

Original Research Article

Follow up assessment of patients with humeral bridge plate technique with two year period

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ABSTRACT

Background: Minimally invasive technique brings together the ease of handling of plates and the relative stability principle of nails. Although there are still only a few studies on this, the initial results have been very satisfactory. The aim of the present study was to report the experience of our shoulder and elbow surgery group relating to treatment of fractures of the humerus, by means of the bridge plate technique, using an anterior route.

Methods: The present study included twenty patients suffering from humerus shaft fracture. The study was done for a total period of two years. The immobilization of the operated shoulder was done till the stitches were removed and average period of the three weeks were kept for immobilization of the shoulder. At the end of the period of immobilization, the patients were asked to perform the active gentle limb range of motion exercises on the basis of their permission of the pain control.

Results: On the basis of the UCLA score the excellent to good score were found in 16 cases, fair score in rest 4 patients. Less than 5° of valgus angulation intra operatively and on following these patients up, in 4 of the cases the angulation was found to be of acceptable alignment. In the two cases, 5° of varus, angulations was found at the end of one year but it did not affect the functional outcome.

Conclusions: Anterior bridge plating after anterior approach is safe and reproducible option, respects the principles of biological fixation with minimal soft tissue dissection, preserves fracture haematoma and periosteal blood supply, and is more forgiving in comminute fractures of the diaphysis.

Keywords: Humeral fracture, Minimal invasive technique, Bridge plating, Anterior route

INTRODUCTION

The humeral shaft is defined as the expanse between the proximal insertion of the pectoralis major and the distal metaphyseal flare of the humerus. Cylindrical in shape, the shaft inherently provides strength and resistance to both torsional and bending forces. Distally the bone transitions into a triangular geometry with the base posterior; the supracondylar region maintains a narrow anterior-posterior dimension.¹

Humeral nonunion is a condition resulting from lack of healing at the fracture site often associated with alteration

of the local biological potential. Absolute anatomical reduction by compromising soft tissue and hence the vascularity is becoming older trend now. Diaphyseal fractures of the humerus occur frequently and represent three to five percent of the fractures of the human body.²

It is demonstrated that the most important factor to achieve bone healing in nonunion is use of a careful, biologically and mechanically adequate technique. The humerus can be considered the most versatile bone in the human body in view of the fact that it can be successfully approached by a variety of methods for fracture fixation

including functional bracing, plating and intramedullary nailing.^{3,4}

It is important to stress that most transverse to short oblique humeral shaft fractures are amenable to nonoperative management and recommendations by some authors for immediate surgical intervention are not supported by level II studies.^{5,6}

Stable mechanical fixation requires precise reduction and opening of the fracture site. It heals by primary intention which is biologically inferior to healing by secondary intention with the preservation of fracture haematoma causing minimal soft tissue injury.

With progressive improvements over the years in surgical techniques, the conservative methods of reduction and stabilisation have given way to internal fixation with plate and screws despite their drawbacks. Anterior bridge plating which utilizes the minimally invasive approach popularly known as the minimally invasive percutaneous plate osteosynthesis technique can be said to be the latest entrant in this list.^{7,8}

On the other hand, the classical intramedullary nailing is minimally invasive, but it has the main drawback of potentially damaging the rotator cuff and causing shoulder impingement. Much of the problem is believed to be due to either subacromial impingement caused by a prominent nail or scar tissue and/or damage to the rotator cuff in its critical zone of hypovascularity creating chronic tendon tearing.⁹

Recently, in seeking minimally invasive techniques, a new therapeutic option has arisen for treating these fractures: bridge plates. This technique brings together the ease of handling of plates and the relative stability principle of nails. Although there are still only a few studies on this, the initial results have been very satisfactory. The aim of the present study was to report the experience of our shoulder and elbow surgery group relating to treatment of fractures of the humerus, by means of the bridge plate technique, using an anterior route.

METHODS

The present study included twenty patients suffering from humerus shaft fracture. The study was done for a total period of two years March 2014 to February 2016, which included the follow up period also at our centre of medical institute. Before the start of the study, the ethical clearance certificate was taken from the ethical committee of the institute. Before the inclusion of the patients in the study, they were prior informed about the study and the informed consent was signed from the included patients. All the surgeries were done by the same surgeon of the institute and during the procedure the fractures were reduced and fixed with 4.5 mm narrow dynamic compression plate.

The inclusion and exclusion criterion were as follows: the entire number patient included in the study were between the age period of 20 to 60 years of age and did agreed to participate in the study. All the surgeries were performed within the time period of 4 days of the injury. In the exclusion criterion patients with bilateral fracture of the limbs, more complex fracture, patient with other medical illness such as vascular insufficiency of the upper limb, malignancy of the limb and patient addicted to any drug.

