

Efficacy of Different Methods of Fixation of Proximal Humerus and Functional Outcome

Dr Neelangowda VP patil¹, Dr.S. H Bellad², Dr.Raghavendra MS³

¹MS ortho, Associate professor, ,

²MS ortho, Assistant professor,

³MBBS, junior resident,

Mysore medical collage and research institute,Mysore

Abstract

Introduction: Fractures of proximal humerus are not uncommon especially in older age group and as the elderly age group people substantially increasing, we expect more numbers people with these fracture. Objective of this study was to understand functional results and complications of 3 part proximal humerus fractures treated with tension band wiring and proximal humerus locking plate
Materials and methods: The proposed study is a hospital based prospective study. It was done between 2003 and 2013. 60 patients of proximal humeral fractures were operated with a mean follow up 1 ½ year (12-36 months).The average interval between fracture and surgery was 3.55 days. All the fracture treated according to fracture pathology by different surgical technique.

Results: The final results are graded according to Neer scoring criteria. We had good to excellent results in 54(90%) of patients. Unsatisfactory results were seen in 6 (15%) patients. 6 cases which were reported poor had mild to moderate pain (n=4) and joint stiffness (n=2). Complication included superficial infection (n=1), secondary displacement and malunion (n=2), plate impingement (n=1) and Avascular necrosis (n=1). Results were compared with other similar study and analyzed.

Conclusion: The surgical management of proximal humerus fracture is demanding. Results are best when the operative method results in stable fixation that allows early passive mobilization .Tension band wiring in adults is simple and preferred fixation device . Philos plate is good device with excellent results in elderly .

n=number of cases

key words: proximal humerus, surgical management, Tension band wiring,

I. Introduction

The field of orthopedic surgery has been in the vanguard in creating new information, establishing new principles of treatment and solving both new and old problems of musculoskeletal system.Fractures of proximal humerus are still unsolved fractures in many ways. Disagreement exists regarding reliability of classification system. The indications for surgical management continue to be modified. Fixation techniques are myriad and none is ideal for all cases¹.

Fractures of proximal humerus are not uncommon especially in older age group. They have been reported to account 4% - 5% of all fractures^{1,2}. About 85% of these fractures are minimally displaced or non -displaced and are effectively treated symptomatically with immobilization followed by early motion. The remaining 15% of fractures are displaced unstable and may have disruption of the blood supply. The treatment of these fractures is therapeutic challenge. Displaced and unstable extra-articular fractures are most commonly treated by operative reduction and fixation using various technique^{1,3}

The treatment is more controversial for articular fractures which carry a high risk of the humeral head necrosis. In Neer's classification, these are two part anatomical neck, three-part and four-part fracture and those with dislocation of head of humerus. A review of published result suggests that there is no universally accepted form of treatment. Conservative management may be associated with non union, malunion, and avascular necrosis resulting in painful dysfunction.^{4, 5, and 6}

Studies which report poor result of internal fixation have been carried out on elderly patients with poor bone quality and have not assessed the quality of reduction obtained with operative intervention.^{6, 7} conversely series with a favorable outcome have frequently consisted of younger patients with good

bone quality. Current therapeutic options: for proximal humerus fractures are humerus nails, plates, tension band wiring, and percutaneous (or) minimally invasive technique such as pinning, Intramedullary flexible nails, 'screw osteosynthesis and'hemiarthoplasties.^{3,4,7,8,9,10,11,12,13,14, and 15}

The Choice of technique and devices depends on quality of bone, soft tissue, age and reliability of patients. However the goal of proximal Humerus fracture fixation should be stable reduction allowing early motion of fracture. This study is conducted to analyze the results of proximal humerus fractures following various surgical modalities of treatment.

II. Materials and methods:

The proposed study is a hospital based prospective study. It was done between 2003 and 2009. 60 patients of proximal humeral fractures were operated with a mean follow up 1 ½ year (12-36 months). The present study was conducted to assess the results of three part proximal humeral fractures treated surgically in our institution. On admission of the patient a careful history was elicited from the patients and/or attendants of injury and severity of trauma. The patients were then assessed clinically to evaluate their general condition and the local injury. The general condition of the patient and the vital signs were recorded. Methodical examination was done to rule out fractures at other sides. Local neurologic deficit of axillary nerve was assessed. Radiograph of proximal humerus i.e., antero-posterior view and axillary view were taken and fractures were classified according to Neer, classification Limb was immobilized in U-slab and arm pouch till the patient taken up for surgery internal fixation which can be anatomically reduced. This is dependent on various factors such as type of fracture, the quality of the bone and the technique of reduction and fixation.

Fracture pattern and method of treatment: In our study we selected all 60 cases of three part fracture of proximal humerus out of which 3 had fracture dislocation. Randomly selected 30 Patients (50%) with 3 part surgical neck humerus fracture with or without dislocation were treated with open reduction and internal fixation with plate and screw. We have used buttress plate in all of them. Deltopectoral approach was used. Other group of 30 Patients (50%) with three part fracture with or without dislocation (n=10) were treated with open reduction and internal fixation with Intramedullary K-wire and tension band wiring. Long head of biceps important landmark in identifying fracture fragments. In most three part fracture the greater tuberosity is displaced from the shaft and from head and also lesser tuberosity fragment. Greater tuberosity line is posterior to bicipital groove. first greater tuberosity and lesser tuberosity reduced to head and made into two part fracture held securely with k-wire. Then neck fracture reduced by placing k-wire which are holding the two tuberosity in to medullary cavity, then making drill hole in shaft tension band wiring done.

