



OUTCOMES ANALYSIS OF CEMENTED BIPOLAR HEMIARTHROPLASTY IN ELDERLY POPULATIONS SUFFERING FROM UNSTABLE INTER-TROCHANTERIC HIP FRACTURES

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Abstract:

Objective: This study aims to evaluate the surgical outcomes of Cemented Bipolar Hemiarthroplasty in elderly patients diagnosed with unstable intertrochanteric hip fractures.

Methodology: A prospective study was conducted at Liaquat National Hospital and Medical College Karachi, Pakistan, from September 2023 to September 2024. Fractures were classified according to the AO/OTA classification system, with a specific focus on Evan's classification to narrow the study parameters. Inclusion criteria encompassed patients with AO/OTA types 31-A2.2 and 31-A2.3, as well as Evan's fracture types 3 and 4. A posterolateral approach was employed for the primary cemented bipolar Hemiarthroplasty, performed with the patient in a lateral position. A T-shaped capsulotomy incision facilitated access to the joint capsule for fracture pattern analysis. The femoral head was excised at the sub-capital region by transecting it at the neck. Temporary fixation of the greater and lesser trochanters was performed based on the degree of fracture comminution and displacement.

Results: Among the 21 patients recruited for the study, 14 (66.6%) were male and 7 (33.3%) were female, with a mean age of 70 years. The age range of the participants was from 61 to 91 years. Patients were admitted for surgical intervention between 1 and 13 days post-injury, with an average presentation time of 4.33 days following the injury. The mean duration of surgery was recorded at 89.76 minutes, with an observed intraoperative blood loss averaging 426.19 ml.

Conclusion: We concluded that bipolar Hemiarthroplasty is best alternative method to manage

unstable Intertrochanteric fractures in patients with severe osteoporosis.

Keywords: Unstable Intertrochanteric fractures, Hemiarthroplasty, Greater Trochanter, Lesser Trochanter

Introduction:

Intertrochanteric fractures represent a significant challenge in the management of elderly patients. In this demographic, intertrochanteric fractures account for approximately 45% of all hip fractures, primarily due to osteoporosis. Notably, 35% to 40% of these fractures are classified as unstable. Various surgical options exist for treating intertrochanteric fractures, including plate osteosynthesis (Dynamic Hip Screws, DHS), intramedullary nails (Proximal Femoral Nail, PFN), total hip replacement, and hemiarthroplasty. While DHS and PFN yield favorable outcomes, they are associated with complications such as bedsores, deep vein thrombosis (DVT), and pulmonary embolism, affecting 22% to 50% of cases. Additionally, these methods can lead to increased morbidity due to mechanical failures.

Elderly patients with intertrochanteric fractures are particularly susceptible to these complications, compounded by the long-term effects of osteoporosis. The reduction in bone stock increases the likelihood of inadequate fixation, poor screw retention, and a higher incidence of cutouts or implant failures. For simple intertrochanteric fractures, successful outcomes can often be achieved with DHS. However, this technique is less effective for unstable comminuted fractures, leading to higher rates of implant failure. Studies indicate a failure rate of 4% to 16.5% in osteoporotic patients treated with osteosynthesis. To mitigate these risks in unstable intertrochanteric fractures among the elderly, hemiarthroplasty is increasingly regarded as the preferred surgical intervention. This procedure involves the replacement of the femoral head and neck with a prosthesis, but it is technically demanding, as it requires the repair of the greater and lesser trochanters using steel wires or non-absorbable sutures. Our study aims to evaluate the outcomes of Cemented Bipolar Hemiarthroplasty in elderly patients with unstable intertrochanteric hip fractures.

Methodology:

This prospective study was conducted at our hospital, enrolling a total of 50 patients with unstable intertrochanteric femur fractures during the study period. The average follow-up duration was one year; however, one patient died eight months post-surgery, and another was lost to follow-up, leading to their exclusion from the final analysis. The inclusion criteria specified patients aged over 60 years, regardless of gender. All fractures were classified according to the AO/OTA system, with Evan's classification employed to further refine the study parameters. Only patients with AO/OTA types 31-A2.2 and 31-A2.3, as well as Evan's fracture types 3 and 4, were included. To minimize the risk of severe complications, we selected patients who were ambulatory prior to their injury.

Informed consent was obtained, ensuring that all patients understood the study's objectives and potential consequences. Exclusion criteria included individuals with a history of prior surgeries, those unfit for surgical intervention, and patients with polytrauma. Open, pathological, or malunited fractures, as well as those with rheumatological, neurological, or psychiatric disorders, were also excluded. Ethical approval was granted by the research ethics department of the hospital. Ultimately, 21 patients who met all inclusion criteria were recruited for the final analysis.

