Research Article

The Pattern of Peripheral Nerve Injuries among Iraqi Soldiers in the War by using Nerve Conductive Study

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Abstract

Background: Traumatic war injury of peripheral nerves is a worldwide problem and can result in significant disability. Management of peripheral nerve injuries (PNIs) requires accurate localization and the assessment of severity of the nerve lesion.

Objective: To assess the electrophysiological pattern of peripheral nerve injuries among Iraqi soldiers in the war and compare it with the experience elsewhere.

Patients and Methods: A case series study was carried out in the Department of Electrodiagnosis of Al-Yarmok Teaching Hospital for a period from December 2015 to July 2016. Two groups of human subjects included in the present study: Control group consists of (50) healthy volunteers and the patients group consists of (136) with documented war peripheral nerve injuries (Iraqi soldiers) were included in this study, their age ranging from (20 years) till(49years). Physical examination and electrodiagnostic study was carried with interventions both of the nerve conductive study (NCS) and the needle electromyographic study (EMG). The main parameters which were used in the study for the sensory nerves (distal sensory latency, amplitude, sensory nerve conduction velocity). For the motor nerves (distal motor latency, nerve conduction velocity, F-wave, latency, amplitude, decay, temporal dispersion). Needle EMG study (spontaneous activity, motor unit potential, recruitment and interference pattern).

Results: There were (136) cases of war peripheral nerve injuries. The improvised explosive device (IEDs) was the main cause of the peripheral nerve injuries (PNIs) in (66%) of the cases followed by gunshot in (28%) of cases and (6%) of cases had (PNIs) secondary to fall from explosion , burial under debris and motor vehicle accidents. Most commonly injured nerves was sciatic (28%) followed by common peroneal nerve (22%), tibial nerve (11%), ulnar nerve (9%), femoral nerve (8%), median nerve (6%), radial nerve (6%), brachial plexus (4%) , lumbosacral plexus (4%), musculocutaneous nerve (1%) and axillary nerve (1%) respectively.

Conclusion: PNIs are a major component of war related injuries mainly involving upper and lower limbs. Electrodiagnostic studies in 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 extended rehabilitation services.

Key words: Peripheral nerve injuries, War injuries, Nerve conduction studies.

INTRODUCTION

Traumatic injury to peripheral nerves is a worldwide problem and can result in significant disability it result from penetrating injuries, crush, stretch and ischemia.[1] The etiological and epidemiological factors of peripheral nerve injuries (PNIs) may vary according to periods of peace or conflict and also according to the development level of populations. Traumatic nerve injuries results in significant neurological deficits. In periods of peace, (PNIs) generally result from motor vehicle accidents (MVAs), lacerations with sharp objects, penetrating trauma, stretching or crushing trauma and fractures, and gunshot wounds. Throughout history, it has been proven that is a large number of the (PNIs) was developed during wartimes especially in American Civil War, World Wars I and II, and subsequently in Vietnam, Korea and Gulf war which has the basic knowledge about peripheral nerve injuries epidemiology and their outcomes came from the these wars.[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 Operations of American war in the Iraq combatant.[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 bomb has resulted in new pattern of injuries amongst combat casualties compared to the previous conflicts.[6] This pattern needs to be known for developing appropriate management protocols.[7] Electromyography (EMG) is the most important diagnostic method for evaluating (PNIs). These studies help in precise localization of the lesion and also in assessing the severity of the lesion, thus facilitating the treatment options and determining the prognosis.[8]

Since nerve injuries are one of the most important causes of war related disability due to long-term functional impairment,[9] documentation of such data is valuable for medical planning, focus of further investigations, resource management and determining rehabilitative needs. To our knowledge, no such data is available regarding Iraqi 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.

PATIENTS AND METHODS

A case series study was carried out in the Department of Electrodiagnosis of Al-Yarmok Teaching Hospital for a period from December 2015 to July 2016. Two groups of human subjects included in the present study: Control group consists of (50) healthy volunteers and the patients group consists of (136) with documented war peripheral nerve injuries (Iraqi soldiers) were included in this study, their age ranging from (20 years) till (49 years) and all ranks (who got injured while fighting in the war) .Physical examination and electrodiagnostic study was carried with interventions both of the nerve conductive study (NCS) and the needle electromyographic study (EMG). The main parameters which were used in the study for the sensory nerves (distal sensory latency, amplitude, sensory nerve conduction velocity). For the motor nerves (distal motor latency, nerve conduction velocity, F-wave, latency, amplitude, decay, temporal dispersion). Needle EMG study (spontaneous activity, motor unit potential, recruitment and interference pattern).

