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Functional outcome of cemented hemiarthroplasty in home-ambulant elderly patients with unstable pertrochanteric fractures

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Abstract

Background: Unstable pertrochanteric fractures pose a significant health problem in elderly home-ambulant patients with increased morbidity and mortality, and their attendant co-morbidities.

Objective: To study the functional outcome of cemented hemiarthroplasty in home ambulant elderly patients with unstable pertrochanteric fractures.

Methods: A hospital-based, prospective, non-randomized study between September 2013 and September 2019. All patients aged 65 years and above with unstable pertrochanteric fractures were included with the exception of those who were non-ambulant before injury and those with histologically confirmed tumors. Harris Hip Scoring (HHS) was done for all patients on both hips pre- and postoperatively. Cemented bipolar hemiarthroplasty was done using cement mantle to reconstruct the calcar, and biopsy was taken for histology at surgery. Subperiosteal detachments of the iliopsoas muscle and adductor tenotomy were done when indicated. Full weight-bearing ambulation was commenced on the second postoperative day. Data was analyzed using SPSS version 23 for windows.

Results: Forty-eight hips in 47 patients were analyzed. The mean age was 83.4 \pm 5.0 years with a F: M ratio of 2.4:1. Average duration of presentation was 26.4 \pm 12.8 days as all the patients had had traditional bone setters' treatment prior to their presentation. Hypertensive heart disease was the commonest co-morbid condition. The mean operation time was 77.9 \pm 9.5 minutes (range 60-98 minutes). The mean estimated blood loss (EBL) was 385.6 \pm 198.2 ml (range 150-850ml). Twenty-two (45.8%) patients were transfused. All patients ambulated at second postoperative day. Forty-seven (97.92%) hips had good and excellent functional outcomes at 12 weeks, and 46 (95.83% of total hips studied, but 100% of those still alive) had good to excellent functional outcomes at 2 years with p value < 0.0005. A patient had both hips recruited 2 years apart. A deep surgical site infection and two limb length discrepancies were associated complications. Two (4.26%) of the patients died of unrelated causes before the end of the first year of follow up.

Conclusion: Primary cemented bipolar hemiarthroplasty allows early weight bearing and produces good to excellent functional outcomes in home-ambulant elderly patients with unstable pertrochanteric fractures with minimal complications.

Keywords: functional outcome, cemented hemiarthroplasty, home-ambulant elderly patients, unstable pertrochanteric fractures

Introduction

Unstable pertrochanteric fracture in the elderly patient is a frequent problem and is becoming frequent as the proportion of elderly people in the population increases [1]. The treatment of such unstable intertrochanteric fracture remains controversial, despite the publication of reports of randomized trials and comparative studies [2]. Although the treatment of choice for unstable intertrochanteric fractures in elderly patients has been internal fixation for a long time, several studies have shown mechanical and technical failures [3]. Unstable intertrochanteric fracture is associated with poor bone quality, excessive collapse, loss of fixation, and cut-out of the lag screw as the common problems of attempts to fix the fractures [4]. The primary goals of treatment are stable fixation and early rehabilitation [5]. Management of these cases with cemented bipolar hemiarthroplasty eliminates most of the short-comings of other modes of internal fixation and permits early mobilization, thus avoiding most of the

complications related to prolonged immobilization [6, 7]. The purpose of this prospective cohort study (level II evidence) was to assess the functional outcome of cemented bipolar hemiarthroplasty as a primary treatment modality for unstable intertrochanteric fractures in home-ambulant elderly patients in a low resource community.

Methodology

Prospective cases of unstable pertrochanteric fractures using the Kyle classification scheme were treated with primary bipolar hemiarthroplasty between September 2013 to September 2019. All elderly independently home-ambulant patients with unstable pertrochanteric fractures were included. Patients with stable fractures, those who were community ambulant or non-ambulant prior to injury, those with histologically confirmed tumors, and those that did not consent were excluded. Ethical clearance was obtained from the hospitals' research and ethics committees. The endoprotheses used were products from JS Medimax (P) limited and Sofia Surgicals PVT, limited, both based in Delhi, India. No conflict of interest to declare.

