axillary	24	4.8
Others	19	3.8
Tibial	10	2.0
Femoral	9	1.8
Long thoracic	2	4
Total	504	100.0

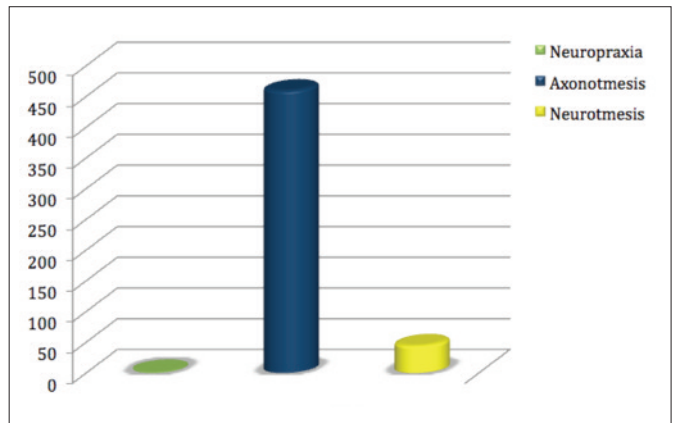


Figure 2: Severity of nerve injuries.

Most commonly injured nerve was the ulnar nerve (20.6%) followed by sciatic (16.7%) and median nerves (16.5%). Rest of the data is given in Table I. Eighty six cases had multiple nerve injuries.

Axonotmesis was seen in 459 (91.1%) cases of nerve injuries, 44 (8.7%) cases revealed neurotmesis and 1 (0.2%) case had neuropraxia (Figure 2).

DISCUSSION

Nerve injuries sustained in long standing low intensity conflicts can have a devastating effect on healthcare resources. Precise data regarding burden of disabled population can only be estimated by gathering records of such patients. This study is the first effort to build the database in Pakistani soldiers. The mean age of the cohort was 29.41 ± 14 years which is similar to the previously reported English soldier cohorts in Iraq and Afghanistan.¹¹

The commonest cause of nerve injury was blast resulting from IEDs, explosions and splinters in this series. Another study from Pakistan showed that 69% had injury due to splinters from Improvised Explosive Devices (IEDs) and 31% had gunshot wounds.¹²

In the Vietnam war, 59% nerve injuries resulted from shell fragment wounds and 38.9% from bullet wounds.¹³

In Croatia, injuries resulted from shell fragments in 80% of the patients and by projectiles in 20% of the patients.¹⁴ In British troops in Afghanistan, explosions accounted for 63% injuries.¹⁵

In the Operation Iraqi Freedom, 65% of injuries to US marines were sustained by IEDs.⁸ In the same operation in Iraq, Owens *et al.* reported that 75% of orthopaedic injuries resulted from explosions and 16% from gunshot wounds.⁷

The injuries suffered by US soldiers in the recent War-on-terror resulted from explosive mechanisms in 75% and just 20% were gunshot wounds.¹ Warden reported that explosion or blast injury was the most common cause of war injuries in Iraq and Afghanistan.¹⁷

Over 75% of combat casualties from Iraq and Afghanistan sustain injuries to the extremities, with 70% resulting from the effects of explosions.⁵ This finding is similar to war pattern among US soldiers in Iraq and Afghanistan and Pakistani soldiers in northwestern region.

Most commonly injured nerve was ulnar (20.6%) followed by sciatic (16.7%) and median nerves (16.5%) in this study. The pattern of nerve injuries in Vietnam war also showed the ulnar nerve to be the most common nerve injured followed by median, peroneal, radial, brachial plexus and sciatic nerves.¹³

In the Persian Gulf war, median nerve injuries were most common, comprising 18% of injuries followed by 16% peroneal nerve injuries, 12% ulnar nerve, 11% radial nerve, 10% brachial plexopathies, 10% lumbar plexopathies, 8% tibial nerve, 7% sciatic neuropathies, 2% femoral nerve injuries and 3% cranial neuropathies.¹⁷ Two hundred and sixty one peripheral nerve injuries sustained in the wars in Iraq and Afghanistan were studied at the War Nerve Injury Clinic, Headley Court, which reported that ulnar, common peroneal and tibial nerves were most commonly injured.¹⁵

Peroneal and ulnar nerves were most frequently involved (20.9% and 19.8%, respectively) during the war in southern Croatia and Bosnia and Herzegovina.¹⁴ In another study carried out on British veterans reveals that the most commonly injured nerves were the tibial (19%), common peroneal (16%) and ulnar (16%).⁵

The finding of ulnar nerve injury to be the commonest nerve may be due to the fact that the rate of upper extremity injuries was nearly twice that of lower extremity injuries.⁷ Most of the injuries resulting from explosives among combats in operation Iraqi Freedom have been reported in upper limbs in upto 71% cases.⁴ Upper extremity nerve injuries produce long-term disability hence setting up upper limb surgical and occupational therapy centres in Pakistan army can reduce long-term disability.

There was axonotmesis in 459 (91.1%) cases of nerve injuries followed by neurotmesis in 44 (8.7%) and neuropraxia in only 1 (0.2%) case. In a recent study from the War Nerve Injury Clinic, UK, focal prolonged conduction block/neurapraxia was seen in 45%, axonotmesis in 35% and neurotmesis in 20% cases.¹⁵ Ramasamy reported the severity of nerve injuries to be conduction block in 25% cases, 41% showing axonotmesis and 34% had neurotmesis.⁵ In this series of patients neuropraxia was seen only in one case. The reason for this is two-fold. First because few centres are available for electrodiagnostic studies in army setup and secondly mild neuropraxic injuries are missed in otherwise seriously injured soldiers.

In this series of patients, 86 cases (21%) had injury to more than one nerve segment. During the war in Croatia, 713 patients with wounds inflicted by firearms were examined at the Laboratory of Neurophysiology, where single peripheral nerve lesions were present in 80% of the patients, and multiple peripheral nerve or plexus lesions were present in 20% of the patients.¹⁴ In British soldiers in Iraq and Afghanistan, two or more main nerves were injured in 70 patients.⁵

The limitation of this study is that it is a cross-sectional study. The follow-up was difficult because the patients were posted out at different stations or invalidated out of service as per severity of their injuries.

The authors, therefore, recommend that there should be a central system for registration of war related injuries in Pakistan army to see the level of disability and functional status in these soldiers. A database for dependent population requiring long term rehabilitation should be maintained. These steps will help us to estimate the burden of situation in terms of cost and duration of rehabilitation therapies spent to assess their outcomes.

CONCLUSION

Peripheral nerve injuries are a major component of war related injuries mainly involving the upper limbs. Electrodiagnostic studies help in assessing severity and determining prognosis. Precise documentation of severity of nerve injuries is important to estimate the burden on our resources and to extend rehabilitation services.

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