RESULTS

In this study the commonest cause of peripheral nerves injuries was blast resulting from Improvised Explosive Devices (IEDs) nearly (66%) dividing into (5%) for the upper limb nerve injuries and (61%) for the lower limb nerve injuries. Bullets injuries are the second etiological factor for the PNIs it was (28%) dividing into (20%) for the upper limb nerve injuries and (8%) for the lower limb nerve injuries. While other causes for PNI related to secondary fall from explosion, motor vehicle accident and burial under debris it represents nearly (6%). The injuries of peripheral nerves in the lower limbs represent about (73%) while the injuries of peripheral nerves in the upper limbs represent (27 %). The explanation is that the injuries of peripheral nerves in the lower limbs caused by improvised explosive devices exploded dramatically while injuries of peripheral nerves in the upper limbs resulted from gunshot injuries, especially by snipers. It was noted that the injured peripheral nerves in the upper limbs in the right side was more than the left side, where they represent the proportion of (19%) while the (8%) in the left side, and attributed the cause, according to our interpretation profile the right side is the dominant and most widely used so it can be the goal of the injured by snipers. While the PNIs in the lower limbs was more in the left side (45%) while nearly (28%) in the right side.

Table 1 : Etiological factors of the peripheral nerve injuries.

Nerve	IEDs	Bullets injury	Others
Upper Limbs Nerves	5%	20%	2%
Lower Limbs Nerves	61%	8%	4%
Total	66%	28%	6%

In this study most commonly injured nerves was sciatic (28%) followed by common peroneal nerve (22%), tibial nerve (11%), ulnar nerve (9%), femoral nerve (8%), median nerve (6%), radial nerve (6%), brachial plexus (4%) , lumbosacral plexus (4%), musculocutaneous nerve (1%) and axillary nerve (1%) respectively as shown in table 2.

Table 2: Frequency of peripheral nerve injuries.

Nerve	**Frequency**	**Percentage**
Median	8	6%
Ulnar	13	9%
Radial	8	6%
Axillary	1	1%
Musculocutaneous	1	1%
Brachial Plexus	6	4%
Femoral	11	8%
Common Peroneal	30	22%
Tibial	15	11%
Sciatic	38	28%
Lumbo sacral plexus	5	4%
Total:	136	100%

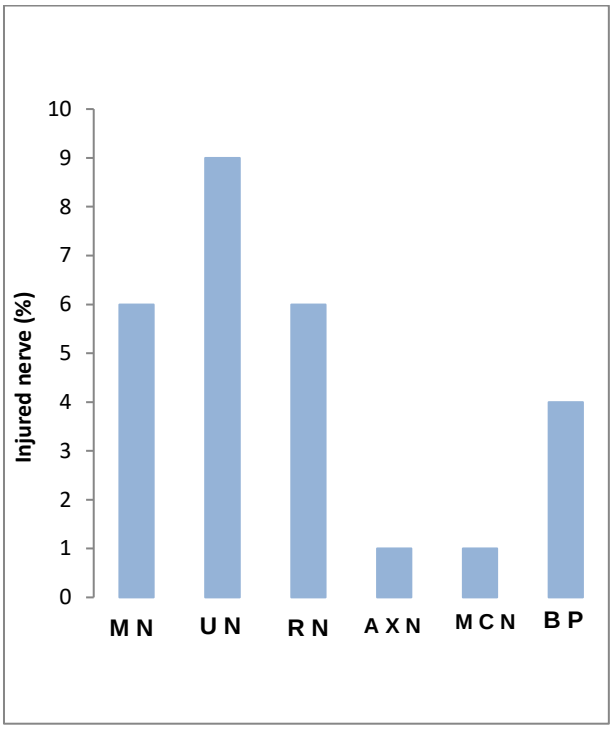

Figure 1:The percent of individuals injured nerve of upper limbs. Total number of limbs injured patients =136

M N = Medial N., U N = Ulnar N., R N = Radial N., AX N = Axillary N., MC N = Musculoskeletal N., BP = Brachial plexus

