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STUDY ON COMPARATIVE ANALYSIS OF FUNCTIONAL OUTCOME OF OSTEOSYNTHESIS VERSUS ARTHROPLASTY IN COMMINUTED PROXIMAL HUMERUS FRACTURES IN ELDERLY POPULATION

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ABSTRACT **Introduction-** Comminuted proximal humerus fractures occur very commonly in elderly population because in older age, osteoporosis alters the elastic and strength characteristics of bone. Anatomical reduction and fixation becomes difficult in these cases. This study aimed to compare the functional outcome between osteosynthesis and shoulder arthroplasty in proximal comminuted humerus fractures. **Method-** In this study, 32 patients were taken out of which, follow up of 2 patients was lost. So the remaining 30 patients were divided into two equal groups, i.e., Group O-patients treated by osteosynthesis and Group A- patients treated by arthroplasty. Patients of age >60 years with Comminuted proximal humerus fracture were included. All the Clinico-demographical data were recorded and compared. All the patients were managed either by osteosynthesis or arthroplasty, followed up at regular intervals, and their functional outcome was assessed using the Constant Murley scoring system. **Results-** Statistically, no significant difference was observed in patients when complications were compared. While analysing the Murley score between both at every follow-up, group-A showed a maximum mean Murley score compared to group-O with a significant difference [p<0.0001*] between them. **Conclusion-** Both the tools are effective in management of osteoporotic comminuted proximal humerus fracture. However, the Murley score indicates that the arthroplasty group had a better functional outcome.

KEYWORDS : Proximal Humeral Fracture, Shoulder Arthroplasty, Osteosynthesis, Murley Scoring System.

INTRODUCTION

A fracture occurring at or near the surgical neck of the humerus is termed as a proximal humeral fracture (PHF). In adults, it is the most common fracture of the shoulder girdle, and its prevalence is increasing. PHF accounted for 4% of all fractures and half of all humerus fractures around 50 years ago. [1] Predominantly osteoporotic fractures of the proximal humerus occur in patients of 65 years of age and older, accounting for 10% of all fractures in this group of individuals.

The elastic and strength characteristics of bone are altered as a result of osteoporosis and ageing.[2]For these fractures, the Neer's classification method is extensively utilised. Only 20% of proximal humerus fractures that are unstable, displaced, or fractured into three or four parts will benefit from surgery.

Many surgical alternatives exist, including open reduction and internal fixation, closed reduction and percutaneous pinning (CRPP), hemiarthroplasty (HA), and reverse total shoulder arthroplasty (RSA). [3] If a fracture is stable and slightly dislocated, nonoperative therapy with short-term immobilisation is a well-accepted.

Recent studies indicate that a considerable percentage of surgeons choose shoulder arthroplasty and operational fixation over a variety of fracture forms in the elderly. [5]Primary arthroplasty should be attempted in fractures when adequate reduction and stabilisation are not possible, and the head fragment's vascularity is damaged or at stake.

Osteosynthesis with locking plate fixation (LPF) has shown to be the gold standard in the majority of remaining instances, particularly when there is a displacement of the tuberosities. [6] As a result, we want to investigate the clinical outcomes of osteosynthesis vs arthroplasty in proximal commuted humerus fractures.

MATERIAL & METHODS

This study was conducted in the Department of Orthopedics, SRN Hospital, Prayagraj. This prospective comparative study was conducted from march 2020 to February 2022.

The patient presented in the outpatient and emergency department and satisfied the inclusion (age >60 years, Comminuted proximal humerus fracture NEERS TYPE 4) and exclusion criteria (Age <60 years, Polytrauma, Immunocompromised and medically unfit for surgery ie; uncontrolled HTN/DM and Proximal humerus fractures, i.e., Neers type 1, 2,3and 5). After taking valid informed consent, patients were divided into two groups of 15 each.

Group O- patients were treated by osteosynthesis, and Group A- patients were treated by arthroplasty. All the patients were evaluated with history and clinical examination and routine investigations. A radiological examination was also done (Chest radiography, MRI).

Routine antibiotics, analgesics /anti-inflammatory drugs were administered and patients were prepared for surgery.

Methods of surgery;

1. Osteosynthesis by locking plate; Pre-operative informed consent was taken and patient was shifted to operation theatre, patient placed supine and shoulder was elevated using a beanbag. Painted and draped. Deltopectoral approach used.

