

Functional Outcome of Fractures of Upper End Humerus In Adults Treated With Percutaneous K Wire Fixation:A Study At Rural Medical College In Central India.

Dr.Sanjay .R.Bharti¹,Dr.Vishal.R.Desai²

¹(Department of Orthopaedics,SVNGMCYavatmal/MUHS ,India)

²(Department of Orthopaedics,SVNGMCYavatmal/MUHS ,India)

Corresponding Author: Dr.Sanjay .R.Bharti

Abstract: The management of fractures of the proximal humerus has always been a challenge to the orthopaedic surgeons. The significant increase in the number of cases is noted due to increase in the number of elderly people with osteoporotic bones and also due to increase in the incidence of high velocity road traffic accidents resulting in fractures of proximal humerus in young adults.

Various modalities of internal and external fixation have been tried to get the best possible results ,but no single method has given uniformly good results in everybody's hands. Out of the various modalities described closed reduction and percutaneous pinning is minimally invasive method with minimal damage to the soft tissues.The purpose of the study was to evaluate the management of fractures of proximal humerus by closed reduction and percutaneous fixation by smooth Kirschner wires.

In our study 32 patients with two ,three and valgus impacted four part fractures of proximal humerus were treated with closed reduction and percutaneous pinning using smooth Kirschner wires, between February 2008 to June 2012.The post operative results were assessed with the help of University of California,Los Angeles(ULCA) shoulder score of 35 points.

At the mean follow up of 28.02 months post operatively ,there were 75%Excellent/Good results and none of them developed avascular necrosis nor required any revision surgery. Pin migration was the commonest complication.

Date of Submission: 10-09-2018

Date of acceptance: 27-09-2018

I. Introduction

Fractures of the proximal humerus are common injuries accounting for 4% to 5% of all fractures [1]. The incidence sharply increases in the elderly with 71% of all proximal humeral fractures occurring in patients over the age of 60 years .The overall female to male ratio has been reported to be 3:1 but may reach 7:1 in ageing populations[2].Many proximal humeral fractures are minimally displaced and can be treated non operatively successfully.[3] A short period of immobilisation is followed by early motion yields predictably high union rates and good outcomes [2].The remaining 15% of proximal proximal humeral fractures are considered displaced .Unless medical contraindications exist ,operative management is recommended ,because closed treatment of these fractures generally leads to poor results.[4]

Codman first noted that the proximal humerus tends to fracture along physseallines[3].Four fragments may be created :the shaft ,the articular surface and the greater and lesser tuberosities. Neer [3]based his classification system on these observations .A fragment is considered displaced if it is separated by more than one cm or is angulated more than 45 degrees .Neer's classification system [5]remains widely used in both clinical practice and research.

Multiple surgical treatment options have been reported. Traditional techniques include open reduction and internal fixation(ORIF) with plates and screws ,intra medullary nails, tension band wiring and suture fixation[4].As displaced fractures of greater tuberosities are associated with large amounts of soft tissue injury which can be avoided by arthroscopic assessment before open treatment, has been reported.[6] .Increasing attention has been focused on the importance of preservation of blood supply of proximal humerus and careful handling of soft tissue [7].Although open reduction and internal fixation of proximal humeral fractures may obtain stable fixation and anatomical reduction ,significant exposure is often required . Minimal invasive techniques with less disruption of soft tissues may offer advantages over conventional fixation .Closed reduction and percutaneous fixation is a less invasive option in properly selected patients for these fractures in all age groups[8].

Closed reduction and percutaneous fixation was reported first by Bohler in 1962 but has received more attention in recent literature[9].The potential advantages compared with open reduction and internal fixation

include higher union rates, lower rates of avascular necrosis, decreased scar formation at scapula –humeral interface [9] and improved cosmetics.

II. Materials and methods

The present study was carried out at ShriVasantraoNaikGovt.Medical college at Yavatmal during the time frame of February 2008 to June 2012. A total of 32 indoor patients of fracture of proximal humerus were included in the study.

Study Design : Randomized clinical trial.

Study location: This was a study carried out at tertiary care teaching hospital in rural Maharashtra affiliated to Maharashtra university of Health Sciences, India.

Study duration : 32 patients of fracture of proximal humerus were treated and followed from February 2008 to June 2012.

Subjects and Selection : Criteria was as follows: adult male and female patients with two, three and valgus impacted four part proximal humeral fractures revealed on radiographs or having closed injury to proximal humerus. Patients not willing for the surgery were excluded.