Preoperative Harris hip scores (HHS) were obtained. Preoperative planning was done using templates on the radiographs on both the fractured and contralateral hips, to determine the vertical and horizontal offsets, the approximate size of the head of femur and hence, the sizes of the bipolar to be made available for surgery (usually a range 2mm above and below the estimated size) (figure 1). Surgeries were done as soon as the patients were stabilized and adjudged fit by the anesthetists (usually within 48 hours of admission). Elective cases had to wait for the following elective list, usually not more than 4 days.

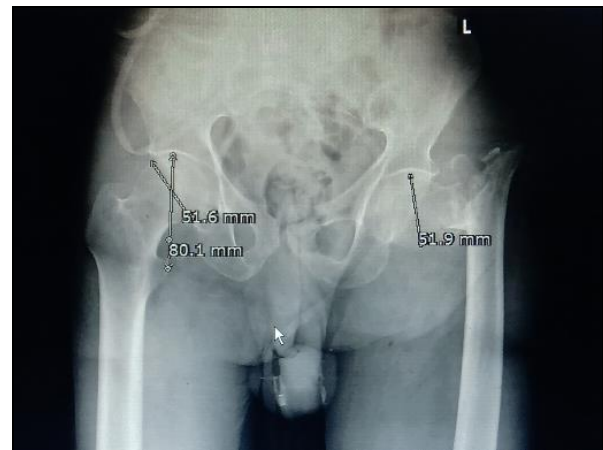


Fig 1: A left unstable pertrochanteric fracture. Vertical offset and diameter of the head being determined.

All cases were done under regional or general anesthesia and led by the same surgeon. Prophylactic antibiotics were given at induction. The surgeries were performed using the anterolateral approach in a supine position with the index hip elevated with a sandbag (figure 2a-c). The limb length discrepancy (LLD) is re-assessed and correlated with the preoperative record. This served as a reference to achieving the desired equal limb length. See foot note for the detailed description of the procedure [8]. The extracted head, neck, and the bone fragments were sent for histology. Operation time and blood loss were estimated and recorded.



Fig 2: (a) anterolateral incision, (b) exposure to periarticular pad of fat, (c) exposing the neck.

All patients had postoperative radiographs, and commenced deep venous thrombosis prophylaxis (Subcutaneous Clexane injection at 40mg daily for 5 days, then Tab Rivaroxaban 10mg daily for 6 weeks), and isometrics exercises on the first postoperative day. All patient had injection morphine, pethidine or pentazocine, Paracetamol, and Nonsteroidal anti-inflammatory drugs (NSAIDs) for 48 to 72 hours before conversion to oral NSAIDs and Paracetamol. Drain is

removed and full weight-bearing ambulation is commenced on the second postoperative day. Postoperative HHS was done for all patients at 3 months, 6 months, 12 months, and 24 months. Data regarding patient demographics, presentation, comorbidities, operation time, estimated blood loss, Limb length discrepancy (LLD), as well as pre- and postoperative HHS, were analyzed using SPSS version 23.



Fig 3: (a) removing a cylinder off the neck; (b) delivering the head; (c) broached marrow.

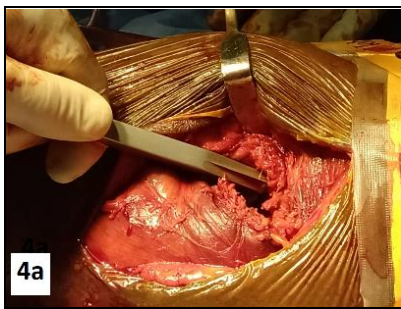


Fig 4: (a): trial reduction done.

