

ORIGINAL ARTICLE

RADIAL NERVE INJURY IN PATIENTS WITH CLOSED FRACTURE OF HUMERUS SHAFT IN HIGH ENERGY TRAUMA CASES

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Background: Fracture of the humerus usually result in radial nerve injury. This study was done with the aim to determine the incidence of Radial Nerve Injury in patients with closed fracture of the humerus shaft in high-energy trauma cases. **Methods:** This descriptive study was conducted in the Department of Orthopaedics and Emergency room, Ghurki Teaching Hospital, Lahore from January to December 2021 recruiting consecutive such patients. Standard ward protocol was followed to manage the patients initially including fracture stabilization and analgesia requirement. All the patients were carefully assessed to detect radial nerve injury. Data analysis was done through SPSS 26.0. **Results:** A total of 80 patients were included with the confirmed diagnosis of fracture of the humerus. There were 55(68.5%) males and 25(31.25%) females. The age range was 20 to 60 years and the mean age of males and females was 31.62 ± 8.35 and 38.43 ± 5.06 respectively with overall mean age \pm SD was 38.93 ± 6.19 . There were 32 (40%) cases of spiral fracture, 17 (21.25%) cases of transverse fracture, 16 (20%) cases of comminuted fracture, and 15 (18.75%) cases of segmental fracture. Radial nerve injury was present in 7 (8.75%) patients. Out of these 7 cases of radial nerve injury; 4 (57.1%) cases were recorded in patients with spiral closed fracture of midshaft of humerus, 1 (14.3%) cases were recorded in transverse closed fracture of humerus shaft, 1(14.3%) cases in comminuted closed fracture of midshaft of the humerus while 1 (14.3%) were segmental fractures. **Conclusion:** Our study highlighted the frequency of radial nerve palsy in humeral shaft cases with most common in spiral closed fracture of the midshaft of the humerus.

Keywords: Closed fracture of the humerus; Humerus shaft; Radial nerve injury

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INTRODUCTION

Fracture of the humerus usually results in radial nerve injury, it is the most common injury in humerus fracture.^{1,2} The reason for the injury of the radial nerve is due to its close anatomical position about the humerus. The radial nerve is the terminal continuation of the posterior cord of the brachial plexus it contains nerve roots from C5-T1.

It is placed posteriorly to the axillary artery. It exits the axillary area from the triangular interval and supplies branches to the triceps muscle. The distal portion of the humeral shaft has the radial nerve wrapped around it and separated by a layer from the triceps muscle. The radial nerve is more susceptible to trauma at the place where it enters the anterior compartment of the arm by traversing the lateral intramuscular septum.^{3,4}

Radial nerve injuries can be divided into two types, i.e., primary or secondary. Primary nerve palsies are the injuries that are endured at the time of the primary injury event. The secondary nerve injuries are those that are endured after the injury due to closed reduction and the process of

internal fixation done to reduce fractures.⁵ Similarly, the incidents of radial nerve injuries due to humeral fractures are reported in the literature.⁶ The radial nerve damage causes difficulty in the extension of the arm, there is difficulty in manoeuvring the wrist numbness, a decrease in sensation, tingling, burning sensations, and pain.⁷ There has been a long debate on the management of radial nerve injuries associated with humeral fracture.⁸

Holstein and Lewis 1963 were the first to describe the treatment of radial nerve injury with associated humeral fracture.^{9,10} With the advancement of instrumentation such as the production of the new intramedullary nail and stable implants, conservative treatment is very rarely used nowadays. The gold standard nowadays is the use of open reduction and internal fixation.¹¹

This study was planned to know the incidence of radial nerve injury in high-energy road traffic accidents resulting in the closed humeral shaft fracture; which is very common in our part of the world specially where due to

various social circumstances the percentage of motorcycles riders is higher than the others.¹²