Procedure: On admission a detailed history was obtained to ascertain the mechanism of injury and severity of trauma. Patients were examined for shoulder pathology regarding deformity, swelling, skin and soft tissue tenderness, bony irregularity, crepitus and distal neurovascular status. After initial stabilization arm was immobilized in a pouch arm sling.

Radiological evaluation was done by AP /lateral in abducted position and abduction could not be done due to pain then Velapeau axillary view was taken.

After performing all the preoperative formalities, surgery was performed under Brachial plexus block and added supraclavicular nerve block. Patient was positioned in a supine position with elevated shoulder to facilitate wire (smooth Kirschner wire 1.5mm, 1.8mm, 2mm) passage. All of the procedure was visualised under image intensifier. Anatomic closed reduction was achieved using different maneuvers for different fracture types. The different fractures reduced were two part surgical neck fractures, two part tuberosity fractures, three part greater tuberosity fractures, three part lesser tuberosity fractures, four part valgus impacted fractures.

Fractures were fixed using the K wires, the placement was confirmed in AP and lateral views and pins were passed from shaft to head, inferomedially to superomedially and slightly posteriorly to fix the humeral head. Then the tuberosities were fixed under fluoroscopic guidance.

Post Operative Protocol:

The arm was strapped to chest by strapping. The patients were examined every weekly for two weeks then every two weekly for next 10-12 weeks till union. Dressing was done around the K wires protruding outside the skin to detect superficial infection and to know the pin migration. Check radiographs were taken to know about loss of reduction, malalignment and pin migration. At the end of 4 weeks strapping was removed and fracture assessed for any mobility under image intensifier if adequate stability was achieved then gradual pendulum exercises were started. K wires were removed at six weeks and gradual strengthening and range of motion exercises started. Fracture union was assessed clinically by loss of tenderness and absence of mobility at fracture site. Radiological union was assessed by appearance of bridging callus and crossing trabeculae.

III. Observations and Results

Result was assessed using University of California, Los Angeles shoulder score (ULCA) [10] of 35 points.

Table:1 : Age and Gender distribution

Age groups	Number of cases	Percentage
20-40	6	18.75
41-60	15	46.875
>60	11	34.375
Gender		
Male	19	59.38
Female	13	40.62

Maximum patients were between 41-60 years of age. Males had 59.38% preponderance.

Table no : 2Mode of injury

Mode	Number of cases	Percentage
Road traffic accident	15	46.87%
Fall from height	2	6.25%
Trivial fall	14	43.75%
Convulsions and fall	1	3.13%

Road traffic accident followed by trivial fall were the two commonest mechanisms of injury.

Table no 3: Distribution of fractures according to side and type

Side	Number of cases	Percentage
Right	18	56.25%
Left	14	33.75%
Type		
Two part fracture	22	68.75%
Three part fracture	9	28.12%
Four part fracture	1	3.13%

Fractures were commoner on right side,commonest of the fractures was two part fractures.

Table no 4:Period between sustaining injury and surgery and Duration of hospital stay

Number of days	Number of cases	Percentage
Within 2 days	17	53.12%
2-5days	7	21.88%
>5days	8	25%
Duration of hospital stay		
1-2 days	19	59.37%
2-5days	9	28.13%
>5days	4	12.5%

Majority of the patients were operated within 2 days of sustaining trauma and discharged within 2 days.

Table no V : Associated injuries

Associated injuries	Number of cases	Percentage
Distal radius fractures	2	6.25%
Calcaneum fractures	1	3.12%
Femur fractures	1	3.12%
Tibia/fibula fractures	1	3.12%
Clavicle fractures	1	3.12%
Ankle Fractures	1	3.12%
Patella fractures	1	3.12%

Distal radius fracture was the commonest associated injury.

Table no 6:Agewise results and ULCA score.

Age	No.of cases with excellent/good results	Total no. of cases	Percentage with excellent /good results	Mean ULCA score
>60years	6	11	54.54%	25.45
41-60years	12	15	80%	28.33
<40 years	6	6	100%	31.16

Only 54.54% of the elderly patients(>60years)had excellent/good results ,whereas all the younger patients(<40years) had excellent /good results and better ULCA score.

Table no 7: Average fracture Union Time

Union time	Number of cases	Percentage
Less than 12 weeks	30	93.75%
More than 12 weeks	2	6.25%

Most of the fractures united in less than 12 weeks.

IV. Discussion

Treatment of proximal humeral fracture has been under discussion for several decades and various modalities of treatment methods are tried to get the best possible results.Out of the various modalities described the closed reduction and percutaneous pinning is a method for the treatment of selected fractures advantages of

minimally invasive techniques include higher union rates ,decreased scarring ,less chances of avascular necrosis and improved cosmetics.

