ORIGINAL ARTICLE

IS CEMENTED BIPOLAR HEMIARTHROPLASTY GOOD CHOICE FOR UNSTABLE INTERTROCHANTERIC FRACTURES IN ELDERLY: MULTICENTRIC PROSPECTIVE STUDY AT KARACHI

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Background: To analyse the functional outcome of primary cemented bipolar hemi arthroplasty (PCBH) for unstable osteoporotic intertrochanteric femur fractures in elderly patients. **Methods:** It was a multicentre prospective study conducted at Institute of Orthopaedics & Surgery, Medicare Cardiac & General Hospital and Dr Ruth K M Pfau Civil Hospital Karachi, Pakistan from February 2015 to July 2020. Thirty-eight patients of 60–90 years of either gender diagnosed as close UIF, severe osteoporosis as per Singh index grade ≤3, time since injury <2 weeks, ASA status II & III and pre-injury independent walking were enrolled in this study. All patients with UIF underwent PCBH. The radiographs were performed before surgery and at intervals postoperatively. All patients were requested to come for follow up visits at 2 weeks, 4 weeks, 3 months, 6 months 1 year and then at 3 years to assess the functional outcome of patients. At first postoperative day check X-rays taken and rehabilitation started as per institutional rehabilitation protocol, at 2-week stiches removed, at 4 weeks' x-ray was done and all the patients were followed for 3 years. The primary outcomes were noted using Harris Hip Score (HHS) for the functional outcome assessed at the end of 1 year and at final follow up. **Results:** The mean age of the study participants was 68.29±8.04 years. One male (2.6%) died at 6th month, then 2 females (5.2%) patients died at 1 year and 2 females (5.2%) patients died at the end of 3 years due to multiple comorbid conditions. During 1st year 3 patients (7.4%) developed DVT and 4 patients (10.5%) having diabetes and hypertension developed superficial wound infection. The mean Harris Hip Score between time points which indicated that the mean Harris Hip Score significantly improve over the period of time (p=0.001). Post hoc tests revealed that there were statistically significant differences between each time points (p<0.05). The functional outcome at 3 years, shown, one patient had excellent outcome, 24 patients had good outcome and 8 had fair outcome, respectively. **Conclusion:** The Primary Cemented Bipolar Hemiarthoplasty is a good choice of treatment in terms of reasonable functional outcome such as early mobilization and associated with less post-operative complications in elderly patients of UIF.

Keywords: Primary cemented bipolar hemi arthroplasty; Unstable intertrochanteric femur fractures; Harris Hip Score; Post-operative complications; Elderly patients

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INTRODUCTION

Ground level falls are the leading cause of accidents and hospital admissions for the elderly. Every year, one out of every three older adults (age>50 years) falls, with 24% sustaining serious injuries and about 6% suffering fractures; including hip, elbow, pelvis, and humerus fractures.[1] The intertrochanteric fracture around the hip is the frequent fractures in these older adults, accounting for 48% of all hip fractures and predicted to rise rapidly in the next decade as life expectancy and osteoporosis increase.[2]

Stable intertrochanteric fractures[3] can be managed with osteosynthesis with consistent successful outcomes, while unstable intertrochanteric fractures (UIF) are more difficult to handle due to the difficulties of achieving anatomical reduction and related comorbid conditions that raise the risk of morbidity and mortality[4,5] In the elderly, an hip fractures are associated with a 20% mortality rate.[6] Intertrochanteric femur fractures account for 50% of all hip fractures resulting from a low-energy mechanism, like a fall from standing height. Attempts to repair these fractures sometimes result in excessive collapse, poor bone quality, loss of fixation, and latency screw cut-out. In the elderly, the coexistence of comminated and unstable fractures with osteoporotic bone worsens the prognosis.[3,7]

In order to treat unstable intertrochanteric fractures in the elderly, sliding hip screw and intramedullary interlocking systems are used. However,

different studies have identified technical and mechanical problems, and no one can guarantee complete fracture stabilization and full bone union in elderly patients.[2,5] As a result, primary cemented bipolar hemiarthroplasty (PCBH) has emerged as a viable therapeutic option with the advantages of rigid internal fixation, early mobilization, and less post-operative complications.[5] Research shown that a PCBH had better outcomes in terms of shorter operation time, less blood loss, no dislocation and lower cost as compared to total hip arthroplasty[8] in elderly UIF patients[9].