Postoperative management:^{3, 4,5,20} all patients are immobilized in arm pouch with cuff and collar sling. Appropriate antibiotics and analgesics were used. Immediate post operative radiographs were taken to determine the bone alignment and maintenance of reduction. Patients were followed every week in first month and every 2-3 weeks for 6 months. The active range of motion was started at 2-4 weeks, postoperatively, depending on stability of osteosynthesis and bone quality. The sling is discontinued by 8-12 weeks depending upon fracture stability. Further follow ups were done at 8 weeks and 12 weeks and 24 weeks. The patients were examined clinically and radiologically, assessed for range of motion and bony union and complication. Patients with shoulder stiffness were given physiotherapy for 7 days to 15 days, on outpatient basis.

III. Results:

In our study 55% of patients were between 18-37 and average age being 39 years. Most of the younger patients in our study were due to fractures following in violent injury. Injury was minor fall in a patients aged above 40 years and especially in osteoporotic females. In our present study fracture occurred on right side in 13 patients and on left side in 7 patients. The average interval between fracture and surgery was 3.55 days in our study The final results were evaluated using Neer score, this system based on 100 units.⁵ Pain is the most important consideration to the patient and is assigned 35 units. The result in any patient with significant pain is graded as failure The final results are graded according to Neer scoring criteria. We had good and excellent results in 34(85%) of patients treated in our institution.

All patients with excellent results and satisfactory results had normal muscle function and functional range of motion according to Neer's Criteria. We had unsatisfactory results in 6 (15%) patients. The unsatisfactory results were seen in one case with the associated ipsilateral olecranon fracture and radial head fracture where rehabilitation was difficult. In 2 cases with 3-part fracture dislocation treated with tension band wiring where fixation was not stable because of gross osteoporosis. In other two cases where fracture was comminuted and rehabilitation was delayed. In another similar study of Siebler et al reported better results in younger patients with isolated shoulder injury and patients with 2 or 3 part fractures. The poor results found in, 25% of patients were due to more complex fracture in elderly patients¹³

Complication in our study included 1 case of superficial infection, 2 cases of secondary displacement, 1 case malunion, 1 case of plate impingement. 1 case of avascular necrosis. We had 6 cases which were reported poor having mild to moderate pain (n=4 cases) and joint stiffness (n=2)

Superficial infection occurred in 1 patient. The infection was controlled with appropriate antibiotics. Patient went on to have satisfactory bony healing with good functional outcome. Secondary displacement and malunion occurred in 2 cases. It was due to gross osteoporosis and in which closed reduction and percutaneous fixation of fracture was done in elderly female. In another case it was due to comminuted fracture treated with open reduction and internal fixation with plate in an elderly male patient, but patient had fair functional outcome. One patient had plate impingement and limitation of abduction, but on plate removal and physiotherapy patient had good range of motion.

The incidence of avascular necrosis ranges from 6% to 35% in different studies.^{3, 9} we had only one case of avascular necrosis in 65 year old patient with gross osteoporosis and delayed fixation was done (15 days following admission). 6 cases went on to have limitation of range of shoulder movements with mild to moderate pain and are considered poor results.

IV. Discussion:

The proximal humerus fracture management is challenge to orthopaedic surgeon. Even if we thoroughly analyze the injury and understand, literature the treatment of displaced fracture or fracture dislocation is difficult, because difficulty in attainment of normal anatomy. If fracture is treated only with rest followed by early motion, a functional deficit will develop and may be associated with pain. The external support is difficult to apply effectively because fracture site is adjacent to trunk. Many studies have shown that the displaced fracture of the proximal humerus have a poor functional prognosis when left untreated because of severe displacement of fragments.^{4, 5} Numerous investigators have described the various surgical treatments for displaced proximal humerus fracture but there is lack of consensus on optimal treatment of displaced proximal humeral fractures which account for about 20% of fractures. In comparison to other study on surgical management of proximal humerus we had better results. Which we attribute younger patients and less complex fracture. Gerber-C et al³ study on internal fixation of proximal humerus fracture by various surgical modalities similar to our study has reported significant good results in 65% of patients with an average Constant score of 83%. They also had 35% of avascular necrosis with average constant score of 66 points which attributed to the more complexity of fracture than in our study.⁹ In another similar study of Siebler et al⁹ reported better results in younger patients with isolated shoulder injury and patients with 2 or 3 part fractures the poor results were found due to more complex fracture in elderly patients.

The best results are obtained if the fracture is well reduced and planned rehabilitation program followed. It must be the goal to select fractures for open reduction and internal fixation which can be anatomically reduced. This is dependent on various factors such as type of fracture, the quality of the bone and the technique of reduction and fixation.

V. Conclusion

Open reduction and plate fixation better option for proximal humerus fractures, but shoulder impingement and loss of fixation, axillary nerve injury are common problem. Open reduction and tension banding wiring in both two part surgical neck fracture and 3-part fracture (greater tuberosity and surgical neck) with or without dislocation is ideal cost effective, stable even in osteoporotic

fracture with less complication. Open reduction and internal fixation of two part fracture greater tuberosity with cancellous screw is necessary for better results.

The surgical management of proximal humerus fracture is demanding. Results are best when the operative method results in stable fixation that allows early passive mobilization.

The rehabilitation program plays important role in functional outcome of surgical management of proximal humerus fracture. The surgical management of displaced proximal humerus fracture gives excellent functional outcome and reduces the incidence of complication that follows conservative management

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