According to Courtbrown CM et al .[11,12] 70 -80% of proximal humerus fractures occur in women while in our study only 40.62% patients were women and 59.38% were males.The higher ratio in our study could be attributed to Indian social pattern demanding males to be engaged in outdoor activities and driving automobiles thus exposing them to a greater risk for fractures in young individuals with high energy trauma.

In a study reported by Keener [9]average age of patients was 61 years and by Calvo[13]was 71years ,Herscovici [14]was 50yrs. Singh et al. [15]50.25 yrs. Our study showed an average of 54.09yrs with age distribution of 18.75%(20-40years),46.88%(40-60years)and 34.38%(>60 years).

According to previous literature more than three quarter of the proximal humerus fractures occur following low energy domestic falls but the road traffic accident was the commonest mode of injury (46.87%) in our studywhich could be attributed to rashly driven vehicles and negligence in following the traffic rules.14 patients had fractures followed by trivial fall which could be a result of osteoporosis in elderly age group.

In our study most of the fractures (93.75%)united within 12 weeks only 2 patients i.e 6.25%fracture took more than 12 weeks to unite .In study conducted by Keener [9]all patients achieved union by 12 weekswhile the patients in study by Singh et al. et al. took an average of 6-8 weeks.

Pin migration was the commonest complication in our studyin 10 patients i.e 31.25% cases.The pins migrated to the soft tissue around the shoulder and were removed by minor surgeries .Lyons and Rockwood [16]reviewed 37reports that included 47 instances of pin migration when used around the shoulder girdle. The pins migrated to heart and vessels including subclavianartery ,ascending aorta and pulmonary artery;lungs, mediastinum, cervical spine and spleen .Factors attributed to pin migration were respiratory motion and regional resorption of bone. A close follow up is essential to detect this complication at the earliest.

In our study superficial pin infection was developed in 4 patients(12.5%).All cases were treated with appropriate dosage of antibiotics.Deep infection was not noted in any of the cases.Singh et al.et al observed 4 (25%) patients developed pininfection of the site [15].

Malunion was present in 4 cases(12.5%) which was varus type and presented with pain which was effectively controlled by analgesics,osteotomy was not required in any case. In a study conducted by Singh et al.et al.17% of cases showed malunion.

Avascular necrosis was not noticed in our study which is in contrast to Jabreget.al[17] who reported avascular necrosis in two forms i.e localized area of avascular necrosis with sclerotic changes and collapse of articular cartilage which requires hemiarthroplasty. The chances of avascular necrosis are lower with closed reduction and percutaneous pinning than with open reduction and internal fixation.[18]The probable cause for higher rate of avascular necrosis in open reduction is due to violation of ofarcuate branch of anterior circumflex humeral artery .[19].The probable reason for not developing the avascular necrosis could be due to minimal handling of soft tissue by closed reduction and percutaneous pinning.

The ULCA shoulder score was used to evaluate the functional outcome .75% of our patients had good/excellent score which are fairly comparable to 76% of good/excellent results by Hessmann et al.[20],Singh et. al. had 65% of good/excellent result assessed by constants scoring system.

V. Conclusion

Proper selection of cases(two part,three part and valgus impacted four parts) is mandatory to obtain good results. Thorough knowledge of anatomy around proximal humerus is a must for the treating surgeon to achieve proper reduction to avoid neurovascular injury which would otherwise compromise the results .Proper preoperative planning and radiological examinationwith a 3D CT scan helps to understand proper fracture anatomy and hence better execution of preoperative plan.

The use of regional anaesthesia averted the use of general anaesthesia and reduced risks of morbidities in elderly patients withmedical conditions like hypertension ,ischemic heart disease etc.Pin migration was the commonest complication which was reduced by the use of threaded K wires and regular follow up. The rate of avascular necrosis is low with closed reduction and percutaneous pinning due to minimal handling of soft tissue.

Regular post operative follow up is mandatory to detect and treat the complications at the earliest. Also initiationand continuation of proper physiotherapy gives better results and function.

References

- [1]. Buhr AJ, Cooke AM ,Fracture patterns.*Lancet*. 1959 Mar 14;1(7072):531-6.
- [2]. Lind T, Krøner K, Jensen J.The epidemiology of fractures of the proximal humerus. *Arch Orthop Trauma Surg*. 1989;108(5):285-7.
- [3]. NeerCS.Displaced proximal humeral fractures. I. Classification and evaluation. *J Bone Joint Surg Am*. 1970 Sep;52(6):1077-89.
- [4]. Neer CS.Displaced proximal humeral fractures. II. Treatment of three-part and four-part displacement *J Bone Joint Surg Am*. 1970 Sep;52(6):1090-103.
- [5]. Sidor ML, Zuckerman JD, Lyon T, Koval K, Cuomo F, Schoenberg N.TheNeer classification system for proximal humeral fractures. An assessment of interobserver reliability and intraobserver reproducibility.*J Bone Joint Surg Am*. 1993 Dec;75(12):1745-50.