About the fact that PCBH is more cost effective than THA, it is associated with less complications and patients will be allowed to weight bearing after the surgery.[5,9] Patients are also advised to walk and mobilize the affected limbs, reducing the amount of time they spend in bed.[5,9] As a result, PCBH aids patients in returning to their pre-fracture phase more quickly.[5,9] There is, however, no research that contrasts the results and outcomes of the two therapies in Pakistani elders with UIF. The aim of this research was to evaluate the early outcomes of Primary Cemented Bipolar Hemiarthroplasty in patients with unstable osteoporotic intertrochanteric femur fractures in order to better understand the differences in their outcomes. This research would aid in determining the procedure that can be used and promoted in order to get elderly patients with UIF to get early mobilization and avoid the morbidity and mortality in this age group associated with osteosynthesis.

MATERIAL AND METHODS

It was a multicentre prospective study conducted at Institute of Orthopaedics & Surgery, Medicare Cardiac & General Hospital and Dr Ruth K M Pfau Civil Hospital Karachi, Pakistan from February 2015 to July 2020. Non-probability consecutive sampling technique was employed.

Sample size was calculated using the select statistics calculator keeping the confidence level of 95%, a margin of error as 5%, and the rate of hemiarthroplasty as 3.3% as reported by Graun and colleagues. The patients were classified according to the Modified Evans Classification. Thirty-eight patients of 60–90 years of either gender diagnosed as close UIF (AO/OTA type 31-A2.2 and 31-A2.3 and Evans type III or IV fractures), severe osteoporosis as per Singh index grade ≤3, time since injury <2 weeks, ASA status II & III and pre-injury independent walking were enrolled in this study. Exclusion criteria were open fracture, multiple fracture, pathological fracture, other fractures in the same extremity, pre-injury functional immobility, inadequate radiographs or follow-up period, and omitted replies in the questionnaires.

The study was approved by the Ethical committee of the department of orthopaedic surgery Dr Ruth KM Pfau Civil Hospital Karachi, Institute of Orthopaedics & Surgery and Medicare cardiac and general hospital. Informed verbal and written consent were taken from patients and their guardians. All patients with UIF underwent PCBH. In general, intertrochanteric fractures are managed with closed reduction and internal fixation technique on traction table with the help of C-arm machine however, in the current study this was not possible because of multiple reasons mentioned above in inclusion criteria. The radiographs were performed before surgery and at intervals postoperatively. All patients were requested to come for follow up visits at 2 weeks, 4 weeks, 3 months,6 months,1 year and then at 3 years to assess the early outcome of patients. At first postoperative day check X rays taken and rehabilitation started as per institutional rehabilitation protocol, at 2nd week stiches removed and at 4th week x-ray was done and all the patients were followed for 3 years. The principal authors reviewed radiographs and medical records of patients with UIF who underwent primary hemiarthroplasty with bipolar prosthesis as shown in Figure-1.

All sociodemographic data were recorded in a predefined *proforma*. Postoperative both early and late complications were recorded at follow-up visits. The primary outcomes were noted using Harris Hip Score (HHS) for the functional outcome assessed at the final follow up by the authors. The HHS was graded as excellent (score 90–100 points), Good (80–89), Fair (70–79), Poor (60–69) and failed result below 60 points at the end of follow-up. The follow up period was 3 years.

All data was analysed via the statistical package for social sciences (SPSS, IBM, Chicago, IL) version 26. The categorical values were presented as frequency and percentages while the continuous data were presented as mean and standard deviation. Repeated measure ANOVA was used to assess the HSS at different time points. Post-hoc Bonferroni test was applied for multiple comparison. A p-value≤0.05 was considered as statistically significant.

RESULTS

Total thirty-eight patients were included in this study. The mean age of the study participants was 68.29±8.04years (range: 60-90 years. Out of 38 patients, 23 were females (60.5%) and 15 were males (39.47%), 13 had diabetes, 14 had hypertension and rest of the patients had no comorbid. About 63.2% of the patients had Evans type IV and 36.8% had Evans type III. (Table-1).

