

The Functional Outcome of Shaft of Humerus fractures Treated With Anterior Bridge plating Y

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Abstract

Introduction: The prevalent operative treatment options for shaft of humerus fractures include Open reduction and plating, closed reduction and fixation with interlocking nail. However many authors have advocated Minimally invasive percutaneous plate osteosynthesis (MIPPO) as a less traumatic, favorable and reproducible technique recently. Clinical, radiological and functional outcome of 15 patients with shaft of humerus fractures treated with anterior bridge plating, were studied and analyzed with an average follow up period of 9.4 months. **Materials and Methods:** Fifteen patients with humerus shaft fracture, managed with anterior bridge plating in MIPPO mode from Dec 2018 to May 2020 were included in the series. A 10 to 12 holed locking compression plate or dynamic compression plate was used on the anterolateral surface of humerus through minimal incisions for fixation of the fracture after closed reduction. Age of occurrence, side, gender ratio, time taken for fracture union, malalignment/angulation/shortening, range of movement at elbow and shoulder and complications were studied. Constant Murley score for shoulder and Mayo elbow performance score was used to assess the functional outcome. **Results:** The mean age of the study group of 15 patients was 42.7 yrs. with maximum number of patients coming in 40-60yrs range. Of the 15 patients, 9 were males and 6 were females. Majority of the patients (60%) had their non dominant side fractured. The average time for union was 11.9 weeks, range being 8-20 weeks. In accordance with constant Murley score, 14 patients had excellent results and 1 patient had good result. In accordance with Mayo elbow performance score, all 15 patients had excellent elbow function score. 2 out of the 15 patients developed post operative radial nerve palsy, one of which recovered by 6 months and the other had to be planned for tendon transfers. **Conclusion:** The study confirmed a better union rate and excellent functional outcome for shaft of humerus fractures treated with anterior bridge plating. The better union rates can be attributed to the biologic fixation and relative stability which along with early mobilization supports union with abundant callus and less scar.

Keywords: Anterior Bridge plating, Humerus shaft fractures, minimally invasive percutaneous plate osteosynthesis (MIPPO). Prevalence, Socio-economic status.

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Introduction

The spectrum of shaft of humerus fractures includes transverse, spiral, oblique and comminuted fractures, all of which may be either open or closed.

Various treatment modalities involve conservative management with velpau strapping, functional cast bracing or operative management with open reduction and plating, closed intramedullary nailing or TENS in pediatric age group.

Each of these methods have evolved over time with their own advantages and complications.

Previously, importance was given to absolute anatomical reduction and rigid fixation but has been growing out of trend lately. This has been attributed to the development and understanding of biologic fixation of fractures, which has been showing promising results.

Also precise reduction and absolute stable fixation has its biologic price[1]. Evidence shows, that a biologic fixation is far more

superior over stable mechanical fixation[2]. We, at our hospital have evaluated the clinical, functional and radiological outcomes of anterior bridge plating of humerus fractures over a period of 2 years, with an average follow up time of 10 months.

Materials and Methods

Fifteen patients with humerus shaft fractures were treated with anterior bridge plating with MIPPO techniques, between Dec 2018 and May 2020. The cases were followed up for a period of 9 to 12 months. Fractures were reduced on table and a 4.5mm narrow Locking compression plate (LCP) or Dynamic compression plate (DCP) was used for fixation with minimally invasive technique.

Inclusion criteria included patients with shaft of humerus fractures within an age range of 20 to 60 years. Patients with open fractures and neurovascular injury was excluded out of the study. Other patients excluded include polytraumapatient and those with medical comorbidities.

Preoperative workup included thorough clinical examination for neurovascular injury, local skin condition, general pre operative tests and radiographs of the arm in anteroposterior and lateral views.

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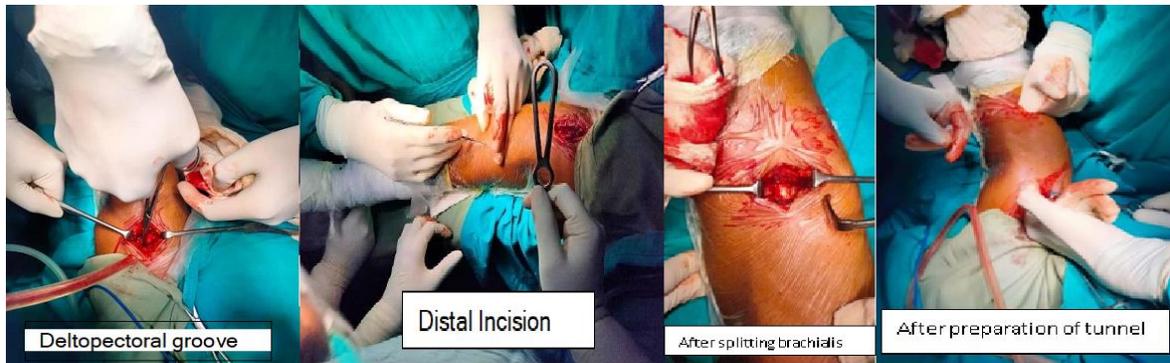


Fig 1: Surgical technique

After appropriate anesthesia, with the patient in supine position, arm and forearm in fully supinated position, two surgical windows were made on the anterior aspect of the arm. Proximal incision is in the deltopectoral groove while the distal is in the midline, 3cm proximal to the elbow crease, the interval being between brachioradialis and biceps. Brachialis is split in the middle to reach the bone. The proximal and distal windows are connected in submuscular plane with the help of a periosteal elevator or the plate with the help of the drill guide. Before the plate is introduced, the fracture is held in reduction by the assistant. The plate is then slid along the submuscular tunnel and held in place with k wires or bone holders. Locking screws are inserted in to the distal most and the proximal most 2 screws. Sometimes an additional unicortical screw may also be added. The plate essentially bridges the fracture site and is fixed with relative stability across it. Reduction is checked under image intensifier and shoulder immobilizer is applied post operatively.

