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Research Article

Evaluation of functional outcome of tension band wiring and intramedullary k-wir fixation in proximal humerus fracture

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ABSTRACT

Functional outcome after fixation of 2 –part, 3 part and 4-part proximal humerus fractures with intramedullary k-wire and tension band wiring. The proposed study is a hospital based prospective study. It was done between 2003 and 2013. 43patients (13females, 30males; mean age 37 years; range 22 to 64 years) with 2-part (n=14), 3 –part (n=22) and 4-part (n=7) proximal humeral fractures were operated. The average interval between fracture and surgery was 3.55 days and had a mean follow up of 1 ½ year (12-36 months). All fracture healed at period interval of 10-17 weeks. The final results are graded according to Neer's scoring criteria. We had unsatisfactory results in 5(15%) patients. Complication in our study included superficial infection (n=1), secondary displacement and malunion (n=2), and avascular necrosis (n=1). 2 patients had k-wire impingement managed only by k –wire removal at four week post operatively. Results were analyzed using constant murley' score taking opposite shoulder as control group. The results of the patients with regard to Constant-Murley score and Neer' criteria were indifferent when the 6th and the 12th month data were compared ($p<0.05$). Results are best when the operative method results in stable fixation that allows early passive mobilization. Tension band wiring technique is simpler to plate fixation or arthroplasty and can achieve stable fixation needed for early mobilization. Technique involves minimal soft tissue dissection hence retain blood supply to bone that helps to achieve osteosynthesis with better functional outcome.

KEYWORDS : Humerus fracture , tension band wiring , intramedullary k-wir fixation

INTRODUCTION:

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]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.[1]

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.[2, 3, and 4]

Materials and methods: The proposed study is a hospital based prospective study. It was done between 2003 and 2013. 43patients (13females, 30males) with 2-part (n=14), 3 –part (n=22) and 4-part (n=7) proximal humeral fractures were operated. Inclusion criteria in study were all case of proximal humerus fracture in adults after skeletal maturity with normal opposite shoulder. Pathological fracture, fracture dislocation, fractures with previous shoulder surgery

on affected side and case of fracture nonunion. The mean age of patients 37 years(range 22 to 64 years) .The average interval between fracture and surgery was 3.55 days and had a mean follow up of 1 ½ year (12-36 months).

All patients were treated with open reduction and internal fixation with Intramedullary K-wire and tension band wiring [3, 4 10].Delto-pectoral approach was used and 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. Grater tuberosity line is posterior to bicepital 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, 4,5,12] 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 12-16 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. 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.

RESULTS:

The final results were evaluated using Neer score, this system based on100 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. All fracture healed at period interval of 10-17 weeks. The final results are graded according to Neer's scoring criteria.38 patients had excellent to satisfactory results. We had unsatisfactory results in 6(7.2%) patients. Complication in our study included superficial infection (n=1), secondary displacement and malunion (n=2), and avascular necrosis (n=1). 2 patients had k-wire impingement managed only by k –wire removal at four week post operatively. Results were analyzed using constant murley' score taking opposite shoulder as control group. The mean constant score was 72.8 in injured shoulder compared to 88.6 in contralateral normal shoulder at 6 month. The results of the patients with regard to Constant-Murley score and Neer' criteria were indifferent when the 6th and the 12th month data were compared ($p<0.05$).

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. Cuomo et al.[12] reported good or excellent results in all eight patients' treated with open reduction and internal fixation using inter fragmentary sutures with the addition of Enders rods if surgical neck comminution were present. Hawkins et al. [14] examined the functional result, range of motion, and level of pain in 14 patients with three-part proximal humerus fracture treated with tension band wiring and found good functional results in the majority of patients. Furthermore, in all but three patients, either relief of pain was complete or pain occurred only occasionally. The average elevation achieved was 126 degrees, active external rotation of 29 degrees, and internal rotation to L2 vertebrae. There were no cases of nonunion or significant malunion. In two patients avascular necrosis developed, but only one of them required hemi-arthroplasty. In cases when there is significant osteoporosis and the quality of bone is poor, some authors recommend immediate prosthetic head replacement [18,19] Tanner and Cofield [18]analyzed 16patients with acute three- and four-part fractures treated with hemi-arthroplasty and found pain relief in all of the 16 shoulders. However, the return of function was less predictable and dependent on the security of tuberosity-muscle cuff repair, sufficient protection after surgery, and long-term rehabilitation.

In comparison to other study on surgical management of proximal humerus with tension band wiring and intramedullary k- wire fixation we had fewer complications and significant number of excellent results (92.8%). Which we attribute younger patients(less osteopenia) and less complex fracture. 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 and also post-operative rehabilitation.

CONCLUSION:

Open reduction and tension banding wiring in both two part surgical neck fracture and 3-part fracture (greater tuberosity and surgical neck) without dislocation is ideal cost effective, stable even in osteoporotic fracture with less complication. The 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. Tension band wiring technique involves minimal soft tissue dissection hence retain blood supply to bone and can achieve osteosynthesis with better functional outcome. Technique is simpler to plate fixation or arthroplasty and can achieve stable fixation needed for early mobilization.

Table 1

Author	No.of cases	Technique	Excellent%	Satisfactory%	Unsatisfactory%	Poor %
Hawakins[15]	15	Tension band wire	40	40	20	0
Flatow[21]	12	Suture	50	50	0	0
Dardar and Dardar[24]	33	Intramedullary K-wire & TBW	0	64	30	6
Our study.	43	Intramedullary K-wire & TBW	0	92%	8%	0

Figure 1

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