One male (2.6%) died at 6th month, then 2 females (5.2%) patients died at 1 year and 2 females (5.2%) patients died at the end of 3 years due to multiple comorbid conditions. Died patient data was collected on phone by their family members and excluded from final

follow up. Out of 38 patients 3 patients (7.4%) developed DVT managed with Tab. Rivaroxaban 10 mg. Four patients (10.5%) having diabetes developed superficial wound infections treated with antibiotics and no dislocation was observed in any patient. Table 2 shows the mean Harris Hip Score between time points which indicated that the mean Harris Hip Score significantly improve over the period of time (p=0.001). Post hoc tests using the Bonferroni correction revealed that there were statistically significant differences between each time points (p<0.05). (Table-3) The functional outcome of hemi arthroplasty was assessed by Harris Hip Score. It was assessed at every follow-up and finally at 3 years. At 3 years, out of 33 patients, one had excellent outcome, 24 patients had good outcome and 8 had fair outcome respectively. (Figure-2)

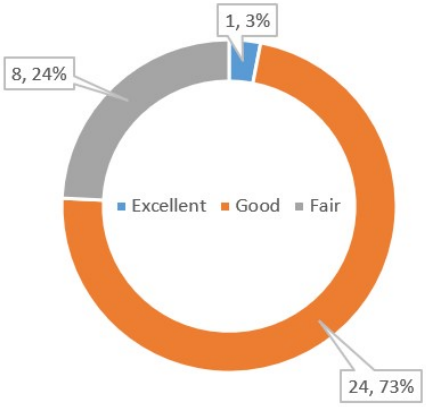

Figure-2: Harris Hip Score (HHS) for the functional outcome at final visit

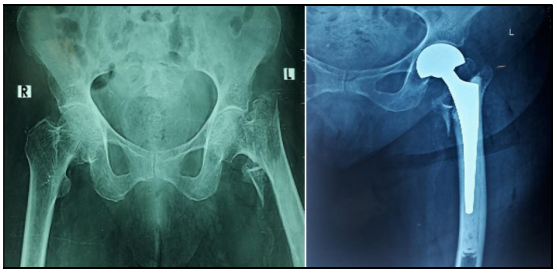

Figure-1: Unstable Intertrochanteric fractures who underwent surgical treatment –primary cemented bipolar hemiarthoplasty

Table-1: Baseline characteristics of study participants

Variables	n (%)
Age (Mean±SD)	68.50±7.12
Gender	
Male	15 (39.5)
Female	23 (60.5)
Comorbid	
Hypertension	14 (36.8)
Diabetes	13 (34.2)
Evans type	
III	14 (36.8)
IV	24 (63.2)

Table-2: Comparison of means Harris Hip Score at the different time points

Time	Mean	SD	95% CI for mean		*p*-value
			Lower Bound	Upper Bound	
4th week	35.286	2.739	34.345	36.227	0.001*
3rd month	63.057	1.626	62.499	63.616	
6th month	72.743	3.657	71.487	73.999	
1st year	80.629	5.771	78.646	82.611	
3rd year	83.200	6.154	81.086	85.314	
*Significant *p*-value<0.05					

Table-3: Pairwise comparisons for mean difference of Harris Hip Score

Time		Mean Difference (I-J)	*p*-value	95% Confidence Interval for Difference	
				Lower Bound	Upper Bound
1^	2	-27.771*	0.001	-29.423	-26.120
	3	-37.457*	0.001	-39.514	-35.400
	4	-45.343*	0.001	-48.528	-42.157
	5	-47.914*	0.001	-51.103	-44.725
2^	1	27.771*	0.001	26.120	29.423
	3	-9.686*	0.001	-11.880	-7.492
	4	-17.571*	0.001	-20.810	-14.333
	5	-20.143*	0.001	-23.580	-16.705
3^	1	37.457*	0.001	35.400	39.514
	2	9.686*	0.001	7.492	11.z880
	4	-7.886*	0.001	-9.706	-6.065
	5	-10.457*	0.001	-12.514	-8.400
4^	1	45.343*	0.001	42.157	48.528
	2	17.571*	0.001	14.333	20.810
	3	7.886*	0.001	6.065	9.706
	5	-2.571*	0.001	-3.495	-1.648
5^	1	47.914*	0.001	44.725	51.103
	2	20.143*	0.001	16.705	23.580
	3	10.457*	0.001	8.400	12.514
	4	2.571*	0.001	1.648	3.495