Postoperative follow-up

Post operatively, reduction was checked under image intensifier and the arm was immobilized with shoulder immobilizer. Regular dressings were done, and sutures were removed on POD 10. Shoulder immobilizer was continued for 3 weeks, and patients were advised to perform gentle range of movement exercises of shoulder and elbow as pain permits. Review radiographs were taken after a month and physiotherapy was started as and when radiographs showed signs of healing with callus formation. Time for fracture union and complications if any were noted. Patients were followed up monthly for 6 months and later once in every 3 months for an year. Shoulder and elbow functional outcome were assessed with constant Murley score and Mayo elbow performance score[3, 4]. Fracture union was assessed on Antero posterior and lateral radiographs as presence of bridging callus in 3 of the 4 cortices.

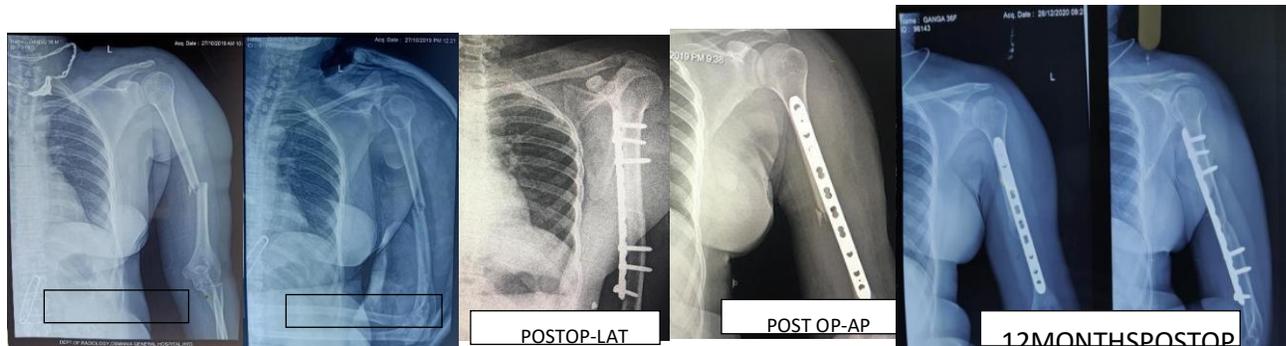


Fig 2: Post Operative Outcomes



Fig 3: Functional Outcomes

Results

Out of the 15 patients studied, 9 were male and 6 were female. The longest follow up was 1 year, with average follow up duration around 9.4 months. Average age of incidence was found to be around 42.7yrs with a majority involving the non-dominant hand. Majority (73.3%) of the fractures were caused by road traffic accidents and the remaining by accidental fall. Among the 15 cases, 6 cases had no angulation, 5 cases had minimum angulation of less than 10 degree of varus, which remodeled to correct alignment in due course of time. 3 cases had >10-degree angulation which caused no functional impairment. No cases had valgus angulation. None of the patients had any rotational malalignment or shortening. Mean union time is 11.0 weeks ranging from 8 – 20 weeks. With respect to shoulder range of motion, among 15

patients, 9 patients (60%) had excellent results, 4 patients (26.7%) had good results and 2 patients (13.3%) had fair results and none had poor results (CONSTANT MURLEY SHOULDER SCORING). With respect to elbow range of motion, among 15 patients, 12 patients (80%) had excellent results and 3 patients (20%) had good results (MAYO ELBOW PERFORMANCE SCORE). Mean surgical time was 69 minutes (range – 60 to 90 minutes) and average blood loss with MIPPO was 109ml (range – 75 to 150 mins).

2 among the 15 cases had post operative radial nerve palsy, one of which recovered in 6 months with conservative management and tendon transfer was planned for the second case which did not recover over 1 year.

Discussion

Tscherne and Krettek first reported minimal invasive osteosynthesis for supracondylar fracture of humerus in 1996. Later it has been practiced in various other fractures. The results of various studies have quoted good fracture healing and functional outcome for the technique. Minimal complications have been reported, which probably reduces with expertise in the method. Compared to conventional and popular open reduction and plating, MIPPO technique has a comparatively lower risk of iatrogenic nerve injury, damage to soft tissues and vascularity of the bone. Excellent to good results have been achieved with sub brachialis plating with no major soft tissue problems and with functional results as per other methods [6]. Open technique of plating interferes with the local vascularity, leading to osteonecrosis underneath the plate, which may cause delayed healing to non-healing (published rate of nonunion being 5.8%) [7]. This bridge-plate technique can be used even for the treatment of humeral shaft nonunion (both atrophic and hypertrophic nonunion) [8].

In conclusion, minimally invasive percutaneous plate osteosynthesis offers excellent outcome for shaft of humerus fractures with better union rate and decreased risk of nonunion compared to open reduction and plating. There is minimal blood loss and chance of infection due to the smaller surgical field.

It shows a better union rate and functional outcome compared to open reduction and plating. The scar produced is also smaller and hence has a better acceptability among the patients.

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