Results

Fifty-three hips in 52 patients were initially recruited but pruned down to 48 hips in 47 patients as 5 patients had histologic diagnosis of metastatic tumors. The mean age was 83.4 ± 5.0 years (age range of 70 to 96 years) with a F: M ratio of 2.4:1. Age range 81-85 years were the most reviewed, representing 28 (59.57%) of the total patients (table 1 and 2). The average duration of patients' presentation was 26.4 ± 12.8 days (range 3 to 150 days) as all the patients had had traditional bone setters' treatment before presentation. Traditional bone setters, TBS, are non-orthodox native doctors who learnt the act of bone-setting in an apprenticeship manner from older ones. Hypertensive heart disease was the commonest co-morbid condition. The mean operation time was 77.9 ± 9.5 minutes (range 60-98 minutes). The mean

estimated blood loss (EBL) was 385.6 ± 198.2 ml (range 150-850ml). Twenty-two (45.8%) patients were transfused.

Table 1: Age distribution (years)

Age Distribution (Years)	Frequency	Percent
70-75	2	4.2
76-80	8	16.7
81-85	28	58.3
86-90	6	12.5
91-96	4	8.3
Total	48	100
Mean: 83.4 ± 5.0 years		

Table 2: Gender distribution

Gender	Frequency	Percent
Female	34	70.8
Male	14	29.2
Total	48	100

A sudden improvement in functional status was recorded in all the patients in the postoperative period as all the patients could ambulate full-weight bearing by second postoperative day with the aid of a walking frame. Postoperative radiographs were obtained at 2nd postoperative day (figure 4b-c). The average hospital stay was 6.5 ± 2.2 days. Every patient had an adult relation giving supportive care both in the hospital and after discharge.



Fig 4: (b): unstable fracture.



Fig 4: (c): postoperative radiograph.

Forty-seven (97.92%) hips had good and excellent functional outcomes at 12 weeks with p value < 0.0005 (Table 3). At 2 years, 46 (95.83% of total hips studied, but 100% of those still alive) had good to excellent functional outcomes with p value < 0.0005 (Table 3), (figure 5). A patient with cor pulmonale

earlier recruited for the left hip sustained contralateral unstable pertrochanteric fracture of the right hip at about 2 years of follow up for the first injury. The right hip was also recruited, followed up, and reviewed separately (figure 6a-h).

Table 3: Comparison of Mean Harris Hip Scores (HHS)

Comparison of HHS	Pre-Op HHS	HHS (3 Months)	HHS (6months)	HHS (1YEAR)	HHS (2 Years)
Mean	25.88	90.96	91.94	92.59	93.17
Standard Deviation		6.99	4.05	2.89	2.91
P-Value	3.54	< 0.0005	< 0.0005	< 0.0005	< 0.0005

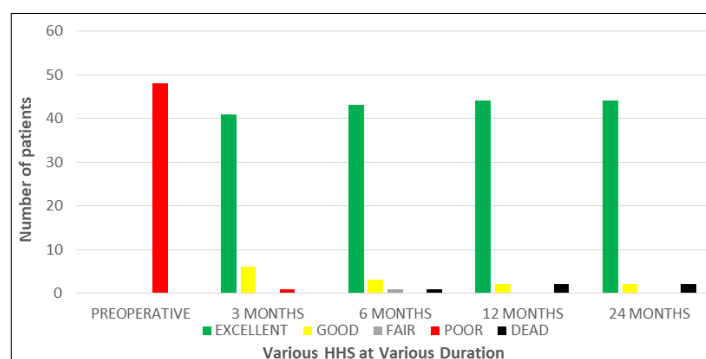


Fig 5: Multiple bar chat comparing HHS before and after surgery, and deaths



Fig 6: (a, b) preoperative for first injury

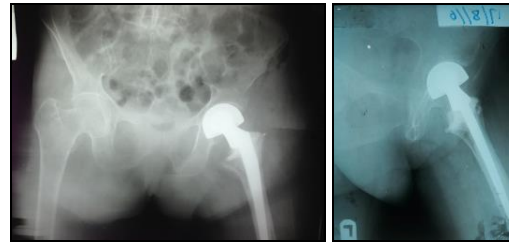


Fig 6: (c, d) postoperative radiograph for left hip



Fig 6: (e) preop. Radiograph for the right hip

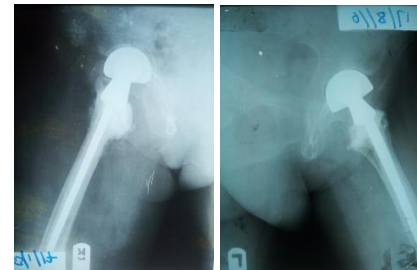


Fig 6: (f-h) Postop. Radiographs: AP and Laterals.