^1=4th week, 2=3rd month, 3=6th month, 4=1st year and 5=3rd year. *Significant p-value<0.05

DISCUSSION

Most elderly people with UIF of the hip suffer from osteoporosis. In older patients, these fractures are often associated with severe displacement and comminution. As a consequence, anatomical reduction of these fractures is difficult to obtain and maintain, often resulting in malunion, non-union, or reduction failure.[2,5] Many scholars have proposed PCBH for the care of UIF in elderly patients to reduce the post-operative problems associated with internal fixation. PCBH allows for early mobilization and sufficient fixation, reducing the risk of post-operative complications such as pneumonia, atelectasis, pressure sores, and pseudoarthrosis.[10,11] The Pakistani perspective regarding the utilization of PCBH as primary treatment modality is limited, therefore in current study we have analysed the early outcome of primary cemented bipolar hemi arthroplasty in cases of unstable osteoporotic intertrochanteric femur fractures in elder patients.

In the current study we have included 38 patients and all underwent for PCBH for the treatment of UIF, the average of our patients was 68.50 years, which is slightly lower than the studies conducted by Elhadi et al., *Sinno et al*. and Sancheti *et al*.[2,12,13] Most of the patients were females (60.5%) in our study, similar in the study by Elhadi *et al*. majority of the patients were females (62%).[2] The majority of our patients had Evan type IV, similarly in the study by Elhadi et al. most of the patients had type IV whereas in the study by Rodop *et al*. majority of the patients had type III.[2,14]

Our study showed one death due to respiratory distress at 6th month, where 2 deaths occurred at 1 year due to cardiopulmonary problem. In the study by Daniel *et al*. reported 2.9% early post-operative mortality.[11] Further, in studies by Elhadi *et al*. and Aristotle *et al*. the one-year mortality was higher (17% and 11.1% respectively), whereas in the studies by Daniel et al. and Elmorsy *et al*. slightly lower mortality rates were reported (10.3% and 12.2% respectively).[2,11,15,16]

Deep infection is one of the common problems in prosthetic surgery and accounted for 0–3% in these operations.[10] In our study, at the end of 3 years, 3 patients developed DVT and four patients having diabetes developed superficial wound infections. In the study by Daniel et al. 5% infection was reported, whereas other studies reported infection rate of 2.8% and 6.8% respectively.[11,17,18] Daniel *et al*. also reported DVT in 2 patients whereas Grimsrud *et al*. reported DVT one case of DVT post-operatively.[11,19]

At the end of 3rd year, most of the patients in our study had excellent to fair outcomes. In the study by Elhadi *et al*. also good outcomes in terms of early mobilization and 93.3% of the UIF patients showed partial weight-bearing at 1st post-operative day.[2] Daniel *et al*. also revealed that 69% of the patients had satisfactory outcomes (Hip functional score as good to excellent).[11] In the studies by Ahmed *et al*., D. Arcy *et al.* and Syed *et al*. also reported satisfactory hip functional outcome in 76%, 82% and 59% respectively.[20–22]

As a result, our results suggest that PCBH is a successful therapy for UIF patients. In terms of early mobilization, it could be an effective surgery. It will help to minimize post-operative complications, death, and increase the patient's quality of life while also easing the financial pressure on the family. Further research should be carried out in which THA is opposed to PCBH to see which is more successful in the Pakistani community. When choosing a care plan for UIF in elderly patients, differences in outcomes should be measured with respect to different possible variables such as age, severity of osteoporosis, and health status in future research.

CONCLUSION

The PCBH is a good choice of treatment in terms of reasonable functional outcome such as early mobilization and associated with less post-operative complications in elderly patients of UIF.

AUTHORS' CONTRIBUTION

IMR, IM, MEA, AAS: Conception or design of the work, Final approval of the version to be published, Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. JK, ZA and SJ: Drafting the work or revising it critically for important intellectual content, Final approval of the version to be published. KA: The acquisition, analysis, or interpretation of data for the work, Final approval of the version to be published

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