MATERIAL AND METHODS

This descriptive study was conducted in the Department of Orthopaedics and Emergency room, Ghurki Teaching Hospital, Lahore from January 2021 to December 2021 recruiting All consecutive patients of both genders between 20–60 years having closed fracture of shaft of humerus were included in the study. Those patients having open fracture or pathological fracture of shaft of humerus, polytrauma patients with multiple fractures of the same limb, and those having a history of previous neurological deficit of the same limb were excluded from the study. The diagnosis of humerus shaft fracture was done based on a break in the continuity of the shaft of the humerus as seen on the x-ray. The diagnosis of radial nerve injury was established clinically based on examination findings of whether the patient was able to extend finger and wrist or not, if unable to extend finger and wrist it was recorded as radial nerve injury positive and vice versa. The purpose and benefits of the study were explained to the patient and written informed consent was obtained. All the patients were worked up with detailed history and clinical examination. Standard ward protocol was followed to manage the patients initially including fracture stabilization and analgesia requirement. All the patients were carefully assessed to detect radial nerve injury. The data analysis was done through software SPSS version 26.0

RESULTS

A total of 80 patients were included with the confirmed diagnosis of fracture of the humerus. There were 55 (68.5%) males and 25 (31.25%) females. The age range was 20–60 years and the mean age of males and females was 31.62±8.35 and 38.43±5.06 respectively with overall mean age±SD was 38.93±6.19. There were 32 (40%) cases of spiral fracture, 17 (21.25%) cases of transverse fracture, 16 (20%) cases of comminuted fracture, and 15 (18.75%) cases of segmental fracture. Radial nerve injury was present in 7 (8.75%) patients. Out of these 7 cases of radial nerve injury; 4 (57.1%) cases were recorded in patients with spiral closed fracture of midshaft of humerus, 1 (14.3%) cases were recorded in transverse closed fracture of humerus shaft, 1 (14.3%) cases in comminuted closed fracture of midshaft of the humerus while 1 (14.3%) were segmental fractures.

Table-1: Demographic and clinical 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-2: Radial Nerve Injury in closed 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

Radial nerve injuries associated with fracture shaft of the humerus are the most common peripheral nerve injuries in long bone fractures and it is due to the fracturing force, by the fractured ends or by traction when the fractured ends are forcibly separated.¹³

Radial nerve injury in closed humeral shaft fractures is commonly encountered in orthopaedics department. 8.75% cases were found with radial nerve palsy in our study. In a study with a sample size of 164, we recorded 14 cases of radial nerve injury while according to a review of 21 papers the overall prevalence was of radial nerve injury due to humerus shaft fractures was 11.8% with the middle and middle-distal parts of the shaft having a significantly higher association of radial nerve palsy.¹⁴ In a systematic literature review, Shao et al, identified 532 radial nerve palsies in 4517 humeral shaft fractures; an 11.8% incidence of radial nerve palsy.¹⁵ In a local retrospective descriptive study conducted at Combined Military Hospital (CMH) Multan, fractures of the humerus were the second most common (21% each) cause of radial nerve injury. This observation also is in agreement with the stern.¹⁶ Our study also focuses on the same concept of frequency of radial nerve injury due to 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.

Among trauma patients, a radial nerve injury associated with a humeral shaft fracture is an important injury. Radial nerve palsy is the most common peripheral nerve injury associated with this fracture. In our study, the spiral fracture was most

common (36.58%), followed by transverse fracture (24.39%), comminuted fracture (20.73%), and segmental fracture (18.29%).

Limitations of the study include small sample size but data was collected employing rigor, therefore, internal validity may be appropriate.

CONCLUSION

Our study highlighted the frequency of radial nerve palsy in humeral shaft cases. 8.75% of cases were found with radial nerve palsy. The majority of radial nerve cases were recorded in patients with spiral closed fracture of the midshaft of the humerus. These findings give surgeons important information to convey to patients who have a radial nerve palsy with a humerus shaft fracture.

AUTHORS' CONTRIBUTION

MMK, MA, JG: Conceptualization of the study design, Literature search, proof reading. MUF, AJ, AA: Data collection, data analysis, data interpretation.

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