Fracture fragments were reduced and fixed temporarily with k wire and rotator cuff by sutures.

final fixation was done by Placing the PHILOS locking plate posterior to the biceps tendon and about 1cm below to the tip of the greater tuberosity. Plate was fixed with locking screws and closed with sutures.

Fig.1: Pre operative X-ray showing AP view shoulder with comminuted proximal humerus fracture

Fig. 2 : Intra operative view of osteosynthesis with locking plate

Fig. 3: Immediate post opearative X-ray AP and lateral views of fixed locking plate on proximal humerus

2. Arthroplasty; here also the pre operative informed consent was taken and then patient was shifted to operation theatre he was placed supine, shoulder was elevated same as previous procedure. Proximal humerus was exposed by deltopectoral approach. Tuberosity fragments were Identified and tagged.

Humeral head was extracted. Rotator cuff integrity and healthy glenoid surface confirmed and humeral canal prepared. Humeral component was inserted with cement in adequate retroversion and length. Then humeral head placed. Obtained graft from humeral head was place around proximal humeral stem. Tuberosities were reduced around stem and tied. Wound closed with sutures.

Fig. 4: Pre operative X-ray AP view of left shoulder with comminute proximal humerus fracture

Fig. 5 : Intra operative view of deltopectoral approach

Fig. 6 : Intra operative view showing implant stem fitted in humerus shaft canal

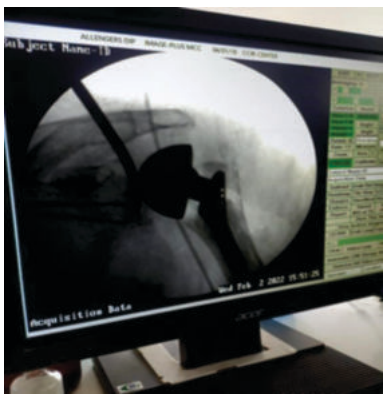

Fig. 7: Post operative X-ray view of hemi- arthroplasty of shoulder joint

Post-operative evaluation by clinical and radiological examination for complications like wound healing and time for the union was done. The range of motion of the shoulder joint and functional outcome were assessed by Constant Murley scoring system at a regular interval of follow up, i.e.,1,3,6,8,12, and 24 weeks post-operatively.

Statistical Analysis

The statistical analysis was done by using SPSS (Statistical Package for Social Science) Version 21.0 Statistical Analysis Software. The values were represented in Number (%) and Mean±SD. A p-value of < 0.05 or 0.001 was regarded as significant.

OBSERVATIONS AND RESULTS

Results were based on 30 patients in which the mean age of patients enrolled was higher in group-A [68.56±4.58] than in group-O [68.24±4.36] **(TABLE 1).** Mean bone mineral density of patients in group-O was [-1.75±0.41], and for group-A it was [-1.84±0.29]. **(TABLE 2).** In group-O, most of the patients had other comorbidities [8(53.33%)] than Hypertension and diabetes mellitus [7(46.67%)]. However, in group-A, the majority of the patients showed other comorbidities [7(46.67%)] than Hypertension and diabetes mellitus [7(46.67%)] **(TABLE 3).** Most of the patients had Road traffic injuries in both groups, and statistically, a non-significant difference [P=0.6843] was observed **(TABLE 4).** In group-O, 3of 5(60.00%) patients had Implant failure/Revision complication followed by Dislocation in 2of 5(50.00%).However in group-A most patients showed Implant failure/Revision and 1(25.00%) patient showed Rotator cuff arthropathy and Dislocation **(TABLE 5).** While analysing the Murley score between both groups at every follow-up, Group-A showed a maximum mean Murley score compared to group-O. It implies that group-A showed better shoulder function than group-O, and the difference in Murley scoring at every follow-up was significant[**p<0.0001***] **(TABLE 6).**

