Asian Journal of Health and Medical Research (AJHMR)
Volume 2, Issue 3, December, Page No.35-39, 2016

ORIGINAL ARTICLE

# SHOULDER HEMIARTHROPLASTY IN PROXIMAL HUMERAL FRACTURE, TAIF EXPERIENCE

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## ABSTRACT

***Background:*** *Improvement of prosthetic materials, surgical techniques and physiotherapeutic tools has improved the outcome of shoulder hemiarthroplasty in trauma patients. In this retrospective study the experience in shoulder hemiarthroplasty at Taif tertiary hospitals will be evaluated.*

***Methods:*** *In this retrospective study, the patients' records who undergone shoulder hemiarthroplasty for proximal humeral fractures at Taif tertiary hospitals; King Abdul Aziz Specialist Hospital, King Faisal Hospital, and Al-Hada Armed Force Hospital from January 2006 to December 2015 were reviewed. Thirty two patients were included in this study. Outcomes were; demographic data, surgical indications, Intraoperative findings and outcome of treatment during the period of follow up.*

***Results:*** *The study included 32 patients andmale to female ratio was 2.2:1. The mean age was 57±13.8 years. The mean follow up of patients was 32.7±7.9 months. Acute trauma represented 78.1% of patients vs. 21.9% of old trauma. Multiple component modular system implants were used in all patients. Variable and in most of cases incomplete outcome scores were recorded in files. The overall findings showed that pain was improved in all patients; completely painless in 68.75%, episodic moderate pain in18.75%, and residual mild pain in 12.5% of cases. Normal function was regained in 81.25%. Postoperative early complications were 9.4% which were improved with treatment with no effect on the patient outcome. Postoperative patients' satisfaction was 81.25%. Delayed complications occurred in 15.6% of patients and necessitated revision.*

***Conclusion:*** *this study found that shoulder hemiarthroplasty has a satisfactory clinical outcome especially in young and acute trauma patients; however, to avoid biased results extended prospective studies are required and surgeons must pay more attention to assess his patients using a complete reliable scoring index.*

***Keyword:*** *Shoulder, hemiarthroplasty, proximal humeral fracture*

## INTRODUCTION

There is a much debate about the best evidence based treatment for proximal humeral fractures; however, undisplaced fractures or Neer one part fracture showed good results with non operative treatment.[1] Displaced fractures showed unsatisfactory outcome with conservative treatment especially in patients above 75 years.[2] Operative treatment for two parts and three parts (without dislocation) will benefit from open reduction and internal fixation.[3, 4] Three part fracture with dislocation, four part fracture with or without dislocation have unaccepted outcome with conservative or internal fixation options and studies verified a better outcome if treated by hemiarthroplasty or reverse shoulder arthroplasty.[5,-8] It has been suggested that reverse shoulder arthroplasty may be a better choice from proximal humeral fractures than hemiarthroplasty, however, there no strong evidence that the former procedure has a significant better outcome.[7] Other indications of hemiarthroplasty in trauma patients include; splitting and impression fractures involving more than 40-45% of the head in addition to some selected cases of old fractures.[6,9] In this retrospective study the experience in shoulder hemiarthroplasty at Taif tertiary hospitals will be evaluated.

## PATIENTS AND METHODS

In this retrospective study, the files of all patients who undergone shoulder hemiarthroplasty for proximal humeral fractures at Taif tertiary hospitals; King Abdul Aziz Specialist Hospital, King Faisal Hospital, and Al-Hada Armed Force Hospital were reviewed from January 2006 to December 2015.32 patients were included in this study. We excluded cases with incomplete files and those who died due to associated injury. Outcomes were; demographic data, surgical indications, Intraoperative findings and outcome of treatment during the period of follow up in the 32 patients included in the study.After approval of the concerned ethical boards written informed consents were taken from all patients or their relatives.Data were gathered, tabulated, analyzed, and SPSS 20.0 (SPSS, Chicago Illinois) was used for carrying out statistical analysis. Descriptive statistics were done and quantitative data were expressed as number, percentage, and mean ± standard deviation. Chi- square test ($X^2$) and Fisher exact test was used to determine the significance between 2 groups. P-value <0.05 is considered significant.

## RESULTS

Table 1 shows preoperative patient characteristics including demographics, indications and preoperative imaging.

Table 2 shows the operative findings, showing the main principles recorded in the patient files and intraoperative difficulties. Table 3 shows the postoperative results, including improvement in pain and function, patient satisfaction, early postoperative complications, and delayed complications that indicated revision. Table 4 shows that failure rate was significantly correlated with advance in age (significantly higher in patients above median age, $P < 0.05$). It shows also that acute trauma had a better outcome than old trauma (failure rate is significantly higher in old trauma patients $P < 0.05$), however, failure was not correlated with the patient gender ($P > 0.05$) or with the time of performance of the operation recorded in the study (first 5 years vs., second 5 years, $P > 0.05$).