Functional Outcome Of Fractures Of Upper End Humerus In Adults Treated With Percutaneous..

- [6]. Taverna E, Sansone V, Battistella F Arthroscopic treatment for greater tuberosity fractures: rationale and surgical technique. *Arthroscopy*. 2004 Jul;20(6):e53-7.
- [7]. Schandelmaier P, Partenheimer A, Koenemann B, Grün OA, Krettek C. Distal femoral fractures and LISS stabilization. *Injury*. 2001 Dec;32(Suppl 3):SC55-63.
- [8]. Paradis G, Lavallee P, Gagnon N, Lemire L. Supracondylar fractures of the humerus in children. Technique and results of osseous percutaneous K-wire fixation. *Clinical Orthopaedics and Related Research* [01 Dec 1993(297):231-237]
- [9]. Keener JD, Parsons BO, Flatow EL, Rogers K, Williams GR, Galatz LM. Outcomes after percutaneous reduction and fixation of proximal humeral fractures. *J Shoulder Elbow Surg*. 2007 May-Jun;16(3):330-8. Epub 2007 Feb 22.
- [10]. Amstutz HC, Sew Hoy AL, Clarke IC. UCLA anatomic total shoulder arthroplasty. *Clin Orthop Relat Res*. 1981 Mar-Apr;(155):7-20.
- [11]. Court-Brown CM, Caesar B. Epidemiology of adult fractures: A review. *Injury*. 2006 Aug;37(8):691-7. Epub 2006 Jun 30.
- [12]. Court-Brown CM, Garg A, McQueen MM. The epidemiology of proximal humeral fractures. *Acta Orthop Scand*. 2001 Aug;72(4):365-71.
- [13]. Calvo E, de Miguel J, de la Cruz JJ, López-Martín N. Percutaneous fixation of displaced proximal humeral fractures: indications based on the correlation between clinical and radiographic results. *J Shoulder Elbow Surg*. 2007 Nov-Dec;16(6):774-81. Epub 2007 Oct 26.
- [14]. Herscovici D Jr, Saunders DT, Johnson MP, Sanders R, DiPasquale T. Percutaneous fixation of proximal humeral fractures. *Clin Orthop Relat Res*. 2000 Jun;(375):97-104.
- [15]. Singh, Daljit & Yamin, Mohd & Soni, Ashwini. (2010). Three And Four Part Fractures Of Proximal Humerus- Is Percutaneous K-wire Fixation A Good Option?. *Journal of Orthopaedics*. 2010;7(3):e11 https://www.researchgate.net/publication/47438203_Three_And_Four_Part_Fractures_Of_Proximal_Humerus-Is_Percutaneous_K-wire_Fixation_A_Good_Option
- [16]. Lyons FA, Rockwood CA Jr. Migration of pins used in operations on the shoulder. *J Bone Joint Surg Am*. 1990 Sep;72(8):1262-7.
- [17]. Jabergh H, Warner JJ, Jakob RP. Percutaneous stabilization of unstable fractures of the humerus. *The Journal of Bone and Joint Surgery. American Volume* [01 Apr 1992, 74(4):508-515]
- [18]. Kralinger F, Irenberger A, Lechner C, Wambacher M, Golser K, Sperner G. Comparison of open versus percutaneous treatment for humeral head fracture. *Der Unfallchirurg* [01 May 2006, 109(5):406-410]
- [19]. Gerber C, Schneeberger AG, Vinh TS. The arterial vascularization of the humeral head. An anatomical study. *J Bone Joint Surg Am*. 1990 Dec;72(10):1486-94.
- [20]. Hessmann M, Baumgaertel F, Gehling H, Klingelhoefter I, Gotzen L. Plate fixation of proximal humeral fractures with indirect reduction: surgical technique and results utilizing three shoulder scores. *Injury*. 1999 Sep;30(7):453-62.

Dr. Sanjay .R. Bharti" 'Functional Outcome of Fractures of Upper End Humerus In Adults Treated With Percutaneous K Wire Fixation: A Study At Rural Medical College In Central India..' IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 9, 2018, pp 31-35.