DISCUSSION

Humeral fractures account for between 1% and 2% of adult fractures in general, and their incidence has risen in the previous 30 years. Reduction and fixation is generally recommended for displaced fractures, especially when the fracture is less than four segments, and have a low rate of surgical reoperation, between 20% and 30%.Following the showing of significant osteonecrosis in the head of the humerus and loss of function, arthroplasty was initially urged; Neer proposed the treatment of subsequent fractures of 3-4 fragments via humerus joint surface changes. According to the AO classification, there is a high probability of avascular necrosis of the humeral head from type 11B onwards when only the form of the fracture is evaluated. [4]Currently, research indicates that arthroplasty outperforms osteosynthesis in the functional aspect, However as evidenced by a study conducted in Guadalajara, Mexico. [5], some findings indicate that there is no statistically significant difference in terms of proximal humeral fractures management between the two methods. A total of thirty patients were enrolled in the current Prospective Comparative Study (Pilot Study). They were randomly assigned to one of two groups: Group-O (Osteosynthesis) or Group-A (Arthroplasty). Both groups exhibited comparable demographic characteristics. Between the two groups, there was no statistically significant difference in the comorbidities of recruited patients[p=0.9402]. The majority of patients in groups O [3(60.00 %)] and group A [2(50.00 %)] had implant failure/revision complications. Between the two groups, there was no statistically significant difference in the type of complication observed [p=0.4868]. When the Murley score was compared between the two groups at each follow-up, it was found that Group-A had the highest mean Murley score in comparison to Group-O. This means that Group A showed superior shoulder function than Group-O, and the difference in Murley scores at each follow-up was statistically significant[**p=0.0001***].**Santiago Esquivel *et al.*** [7] conducted a comparative study of arthroplasty and osteosynthesis in elderly patients with fractures of the 3 and 4 sections of the proximal humerus. According to the ASES assessment scale, they found no difference. They rely on the fact that the outcomes are directly related to the technique, not to the demographic characteristics analysed. However, the functional outcome, as judged by the Murley score, indicated that arthroplasty was a little better option than osteosynthesis. Although we can utilise both procedures to handle older patients with the comminuted proximal humerus. By contrast, other investigations revealed contradictory findings. [5, 8] Despite the high rate of varus humeral head positioning, avascular necrosis, screw cut-out, plate impingement, and construct failure associated with plate osteosynthesis, it continues to be the most widely used technique for treating PHFs. [9] Treatment of failed plate osteosynthesis in the elderly remains challenging and disputed, with options including Hemi-shoulder arthroplasty (HSA) and reverse total shoulder arthroplasty (RTSA). According to Neer's method, it is a comminuted three- or four-part PHF with a high rate of avascular necrosis or fracture-dislocation. [10] After HSA surgery, subluxation of the prosthesis head or glenoid wear may result in persistent pain and reduced shoulder function. [10-11]While HSA clearly outperforms RTSA in terms of operating time, blood loss, and technical requirements, the following potential disadvantages cannot be overlooked: degeneration of the glenoid and recurrent revision surgery or conversion to RTSA. [12] RTSA may be a potential therapeutic option for failing plate osteosynthesis in PHFs, according to evidence-based studies. [13] Additionally, to our knowledge, few studies directly comparing HSA to RTSA have been conducted in older Asian individuals who had previously undergone plate osteosynthesis of a PHF. [10]**Xiulan Han *et al.*** [14] compared the clinical and radiological results of HSA and RTSA in older adults with a minimum of a 5-year follow-up following failed plate osteosynthesis of PHFs. They revised the failed plate osteosynthesis and converted to HSA or RTSA. They found that RTSA offers significant advantages over HAS in terms of functional outcomes. [15-16] **Garrigues *et al.***[15] described 53 patients (54 shoulders) with PHFs who underwent unsuccessful plate osteosynthesis followed by RTSA. After a minimum of two years, the mean absolute Constant–Murley score climbed from 26 to 55 (range 4–54). Similarly, a case-control study with 27 patients discovered that RTSA appeared to restore range of motion earlier than HSA. [13] Functional outcomes have been found to be favourable, including those from a recent randomised trial [17] that demonstrated that RTSA was superior to HSA in treating PHFs when functional outcomes were considered.

CONCLUSION

Although there is a significant rate of varus positioning of humeral head, avascular necrosis, screw cut-out, impingement of plate and failure of osteosynthesis construct. Plate osteosynthesis remains the most extensively used approach of treating proximal humerus fractures but as far as the functional outcome is compared the Murley score indicated that the arthroplasty group had a better functional outcome. Both are effective managerial tools. However, additional multicentric studies are necessary to strengthen the reliability and generalizability of the current study's findings. Our study had various limitations: the cohort was too small, and only one Murley scale implies the functional assessment was used, making objective evaluation difficult. Confounding variables are exacerbated when variables are limited. To increase the reliability of the study, additional variables must be included. Due to the study's confinement to a single tertiary care institution, the findings may not be generalizable to all scenarios. As a result, they are unable to assimilate into a larger population.

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