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ORIGINAL ARTICLE

Frequency of Radial Nerve Palsy in Patients with Closed Traumatic Humeral Shaft Fracture in High Energy Trauma Cases

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ABSTRACT

Background: Different pattern of the fractures of the humerus shaft usually result in radial nerve injury. The frequent injury of radial nerve is because of its close proximity to the humeral shaft in the radial groove.

Objective: Determining the incidence of Radial Nerve Injuries in Patients with Closed type of Humeral Shaft Fractures in high-energy trauma cases.

Material and Methods: Department of Orthopedics conducted this study at Ghurki Trust & Teaching Hospital, Lahore from January 2021 to December 2021, including all patients regardless of gender, aged between 20-60 years with closed fractures at the level of shaft of humerus. All the patients were thoroughly investigated with detailed history, clinical and radiological examination. The patients were originally managed according to standard ward procedures, fracture stabilization with U-slab and analgesic requirements. All of the patients were clinically examined to rule out radial nerve damage. The data accumulated after completion was analyzed using the relative software SPSS version 26.0.

Results: This study included 80 patients with radiologically confirmed humeral shaft fractures. There were 55 (68.5%) men and 25 (31.25%) women having this type of fracture pattern. The participants ages were inbetween 20 to 60 years, with men and women having mean ages of 31.62 ±8.35 years and 38.43±5.06 years, respectively, and overall mean age of 38.93± 6.19 years. Spiral fractures accounted for 32 (40%) of the cases, while transverse fractures17 (21.25%), communited fractures16 (20%) and segmental fractures 15(18.75%). In 7 (or 8.75 percent) out of the 80 patients, radial nerve injury was observed. 4 (57.1%) cases of radial nerve damage were found in patients with spiral closed midshaft humerus fractures, 1 (14.3%) reported case in transverse closed humerus shaft fractures, 1 (14.3%) case in comminuted closed midshaft humerus fractures, and 1 (14.3%) case in segmental fractures.

Conclusion: This study highlighted the frequency of radial nerve palsy among the patients with humeral shaft fractures at spiral goove . Radial nerve palsy was found in 8.75% of cases presented to our setup.Most of these cases reported in patients with spiral type of fracture of humerus midshaft. These findings are helpful to the surgeons during the pre operative counseling of patients, who suffered radial nerve damage due to a humerus shaft fracture at radial groove.

Keywords: Radial Nerve Injury, Closed fracture of the humerus, Radial groove ,Humerus Shaft

INTRODUCTION

Fractures of the humerus midshaft often results in the injury to the radial nerve in cases of upper limb trauma. It is the most common injury in humerus fractures. [1,2]The injury of the radial nerve is due to its close anatomical approximation to the humerus at this level. The radial nerve arises from the posterior cord of the brachial plexus' that comprises of nerve roots arising from the spinal cord from C5 to T1 levels.

At the level of axilla , the nerve takes its course posterior to the axillary artery. It leaves the axillary region through the triangular space and supplies branches to the triceps muscle posteriorly. Radial nerve wraps around the midshaft of the humerus in the radial groove and is also separated by a fascia from the triceps muscle. The radial nerve is more susceptible to trauma at the place where it enters the arm's anterior compartment by traversing the lateral intramuscular septum .[3,4]

Radial nerve injuries can be classified into two major types, i.e., primary and secondary. Primary nerve palsy denote the injuries endured at the same moment of the primary insult.The secondary nerve injuries are those suffered after the damage due to closed reduction and the process of internal fixation done to reduce fractures. [5]Similarly, the incidents of radial nerve functional loss because of traumatic humeral shaft fractures are reported in various literature [6]. Damage to the radial nerve results in difficulties extending the arm, trouble manipulating the wrist, numbness, a loss of feeling,burning sensations, tingling and discomfort.[7]

There has been a long debate regarding the management of injured radial nerve linked with humeral shaft fractures .[8]

Holstein and Lewis 1963 , American orthopedic surgeons described the first ever treatment of radial nerve injury associated with humerus fractures. [9,10]With the advancement of instrumentation, such as the production of the new intramedullary nail and stable implants, conservative treatment is rarely used nowadays. The gold standard regarding surgery nowadays is open reduction of bone and internal fixation with implant having excellent results with minimal complications.[11]

This study was formulated to specify the incidence of radial nerve entrapment or damage in high-energy road traffic accidents resulting in the closed humeral shaft fracture, which is very common in our part of the world,especially where, due to various social circumstances, the percentage of motorcycle riders are higher than the others.[12]