Limb length discrepancy (LLD) of 1.0 and 1.5cm were recorded in two patients. LLD in other patients were less than 1.0cm and were considered insignificant (figure 7). A deep surgical site infection was recorded in one patient after she dislocated following her discharge from the hospital, and had open reduction. Debridement and implant retention (DAIR) was done but the infection could not be controlled. Thus, necessitating a conversion to Girdle Stone Excision Arthroplasty, GSEA. Hip function was poor at the end of 3 months, but fair at 6 months for the infected case. She was one of the two patients that died before 1 year of follow up. She died from an unknown cause at about 9 months of the postoperative period. The other patient was a 90-year-old man that died of the complication of an ischemic heart disease which he was been managed for before the hip injury. He was seen last at 3 months of follow up with a good functional outcome score. Total percentage death was 4.2% (affecting 2.9% of females, but 7.1% of the recruited males). Complications are summarized in figure 8.

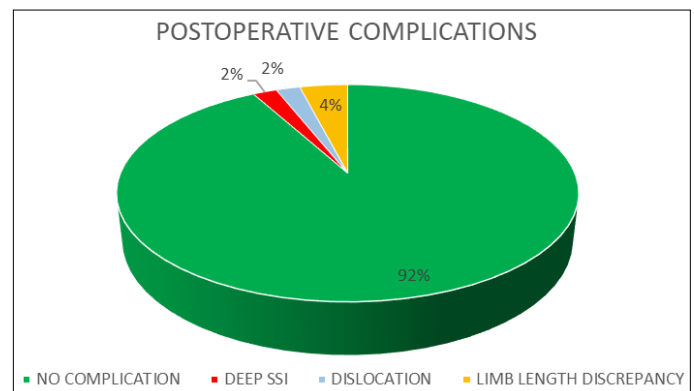


Fig 8: Shows the summary of postoperative complications related to the intervention.

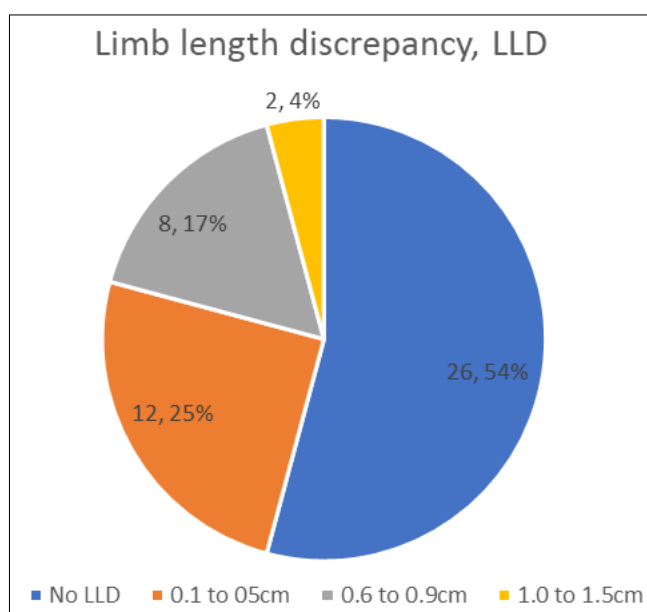


Fig 7: Pie chart showing the various Limb length discrepancies postoperatively.

Discussion

The mean age and F:M ratio of the patients in this study (Table 1&2) were similar to what were recorded in other studies [6, 7]. Sancheti *et al.* and Gu *et al.* also recorded similar findings in their studies [8, 9]. The female preponderance in most of the reviewed articles may not be unconnected with the obvious presence of more elderly females than males in many cultures as the females live longer (may be due to the relatively lesser risk involved in their usual activities which is in contrast to the usual aggressive and adventurous lives of men). Physiologically, the females also develop osteoporosis earlier in life, hence more fragility fractures.