**Table 1:** Preoperative patient characteristics

| | Number (%) |
|---|---|
| Patients (shoulders) | 32 |
| Gender | |
| Male | 22/32 (68.75) |
| females | 10/32 (31.25) |
| Mean age | 57±13.8 years |
| Age median | 43 years (range 28-79 years) |
| Indications of HA: | |
| Acute trauma (total) | 25/32 (78.1) |
| - Four part fracture with or without dislocation | 14/32(43.75) |
| - Three part fracture with dislocation | 9/32 (28.1%) |
| - Head splitting fracture | 1/32 (3.1) |
| - Head impression fracture | 1/32 (3.1) |
| Old trauma (total) | 7/32 (21.9) |
| - Malunited fracture | 6/32 (18.75) |
| - Non united surgical neck | 1/32 (3.1) |
| Preoperative imaging: | |
| Plain x-rays (anteroposterior and axillary view) | 32/32 (100) |
| CT scan | 32/32 (100) |

**Table 2:** Operative Reports

| | |
|---|---|
| **Approach:** deltopectoral | 32/32 (100) |
| Osteotomy of the lesser tuberosity | 3/32 (9.4) |
| **Prosthesis:** Multiple components (modular system) | 32/32 (100) |
| Preservation of enough bony attachment of the rotator cuff | 32/32 (100) |
| Reconstruction of the tuberosities to shaft and the prosthesis after division (under/at the level of head) | 32/32 (100) |
| Cancellous bone graft insertion between the tuberosities | 32/32 (100) |
| **Recorded intraoperative complications (total)** | 3/32 (9.4%) |
| Bleeding | 2/32 (6.25%) |
| Rotator cuff tear < 2cm (repaired) | 1/32 (3.12) |

**Table 3:** Postoperative results

| **Mean follow up (months)** | **32.7±7.9** |
|---|---|
| Outcome scores | Variable/incomplete |
| Improvement of pain<br>Completely painless shoulder<br>Residual episodic moderate pain<br>Residual mild pain | 32/32 (100)<br>22/32 (68.75)<br>6/32 (18.75)<br>4/32 (12.5) |
| Regained normal function and range of movement<br>Limited function and range of movement | 26/32 (81.25)<br>6/32 (18.75) |
| Attending the rehabilitation program<br>Completed the program | 32/32 (100)<br>10/32 (31.25) |
| Satisfaction (total):<br>• Very satisfied<br>• Satisfied<br>• Satisfied with reservation<br>Not satisfied | 26/ 32(81.25)<br>14/32 (43.75)<br>10/32 (31.25)<br>2/32 (6.25%)<br>6/32 (18.75) |
| Complications (total):<br>- Brachial neuropraxia (improved with physiotherapy)<br>- Inferior subluxation (improved with physiotherapy)<br>- Non united greater tuberosity (treated by operative fixation)<br>Persistent complications (considered as failure and required revision)<br>- Painful glenoid erosion<br>- Loosening of the prosthesis | 8/32 (25)<br>1/32 (3.12)<br>1/32 (3.12)<br>1/32 (3.12)<br>5/32 (15,6)<br>3/32 (9.4)<br>2/32 (6.2) |
| Early post operative mortality | 0 (0) |

**Table 4:** Comparison of failure rate (5 cases) in relation to different patient groups

| Acute trauma | Old fractures (mal and non union) | P-value | Significance |
|---|---|---|---|
| 2/25 (8%) | 3/7 (42.8%) | <0.05 | S |
| Rate of failure below median age | Rate of failure below median age | P-value | Significance |
| 1/15 (6.7%) | 4/17 (23.5%) | <0.05 | S |
| Rate of failure in males | Rate of failure in females | P-value | Significance |
| 3/22 (13.6%) | 2/10 (20%) | >0.05 | IS |
| Rate of failure in the first 5 years of the study | Rate of failure in the second 5 years of the study | P-value | Significance |
| 2/13 (15.4%) | 3/17 (17.6) | >0.05 | IS |

S; significant, IS; insignificant

## DISCUSSION

Hemiarthroplasty of the shoulder is a continuously spreading surgical procedure for treatment of complex cases of proximal humeral fracture. [5-8]

Aldinger *etal* revised in their study more than 100 hemiarthroplasty over ten years in a single center.[10] In this study the sample size was much lower, where 32 shoulder hemiarthroplasties were recorded in three tertiary hospitals in a similar period.

