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OPEN REDUCTION AND INTERNAL FIXATION OF FRACTURES OF THE SHAFT OF HUMERUS EXPOSED THROUGH ANTEROLATERAL APPROACH AND PLATE FIXED TO THE ANTEROMEDIAL SURFACE.

Orthopaedics

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ABSTRACT

Background: The incidence of humerus shaft fractures has been postulates to be about 1- 2 % of all fractures. Amongst all humerus fractures the fractures at the humerus diaphysis constitute about 14% of all humerus fractures. The outcome of medial plating of humerus and analyze its potential merits and demerits are important.

Materials and Methods: A retrospective study was conducted on patients admitted in college of medicine and JNM Hospital at Kalyani Nadia through the ER or OPD between January 2016 to November 2018. The study was conducted on 18 patients. The patients were selected based on pre-determined inclusion and exclusion criteria. Medial plating is done on these patients.

Result: Delayed union is seen on one patient, superficial infection is seen on one patient.

Conclusion- antero-medial plating of humorous safe and effective approach for fracture shaft of humerous.

KEYWORDS

Antero-medial plating, humerous shaft fracture

INTRODUCTION

Unlike fractures of other long bones, the epidemiological parameter of the diaphyseal shaft of humerus has not been studied extensively. From available resources the incidence of humerus shaft fractures has been postulates to be about 1- 2 % of all fractures[1]. Amongst all humerus fractures the fractures at the humerus diaphysis constitute about 14% of all humerus fractures[2].

Age distribution of humerus shaft fractures:

Up to the age of 60 the incidence of humerus fractures occurs equally in men and woman but the incidence of these fractures increases significantly in woman(80%)[3].these fractures have a bimodal age distribution with a very low incidence in young females.

Fractures in the upper end of the diaphysis occur mostly in elder age group. Fractures in the middle part of the diaphysis tend to occur mostly in a relatively younger age group. Distal humerus shaft fractures occur in the youngest age group.

Mechanism of injuries in humerus shaft fractures:

90% of all humerus shaft fractures occur either by fall or by motor vehicle accident. In older patients low intensity trauma is the predominant cause[4,5,6,7.]

Associated injuries:

Nerve injuries

Radial nerve is the most common nerve that is injured in humerus shaft fractures because of its close anatomical relation with the humerus shaft[8,9,10]. There is one variety of spiral fractures of the diaphyseal shaft of humerus that is known as the Holstein Lewis fracture pattern. Holstein Lewis pattern is a spiral injury pattern with one end towards the radial side. A closed fracture associated with nerve palsy does not usually require nerve exploration and patient is closely monitored for expectant recovery. In certain cases however early exploration is preferred that is in cases of concomitant vascular injuries, gunshot injuries, open injuries with severe soft tissue trauma.

Radial nerve injuries are associated with wrist drop and sensory loss over dorso-radial part of hand.

Shoulder dislocation[11]

The ipsilateral shoulder injury must not be missed and if present must be urgently addressed i.e. closed reduction under general anesthesia must be done while the humerus shaft fracture may be dealt with later.

Floating elbows[12]

These are rare injuries that occur with humerus shaft fractures. In these injuries the proximal radius and ulna are also fractures resulting in a highly unstable elbow. These injuries are usually associated with very high energy trauma. These injuries must be addressed early and usually are treated operatively.

Applied anatomy of the humerus shaft

The shaft of humerus extends from the neck of humerus above to the supra-condylar ridges below[13,14]. The cross section of the humerus is circular at its proximal end which gradually becomes triangular at the end. The medullary cavity gets gradually narrow at the distal end.

Length wise the humerus shaft can be divided into three parts, the proximal, the distal and the distal.

The surface of the humerus is also divided into three distinct surfaces: the anterolateral, the anteromedial and the posterior. Each area extends from the tuberosities to the supracondylar ridges. The radial nerve lies in close proximity to the shaft of humerus .it enters the posterior compartment and lies in between the long and the lateral heads of the triceps. It lies in the spiral groove along the posterior surface and course along posterolateral direction before emerging in to the anterior compartment after piercing the lateral inter-muscular septum to lie in between the brachialis and the brachioradialis muscles[15].

Treatment options in humerus shaft fractures:

Conservative or operative

Traditionally isolated humerus fractures have been treated conservatively with fairly good outcomes[17]. However in modern times the trend has shifted more towards operative intervention because in today's world a faster return to daily activities and with good range of motion of the shoulder and elbow is in high demand. These factors and improved surgical strategies are shifting the tide towards surgery.

Surgical options

Plating still remains the standard surgical choice for most humerus fractures[17]. Although nailing is also an option but unlike the femur and tibia nailing in humerus has certain distinct disadvantages[18] .rotator cuff injury is common during nail insertion, intra-operative imaging is difficult and neuro- muscular injuries may occur during reaming process or during distal locking. Hence plating is preferable over nailing with few exceptions.

Plate osteosynthesis

Conventionally plates have been fixed to antero-lateral and posterior surfaces. Recently though the antero medio surface is gaining popularity.

Aim of the study

In our study we want to study the outcome of medial plating of humerus and analyze its potential merits and demerits.

MATERIAL AND METHODS

We did a retrospective study on patients admitted in college of medicine and JNM Hospital at Kalyani Nadia through the ER or OPD between January 2016 to November 2018. The study was conducted on 18 patients. The patients were selected based on pre-determined inclusion and exclusion criteria.