The primary cemented hemiarthroplasty by-passes the phase of fracture healing thereby providing an immediate stable, mobile, relatively pain-free joint which eliminates the need for prolonged immobilization and permits early ambulation [1, 7], [10, 11]. It equally eliminates the fear of implant failure and not usually associated with peri-implant fractures as commonly seen in other modes of fixation [12, 13]. A systematic review by Yoo *et al.* revealed that the overall outcomes such as mortality, reoperation rate, and complication showed no significant difference between the arthroplasty and internal fixation groups but, the arthroplasty group achieved superior functional outcomes, especially earlier mobilization [14]. The results in this study affirms the early mobilization as all the patients ambulated at second postoperative day with good to

excellent HHIS in 47 (97.92%) hips at 12 weeks (Table 3) with p value < 0.0005. At 2 years, 46 (95.83% of total hips studied, but 100% of those still alive) had good to excellent functional outcomes (figure 5).

Pre-hospital delay in surgery for hip and proximal femoral fracture is the norm in our environment due to the persistent patronage of traditional bone setters despite their obvious failures. The average duration of patients' presentation in this study was 26.4 +/- 12.8 days (range 3 to 150 days), mainly pre-hospital delay. This is contrary to the findings of Cha *et al.* in their study with a mean delay before surgery of 7.5 days (range 3–167 days) after hip fracture which was mainly hospital delay [15]. They concluded that delayed surgery was significantly related to 30-day and 1-year mortality [10]. Despite the significant delay in presentation in this study however, we had no mortality in 30 days and the overall mortality was low. The reason is unknown to us.

Jolly A *et al.* reported that cemented hemi-replacement arthroplasty allows early pain-free mobilization and had a good short term outcome, over time it was associated with a variety of complications that significantly affects the quality of life of patients unlike patients treated with PFN that had delayed postoperative mobilization, but better results when followed up to 1-year post-surgery [16]. This finding is contrary to the findings in this study, and those of Thakur A and Lal M, Singh S, and Gashi YN *et al.* that found cemented hemiarthroplasty to be consistently superior [3, 4, 17]. A patient had cemented hemiarthroplasty on the contralateral hip after 2 years of follow up with excellent functional outcomes for both hips (figure 6a-h).

One case of dislocation leading to deep surgical site infection, and two LLD of 1.0 and 1.5cm were the complications recorded. These relatively less complications were reported by other researchers [4, 8, 18]. Chehade MJ *et al.* in their study found that older age, male gender, higher American Society of Anesthesiologists classification, in residential care, and in-patient reported medical complications were independent risk factors for early mortality [19]. Two patients died of unrelated causes in this study. This is similar to the findings of Sancheti *et al.* and Zha *et al.* [8, 20]. Advantages and limitations of cemented hemiarthroplasty for unstable per trochanteric fractures in home-ambulant patients are as listed in table 4.

Table 4: Shows the highlights of the advantages and disadvantages of primary cemented Hemi arthroplasty.

Advantages
Early weight-bearing ambulation
Shorter duration of surgery
Shorter hospital stay
Fluoroscopy not needed
Relatively cheaper than internal fixation
Less failure rate and re-operation
Better functional outcome from first day postoperative period
Disadvantages
Cement related complications
Make use of permanent exogenous materials
Not suitable for community ambulant patients

Conclusion

Primary cemented bipolar hemiarthroplasty allows early weight bearing and produces good to excellent functional outcomes in home-ambulant elderly patients with unstable pertrochanteric fractures with minimal complications. Level of evidence is level II (Prospective cohort study).

Limitations

1. Prolonged hospital stays: Despite weight-bearing ambulation at second postoperative day, patients are kept in the hospital until they are confident ambulating using a walking frame because of paucity of nursing homes to discharge patients to in our environment. This is not unconnected with the fact that African cultures and religions encourage children to take care of their parents in old age.
2. Variable days of presentations due to various length of stay with the TBS also made some of the cares to the patient to be individualized.

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