MATERIALS AND METHODS

From January 2021 to December 2021, this study was done in the Ghurki Teaching Hospital's Department of Orthopedics and Emergency Room in Lahore, Pakistan. The survey comprised male and female patients between 20 and 60 years with a closed humerus shaft fracture. Patients with an open or pathological humeral shaft fracture, polytrauma patients with multiple fractures in the same upper extremity and those having any history of prior neurological flaws in that limb were not included in this research. The x-ray revealed a break in the continuity of the humerus shaft, which was used to diagnose humeral shaft fracture.The diagnosis of radial nerve damage was made clinically based on the patient's ability to extend their wrist and fingers. If the patient could not raise their wrist and fingers backward, it was labeled as confirmed radial nerve insult and vice versa. The patient was told about the study's goal and advantages, and formal informed permission was acquired. All of the patients were assessed through detailed history and thorough physical examination. The patients were originally managed according to standard ward procedures, including initial fracture stabilization with U-slab and analgesic requirements. Patients of this study were thoroughly examined for clinical signs of radial nerve damage. The data accumulated after completion was analyzed using SPSS version 26.0.

RESULTS

A total of 80 individuals participated this study, all of them had a verified humerus fracture. There were 55 (68.5%) men and 25 (31.25%) women in the group. The participants ages were between 20 to 60 years, with males and females having mean ages of 31.62± 8.35 and 38.43± 5.06, respectively, and overall mean age of 38.93± 6.19 years. Spiral fractures accounted for 32 (40%) of the cases, whereas transverse fractures accounted for 17 (21.25%), communited fractures for 16 (20%), and segmental fractures for 15 (18.75%). Radial nerve damage was found in 7 (or 8.75%) patients. Out of the seven occurrences of radial nerve damage, four (57.1%) occurred in patients with a spiral closed humerus midshaft fracture.A single (14.3 percent) case of nerve injury was from transverse pattern of closed humerus shaft fracture, one (14.3 percent) case was a comminuted closed humerus midshaft fracture, and sole (14.3 percent) patient was a segmental type fracture.

Table 1: Clinical and Demographic profile of humerus shaft cases (n=80)

Variables		n(%)	Mean±S.D
Gender	Male	55(68.5)	31.62 ± 8.35
	Female	25(31.25)	38.43± 5.06
Type of fracture			
	Spiral	32 (40%)	
	Transverse	17 (21.25%)	
	Comminuted	16 (20%)	
	Segmental	15(18.75%)	
Radial Nerve Injury			
	Yes	7(8.75%)	
	No	73(91.25)	

Table 1: Radial Nerve Injury in closed traumatic humeral Shaft fracture

Type of fracture	Frequency	Radial nerve injury	
		Yes	No
Spiral	32	4	28
Transverse	17	1	16
Comminuted	16	1	15
Segmental	15	1	14
Total	80	7	

DISCUSSION

The most common peripheral nerve injured in upper limb fractures is the radial nerve associated with fractures of the shaft of humerus at the level of the spiral groove, which are caused by the entrapment of the nerve in the fractured ends, bone spikes injuries or nerve traction when the broken ends are forcibly separated. [13]In the orthopaedics department, radial nerve functional loss in closed type of humeral shaft fractures is a regular occurrence. In our study, 8.75 percent of the subjects had radial nerve palsy.We found 14 cases of radial nerve injury in this study having a sample size of 164 people. In contrast, a grand review of 20 papers found that the overall radial nerve injury prevalence owing to humerus shaft fractures was 11.8 percent, with the middle and middle-distal shaft parts having a remarkable correlation with radial nerve palsy. [14] Shao et al. found 532 radial nerve injuries in 4517 humeral shaft fractures in a comprehensive literature analysis, indicating an 11.8 percent incidence of radial nerve trauma. [15]Another retrospective descriptive study held at the Combined Military Hospital (CMH) Multan showed that the humeral shaft fractures were the second most common (21% each) provoking factor of radial nerve injury. This association of nerve with shaft fractures also is an agreement with the stern.[16] This study also strengthens the same concept related to repeated radial nerve injury because of closed humerus shaft fractures in those who have received high-energy trauma. And our sample includes those who had a history of falling from the bike and having closed Humerus fractures.

Unfortunately, Radial nerve is the most frequently damaged peripheral nerve linked with variety of fracture patterns at shaft level in trauma patients. Spiral fractures were the most prevalent (36.58 percent) amongst the patients included in this study, followed by transverse fractures (24.39 percent), segmental fractures (20.73 percent), and comminuted fractures (20.73 percent) in our research (18.29 percent).

CONCLUSION

Incidence of radial nerve trauma in patients having humeral shaft injuries was highlighted in our investigation. Injury to Radial nerve was documented in 8.75 percent of the patients received in the emergency room. Most radial nerve injury instances were seen in those with a spiral closed midshaft humerus fracture. These findings are helpful to the surgeons during the pre operative counseling of the patients, who suffered radial nerve damage due to a humerus shaft fracture.

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