Inclusion criteria

Patients with Post traumatic shaft of humerus fractures who were Aged between 18 to 65 years Had closed fractures Had No other fracture apart from shaft of humerus fracture were selected for the study

Exclusion criteria

Open fractures
Fractures with neuro vascular injuries
Patients with preexisting medical comorbidities were kept out of study.
Informed consent was obtained from all patient and pro pre anesthetic check up was done as per standard protocol.

Surgical details

In all patients the standard antero-lateral incision was made. This runs from the tip of coracoid along the delto pectoral grove and the follows distally along the lateral aspect of humerus and ends about 5 cms above the elbow crease. The length of the incision is modified according to site of the fracture.

The deep fascia of the arm is split in line of the skin incision .the plane between the biceps and the brachioradialis is identified. The biceps is then retracted medially and the brachialis muscle which originates from the shaft of humerus is split along the midline taking care not to injure the musculo cuteneous nerve which lies in the interval between the biceps and the brachioradialis. The brachialis is then split longitudinally. Human retractors are then being placed between the bone and the muscle. The antero medial surface of the humerus is thus exposed.

After exposing the shaft, fracture fragments were identified and margins cleaned of any intervening soft tissues. Fracture is then reduced and fixed with 4.5mm narrow DCP plate. The plate was fixed to the antero-medial surface. Wound is then closed in layers and sterile surgical dressing done.

Fig 1: 4.5 mm narrow DCP fixed to the antero medial surface of the humerus.

The biceps and the medial part of brachialis retracted by human retractor.

Fig 2: Radiograph showing the plate fixed to the medial side of the humerus.

RESULTS:

We operated upon 18 patients. In all patients the humerus was explored thought he antero lateral approach.4.5 mm narrow Dyanamic Compression Plates plates was fixed to the antero medial surface of the humerus.

Each patient was followed up for a minimum period of 1 year. The outcome of the study was analyzed based on the following parameters:

Study Parameters	No Of Patients
1. Non Union	NONE
2. Delayed Union	ONE
3. Mal Union	NONE
4. Infection - Superficial	ONE
5. Infection - Deep	NONE
6. Iatrogenic Radial Nerve Injury	NONE

In our study there was no iatrogenic radial nerve injury. The fractures went on to heal in all patients. One patient had delayed union for which the patient was kept under close observation and no active intervention was done. This patient eventually had complete union without any complication.

In one patient there was superficial skin infection for which debridement was done following which the infection healed without any further complication. None of the patients had deep infection.

DISCUSSION

Plating of the shaft of humerus fractures are being done mostly through an anterolateral approach or through a posterior approach[17].

The posterior approach has certain advantages i.e the radial nerve is explored all along its course in the spiral groove. This allows care full exploration of the nerve to look out for any potential nerve damage and also since the nerve is in full view and hence it can be safely be avoided during plate placement and screw placement. More over in this approach the inter-condylar area of the humerus is visible and hence fractures of the shaft of the humerus with inter-condylar extension this approach is usually preffered.

However the problems for posterior approach is that the patient needs to be placed in prone position which is not a favored position for anesthesiologists and also the exposure has one important disadvantage i.e. the proximal extent is limited by the insertion of the deltoid which restricts the use of this exposure to fractures in the lower part of the shaft of humerus only.

In our study we have explored the humerus through a standard anterolateral approach. This approach can be done with the patient in supine position. The incision can be extended proximally up to the coracoid process. But the distal extension is restricted 5cms above the elbow crease. Hence this is the preferred approach for fractures shaft of humerus when the fracture lies proximally.

Traditionally in this approach, after identifying the interval between the biceps and the brachialis the brachialis is splilt and retracted laterally and the plate is applied over the anterolateral surface of the humerus.

Fixation of the plate over the anterolateral surface has certain disadvantages i.e:

This surface is not a flat surface: it is curved surface
It has the insertion of deltoid muscle at the deltoid ridge in the proximal part: this requires extensive resection of the deltoid insertion. This results in extensive soft tissue dissection and potential damage to the axillary nerve which may affect the functioning of the deltoid muscle in the patient.

The radial nerve lies in close proximity along the posterior part of this surface[15]. Unlike the posterior approach where the nerve can be easily identified and protected, in this approach the nerve is not clearly seen and hence is in definitive risk of iatrogenic injury during screw placement.

The irregular and curved surface makes it difficult for plate placement. The plate need to be pre bent to confirm to the curvature of the humerus and failing to do so in a perfect manner would lead to loss of reduction post fixation with undesirable effects.

The antero medial surfaces of the humerus have distinct advantages over antero lateral surface. This surface is relatively flat compared to the antero medial surface. This makes plate fixation easier and pre bending is not required. This results in better fixation and hence reduces the chances of non union.

The chances of radial nerve injury is less while application of screws because unlike the antero lateral surface the nerve does not lie in close approximation to the medial surface.

Moreover we found that the average surgical time is shorter and also the amount of soft tissue stripping is low hence a chance of infection becomes less.

In our study we found this to be absolutely relevant and we had no incidence of non union or iatrogenic radial nerve injury while playing the antero medial surface of humerus. Only one case has superficial skin infection which healed by debridement and a prolonged course of antibiotics.

LIMITATION OF THE STUDY

Our study was limited by the small sample size of just 18 patients and short follows up of 1 year.

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