In accordance with the findings in the literature; shoulder HA is indicated in this study in acute proximal humeral fractures if it is four part fracture, three part fracture if associated with dislocation, head splitting, and head impression fractures when the fragments exceeded more than 45% of the articular surface.[5-8] Conservative treatment for these types of fracture results in poor outcome in about 95% of cases and several authors found that the outcome of internal fixation is inferior to primary hemiarthroplasty with a high rate of avascular necrosis in the former.[2, 11] The primary goal of head replacement in neglected or poorly managed old fractures is pain relief when other measures fail, which meets the indications in malunited and non-united fractures in this study.[9] Some authors favor TSA in trauma patients; however, other studies found no clear difference between the two procedures as regard the pain relief, function, and overall patient satisfaction.[7, 8]Van den Bekerom*etal*[8] in their systemic review comparing the long term outcome of total shoulder arthroplasty (TSA) and hemiarthroplasty (HA) found that TSA has more complications but less revision rate than HA, and they concluded that hemiarthroplasty is a simple reliable procedure in experienced hand. Similar results were obtained in Dwyer *etal*.[5] where they recorded no statistically significant differences for the outcome of TSA and HA.

The mean age recorded in literature for shoulder HA ranges around 70 years which is higher than that reported in this study, this difference may be related the higher percentage of young aged amongst trauma patients. [5, 10]

Male to female ratio in this study was 2.2 to 1 which differs than that recorded in other studies[5-10] where the percentage of the female was much higher, this may be illustrated by the higher women activity in developed countries.

In the present study extended deltopectoral approach was used which is in accordance with other studies. [11, 12]

In malunited fracture to facilitate the joint entrance, osteotomy of the lesser tuberosity or division of subscapularis perpendicular to its fibres may be required.[11] In this study lesser tuberosity osteotomy was required only in three patient with malunited fracture.

Modular systems offer prosthesis with multiple component choices to match patient-specific inclination and it has revolutionized the revision of hemiarthroplasty to reverse total shoulder arthroplasty where the previously implanted humeral head can be removed from the stem and replaced with a reverse total shoulder cup component. In this study the modular system was used in all patients.[13, 14]

Optimization of shoulder biomechanics is largely dependent on the reconstruction of the humeral head using good anatomic approximation particularly with respect to rotator cuff function, deltoid function, and soft tissue balance.[11, 12]

In agreement of other studies the reported operative data in this study revealed that the reconstruction of the tuberosities and rotator cuff preservation were adopted in all surgeries which is considered to be the cornerstone in achieving a good clinical outcome.

Intraoperative complications as neuro or/and vascular injury, fractures of the humerus or glenoid, rotator cuff tears, relevant intraoperative bleeding and implant instability were recorded in 8.9% of hemiarthroplasies in Aldinger *etal*[10] study. The operative reports in the present study recorded intraoperative complications in 9.4%. which appears slightly higher than that recorded in Aldinger's *etal*[10] study. The overall recorded postoperative complication rate in this study was 25% which is higher than that recorded in the literature and this may be related to the smaller sample size. Doyer *etal*[5] recorded complication rate of their study to be 6.6%, and in the studies of Aldinger *et al.*[10] & Edwards *et al.* [15] the reported complications were 11.6% and 19% respectively.

Many scoring indices were used for the objective assessment of the clinical outcome after HA, as Neer scoring Index, the patients' self reported Oxford shoulder score (OSS), constant shoulder score, simple shoulder questionnaire (SSQ) and others.[16-19] Unfortunately, incomplete scoring indices (mostly the SSQ) were recorded in the files of the patients of this series; however, the overall results were available after mean follow up of 32.7±7.9 months (12- 105 months).

Doyer *etal*[5] recorded clinically significant improvement of OSS in 93.1% (27/29) of their studied patients; however, the other two cases were reassessed and minimal improvement was recorded in both. Inferior results were obtained in this study, in spite that improvement in pain occurred in all patients, only 68.8% patients had painless shoulder in addition to 12.5% with mild and tolerable episodic pain, furthermore 81.25% of patients reported that they regained normal shoulder function, however, in 18.75% the patients were unsatisfied due to either residual pain or impaired function. Better results were recorded other studies. [10, 12, 20] The revision rate recorded Fevang et al after revision of 1531 shoulder HA was 6.1%.[21] In the present study the recorded revision rate was 15.6%, this high figure can be explained in part to the smaller sample size.

Robinson *etal*.[22] tin their study reported better outcome in young patients who has no preoperative neurological or musculoskeletal deficit, in addition, Boileau*etal*.[9] found that HA had a better outcome if performed within less than 4 weeks from trauma in proximal humeral fractures. In the present study, similar results were reported where rate of failure was significantly higher in the group of patient above the median age than in younger patients and

in old trauma than in acute trauma patients. However, our findings found no correlation between failure rate and gender. Improvement in learning curve was not evident in this study where no significant difference in the rate of failure comparing the first 5 years of the study with the second 5 years.

**LIMITATION**

The number of patients in this study is limited, the fact which may explain in part the difference in the results with that in the literature.

**CONCLUSION**

This study found that shoulder hemiarthroplasty has a satisfactory clinical outcome specially in young and acute trauma patients; however, to avoid biased results extended prospective studies are required and surgeons must pay more attention to assess his patients using a complete reliable scoring index.

**Conflict of Interest:** None

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