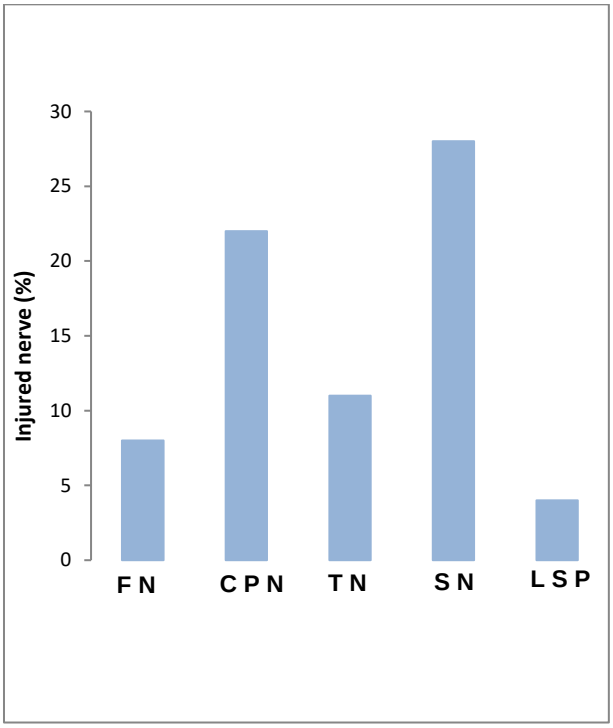

Figure 2: The percent of individual injured nerve of lower limbs. Total number of limbs injured patients =136

M N = Medial N., U N = Ulnar N., R N = Radial N., AX N = Axillary N., MC N = Musculoskeletal N., BP = Brachial plexus

DISCUSSION

Peripheral nerve injuries sustained in long standing low intensity conflicts can have the impact of a devastating effect on healthcare resources.[10] This study builds the database for Iraqi soldiers, their age ranging from (20 years) till (49years) comparable with other studies.[11] where we classified the PNIs according to the level of nerve injury using the following criteria:

Upper extremity injuries were classified into the levels of the arm (between shoulder and elbow), elbow, forearm, wrist, and palm. Injuries in the lower extremity were classified according to pelvis/buttock, upper leg, knee, lower leg, and ankle levels. The skeletal injuries were found to have a very close relationship to the PNI in our study; Fractures and other musculoskeletal injuries are common and may damage the adjacent nerves either by direct trauma or stretch with hemorrhage in the nerve. Humeral fractures accompanied (4%) of radial nerve injuries occurred in the arm (proximal segment), were at the wrist level (2%) (distal segment). Median nerve injuries most commonly were at the forearm level proximally (4%), were in the wrist and palm distally (2%). Ulnar nerve injuries occurred with frequency (4%) at the forearm and elbow levels proximally, whereas (5%) distally at wrist and palm level. Axillary nerve injury (1%) has a very close association with shoulder dislocation and blunt injury to the shoulder. Due to the associated movement at the shoulder, cases of scapular fracture also injure the axillary nerve along with the brachial plexus. Our observations regarding brachial plexus injury and shoulder trauma was (4%) also there is a close association between the injuries to the subclavian artery and brachial plexus. Femoral nerve injury (3%) proximally is known to occur secondary to an iliopsoas hematoma and also with pelvic fractures and (5%) distally associated with femor fracture.The sciatic nerve injury is very often associated with dislocated hip joint and pelvic fractures (7%) the remainder were in the upper and lower leg levels (21%).

An injury to the tibia/fibula was present in (9%) of peroneal nerve injuries proximally and (13%) distally. The tibial nerve injuries (4%) proximally associated with tibial shaft fracture and (7%) distally. Regarding lumbosacral plexus injuries usually associated pelvic fractures (4%). In PNIs accurate localization of the lesion and assessment of the severity of the nerve lesion were of importance in selecting the appropriate management strategies.[12] Electromyographic evaluation and detailed clinical examination of patients with trauma are of great importance in avoiding the nerve injury-related disability. Electrodiagnosticaly detection of the lesion was expressed as disproportional prolongation of the distal motor latencies (DML) suggests predominant distal nerve segments involvement, while marked slowing of the motor conduction velocity(MCV) points to maximal involvement of the main nerve trunk(out of proportion to the distal latency). Marked prolongation of the f-wave latencies indicates involvements of the very proximal or radicular pain. when considering such classification the time profile of the injury is vital for detection of the site of maximal insult. PNIs may result in considerable morbidity if not managed efficiently; it can contribute to major social and economic burden since they generally occur in the most productive age group, the young population. Functional disability associated with nerve injuries can be devastating, so by early diagnosis optimal results can be obtained with appropriate surgical and conservative treatment. When evaluating patients with peripheral nerve lesions, the electrodiagnostic (EDX) should provide several types of information about diagnosis, location and the pathophysiology of the nerve lesion, such as axon loss and/or demyelination.[13]

Prognosis is a valuable part of the EDX assessment for several reasons. Knowing the probable outcome from a nerve injury allows the treating physician to make a more informed recommendation regarding treatment options.

CONCLUSION

Peripheral nerve injuries are a major component of war related injuries mainly involving the upper limbs and lower limbs. Electro-diagnostic 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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