Before the surgery the preoperative clinical examination of the fractured arm was done in respect to points like swelling, puckering, contusions and abrasions. Radiographic evaluation was done for appropriate planning of the surgery and also to decide the appropriate length of implant used in the surgery. The radiographs used in the study were anterior posterior and lateral radiographs of the humerus.

The immobilization of the operated shoulder was done till the stitches were removed and average period of the three weeks were kept for immobilization of the shoulder. At the end of the period of immobilization, the patients were asked to perform the active gentle limb range of motion exercises on the basis of their permission of the pain control.

The patients were asked to take out the immobilizer and perform the exercises for ten minutes at the gap of one hour. Next was the role to perform the exercise with the help of physiotherapist to avoid the stiffness of the joint and early recovery to occur. The main aim was to attain full muscular strength and full mobility as early as possible. Later the follow-up was done by the same surgeon. Regular follow up was done at the interval of two weeks for the period of six months.

Assessment of the fully functional shoulder was done by the UCLA score and the Mayo elbow performance score. The grading of the UCLA score was done as follows: score more than 27 points were graded as excellent to good, if the points were less than 27 as it was considered as fair to poor. Mayo elbow performance score was graded as follows: excellent if points more than 90, good if the points are between 75–89 points, fair if points are between 60–74 and if points were less than 60 then it's considered as poor. Later on the radiographs were taken to assess the improvement in the shoulder injury healing.

RESULTS

The totals of twenty patients were included in the study. Out of total twenty patients 12 were males and 8 were females with the average age of 40 years. Dominant side fracture was found in 16 patients out of total 20. The average time for the surgery for the entire patient was 60 minutes. The average mean union time was found to be one and half months for initial union of surgery.

On the basis of the UCLA score the excellent to good score were found in 16 cases, fair score in rest 4 patients. Less than 5° of valgus angulation intra operatively and on following these patients up, in 4 of the cases the angulation was found to be of acceptable alignment. In the two cases, 5° of varus, angulations was found at the end of one year but it did not affect the functional outcome. When the determination of the functional outcome was done, 16 cases were found to have excellent to good outcome.

Table 1: Demographic data of the study.

Gender	Male	Female
Number	12	8
Side fracture	Dominant	Non dominant
	16	4

Table 2: ULCA score assessment.

Score	Number
Excellent to good	16
Fair	4
Poor	0
Total	20

DISCUSSION

Minimally invasive technique for fracture treatment has evolved based on the idea that with the preservation of fracture haematoma and the vascularise around the fracture site, new bone is layed down in the form of callus and led to the success of the MIPPO technique for fracture fixation at other sites and lies in the fact that using long plates across zones of extensive fracture fragmentation with only few screws on either side of the fracture.^{10,11}

It is now known from the literature that fixation of diaphyseal fractures of long bones should preferentially be done using the principle of relative stability, by means of minimally invasive techniques, thereby enabling formation of a bone callus.

The humerus bone has a wide range of acceptability criteria in its reduction and is highly amenable to conservative management. However, it requires the continuous use of a cast/splint for 6–8 weeks, which is usually cumbersome for the patient. This option is not very suitable for young active individuals who need to begin their activities at the earliest. So, these patients are better suited for an early operative intervention.¹²

According to the recent modern biological-fixation theory, minimally invasive plating osteosynthesis and IMN have emerged as typical surgical biologic fixation procedures. Neither the fracture sites nor the radial nerves need to be dissected when performing minimally invasive plating osteosynthesis using an anteriorly placed plate to

treat humeral shaft fractures. However, during IMN, the nail needs to be inserted into the bone marrow cavity, including the fracture segment. For intraoperative clinical application, the danger zone for the radial nerve is approximately three to five-eighths of the humeral length measured from the tip of the acromion process to the lateral epicondyle when the humeral length is divided into 8 parts.¹³

Union of the humeral shaft fractures in this series presents good results with fixation through indirect reduction aims at maintaining bone alignment through mini incision and replacing absolute stability by relative stability. This bridge-plate technique can be used even for the treatment of humeral shaft non-union. The present technique through its less tissue dissection and periosteal stripping makes a promising modality of treatment.

CONCLUSION

Anterior bridge plating after anterior approach is safe and reproducible option, respects the principles of biological fixation with minimal soft tissue dissection, preserves fracture haematoma and periosteal blood supply, and is more forgiving in comminute fractures of the diaphysis.

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