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Iatrogenic radial nerve palsy in open reduction internal fixation of humeral diaphyseal fracture by anterolateral approach

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Abstract

This study was done to determine frequency of post-operative iatrogenic radial nerve palsy in open reduction and internal fixation of humerus fracture by anterolateral approach. It is a Cross sectional study was done on 20 humerus shaft fractures were treated at adichunchanagiri hospital and research centre, nagamangala, Karnataka over a period of 12 months from septemeber 2019 to august 2020. Among these patients post operatively iatrogenic radial nerve palsy were noted. Among 20 patients, 16 were male and 4 were female. Median age was 32.5 years. Out of these 17 patients were has been treated with dynamic compression plate and 2 with locking compression plate. All the fractures were diaphyseal, at distal / middle third level. Among 20 patients 2 patients developed iatrogenic radial nerve palsy. In these patients there was no macroscopic lesion and nerve was in continuity and beginning of clinical recovery was seen in within 3 months. The incidence of secondary nerve palsy after surgey is 10%. Secondary nerve palsy is always transient recovers with time with dynamic splint in extent position of wrist and fingers. Open reduction and internal fixation provide greater patient comfort and better alternative to conservative treatment.

Keywords: Iatrogenic radial nerve palsy, humerus fracture, dynamic compression plate, locking compression plate, internal fixation

Introduction

Humerus shaft fractures are common fracture treated by orthopedic surgeon. It accounts for 1-3% of all fracture ^[1]. People of all ages are vulnerable to the injuries. Fracture in young individual usually following high energy trauma and elderly population following low energy trauma. Humeral shaft fracture are leading cause of radial neuropathy. The incidence of radial palsy in humerus shaft fracture is between 7 to 17% ^[2]. Nerve palsy can be primary nerve palsy due to the anatomy of radial nerve and entrapment between fragments, open wound, direct injury to nerve. Secondary or iatrogenic nerve following fracture fixation or manipulation. Regarding literature the overall Incidence of iatrogenic nerve palsy, patient with humeral shaft fracture vary between 6 to 32% ^[3, 5]. Management is depends upon patient age, hand dominance, fracture pattern, fracture displacement and associated injury. Surgical treatment is considered right treatment method for humerus shaft fracture. Both open reduction and internal fixation with plate osteosynthesis and intermedullary nailing are well established treatment method ^[6]. certain advantage of intramedullary such as minimal invasive insertion techniques, intact blood supply, less stress shielding at fracture site and shorter operative time accompanied with less blood loss ^[6, 9]. However the main disadvantage of intramedullary nailing are less anatomical reduction and potential sub-acromial impingement syndrome with restriction of shoulder movements ^[6, 7]. ORIF on the other hand allows direct visualization of fracture site and radial nerve facilitating possible dissection of entrapped radial nerve as well as anatomic reduction, direct visualization of the fracture and therefore reducing risk of nonunion. However due to the open surgical approach to the humerus ORIF potentially increases risk of iatrogenic radial nerve damage during soft tissue preparation leads to longer operation time and greater blood loss ^[6, 9]. The purpose of the study was to retrospective analyze treatment and long term outcome of secondary radial nerve palsy observed in surgically treated humeral shaft fracture.

Methodology

The study was approved by local ethics committee. All the patient with surgically treated humeral shaft fracture treated at our institution Adichuchangiri Institute of Medical Sciences during a 12 months period from septemeber 2019 to august 2020.were included 20 patients above 18 years and both sexes were studied written informed consent was taken by all the patient. Patient chart, operation follow up notes were retrospectively analyzed.

Patient with primary radial nerve palsy were excluded from the study. Patient with pathological humeral shaft fracture were excluded. All humeral shaft fracture were diagnosed by two plane standard xray image (ap and lateral). For all the fracture type AO classification was used.

Severity of soft tissue damage was classified according to gustilo Anderson classification.

Results

OUT of 20 patients 16 (80%) were male while 20 % were female. Median age was 32.5 years (Table 1). 55% of fractures were due to Road traffic accidents, 35 % due to fall on outstretched hand and 10 % were due to other traumatic causes (Table 2).

Table 1: Number of Patients

Age	Male	Female
18-20	2	0
20-25	2	1
25-30	3	1
30-35	4	0
35-40	3	0
40-45	0	1
45-50	1	0
50 +	1	1
Total :	16	4

Table 2: Mechanism of Injury

Cause	Numbers	Percentage
Fall	7	35 %
RTA	11	55%
Others	2	10%
Total	20	100%

AMONG 20 patients in 15 patients, the right humerus was fractured and in 5 patients left humerus was fractured. According AO classification ^[10] most fracture were A1 TYPE And second most was B1 Type (Table 3).

Table 3: Type of Fracture

Туре	Number	Percentage
A1	8	40 %
A2	2	10%
A3	1	5%
B1	4	20%
B2	1	5%
B3	2	10%
C1	1	5 %
C2	1	5%
C3	0	0%
Total	20	100%

Among 20 patients dynamic compression plate was applied in 17 patients and remaining 3 patients were applied locking compression plates (Table 4).

Table 4: Type of Treatment

Туре	Nubers	Percentage
DCP	17	85%
LCP	3	15%
Total	20	100%

Out of 20 patients 2 patients developed radial nerve palsy post operatively (Table 5). Both the patients were fully recovered by 6 months.

Table 5: Iatrogenic Radial Nerve Palsy

Injury	Number	Percentage
No	18	90%
Yes	2	10%
Total	20	100%

Discussion: Radial nerve is one of most frequently injured of all the nerve ^[11], in arm radial nerve palsy commonly causde by humerus fracture. Secondary nerve palsy / iatrogenic nerve palsy seen following fracture fixation and manipulation.

Indication of surgrical fixation of humerus is based on open fracture, displaced fracture, middle and distal one third fracture which is difficult to manage conservatively, delayed or non-union and associated multiple trauma ^[12].

In a study Shankar *et al.* there was 7.89 % ^[13]. In other study Wang *et al.* there frequency of secondary nerve palsy was 4.24 % ^[14]. In another study done by T.R Schwab *et al.* showed 9 % of radial nerve palsy ^[15].

Approach to humeral shaft fracture are anterolateral and lateral approach. Most surgeon prefer anterolateral approach for proximal and middle one third fracture. And posterior approach for distal one third fracture. In posterior approach patient need to position lateral, which pose difficulty in polytauma cases and it's important to isolate the radial nerve completely before placement of plate or else there is risk of nerve entrapement beneath the plate. In a study done by AO Yildirim *et al.* used modified lateral approach for distal nerve suspension, the radial nerve was visualized after passing fascia of triceps. The anterolateral side of triceps muscle was released and radial nerve was retracted posteriorly.

Study by shankar *et al.* showed that LCP and DCP had similar function and result in management of diaphyseal humerus fracture ^[13]. Plate osteosynthesis was done in anterolateral aspect of humerus, anteromedial palting should be avoided because eplate positioning may be damage Musculocutaneous nerve and brachial artery.

2 patients who suffered radial nerve palsy in them signs of recovery were noted at end of 3 months and fully recovery was seen by 6 months.

Conculsion

Open reduction and internal fixation of humerus diaphyseal fracture gives better results than conservative management. The risk of iatrogenic injury during lateral approach in distal one third humerus fracture can be reduced by posterior retraction of radial of nerve with tricep muscle of anterior dissection.

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