We employed a posterolateral approach for the primary cemented bipolar hemiarthroplasty, positioning the patient laterally. A T-shaped capsulotomy incision was used to access the joint capsule for fracture pattern evaluation. The femoral head was excised at the sub-capital region by transecting it at the neck. Temporary fixation of the greater and lesser trochanters was performed based on the degree of fracture comminution and displacement. Excessive portions of the neck were trimmed, and the femoral canal was prepared using reamers and broaches. A trial stem was inserted, aligning the transcondylar axis of the femur's lower end with the long axis of the leg, while ensuring

the correct prosthesis version.

Determining the appropriate prosthesis height in cases of severe comminution, particularly in lesser trochanter fractures, proved challenging. To address this, both knees were brought together to mark the prosthesis height. We utilized a second-generation cementing technique, selecting the appropriate prosthesis size to prevent limb discrepancy. The prosthesis stem was then sunk to the predetermined mark. Tension band stainless steel wires were employed for the reconstruction of the greater and lesser trochanters, with encircilage techniques used in some cases. In severe comminution, Ethibond sutures were used to secure the trochanters, sometimes left within the soft tissues for additional support. A cement mantle was applied to create a calcar where lesser trochanter reconstruction was not feasible.

Bone drills and wires were utilized to secure the gluteus medius sleeves and vastus medialis to the greater trochanter, along with the attachment of short external rotators. After ensuring joint stability and assessing the range of motion, the wound was closed in layers. Patients were encouraged to sit on the first postoperative day and stand on the second. By the third and fourth days, ambulation with assistance was permitted. Follow-up assessments occurred at two weeks, four weeks, three months, six months, and twelve months post-surgery, with radiological evaluations conducted at each visit. The Hip Harris Score (HHS) was used for assessment, categorizing scores as follows: <70 (poor), 70-79 (fair), 80-89 (good), and 90-100 (excellent).

Results:

Out of 21 recruited patients 14 (66.6%) were male and 7 (33.3%) were female with average age of patients was 70 years. We recruited patients aged 61 to 91 years. These patients were admitted to our hospital between 1-13 days of injury for surgery. The average presentation of patients was reported as 4.33 days after injury. The mean surgery duration was 89.76 minutes and we observed 426.19 ml intraoperative blood loss (Table 1). After surgery, we allowed patients to bear weight on average 3.52 days. On day 4th and 5th day of surgery, we asked our patients to walk without support. One patient started his walk with support after 28 days however, one patient refused to walk at all. Except for 8 cases all the patients walked without support after one month. The average hospital stay was noted as 9.48 days with a minimum of 7 and maximum of 25 days (in one patient). Overall we observed very few complications however, we observed one case of bedsores, after the 13th day of surgery. Although he was healed with nursing care and dressing still patient refused to walk and had poor outcomes. One patient reported a superficial surgical site infection which was managed with antibiotics. One case of revision surgery was reported due to superficial surgical site infection on the 6th week after surgery. This case was managed with removal and reimplantation. The patient was already suffering from diabetes with improper control of blood sugar which leads to complications and results in surgical revision. However, we did not observe any case of dislocation or loosening (Table 2). Our study reported 85.24 final mean HSS with 9 excellent, good in 7 cases, fair in 3 cases, and poor in 2 cases. (Table 3).

Table 1: Demographic and clinical characteristics of recruited patients

Variables	Mean values/ (%)
Age in years	70 (61-91 years)
Gender	
Male	14
Female	7
Injury to surgery time (in days)	4.33 (1- 13)
Surgery duration (in minutes)	89.76
Intraoperative blood loss (ml)	426.19

Table 2: Postoperative Outcomes of Patients

Variable	Mean or (%)
Weight Bearing (days)	3.52
Walk Without Support (28th to 62nd day)	13 (61.9%)
Not Able to Walk Without Support	8 (38%)
Hospital Stay Duration (days)	9.48
Postoperative Complications	
Superficial Surgical Site Infection (SSI)	1 (4.76%)
Deep Surgical Site Infection (SSI)	1 (4.76%)
Revision	1 (4.76%)
Limb Length Discrepancies	5 (23.8%)
Limb Shortening	4 (80%)
Limb Lengthening	1 (20%)

Table 3: Hip Harris score after surgery

Hip Harris score	Frequency (%)
Excellent	9 (42.8%)
Good	7 (33.33%)
Fair	3 (14.2%)
Poor	2 (9.5%)
Mean Hip Harris score at 3rd week follow up	74.29
Mean Hip Harris score at final follow-up	85.24

Discussion:

In this study, we performed Hemiarthroplasty in 21 elderly age cases with Bipolar prosthesis in which we reconstruct GT and LT with steel wires. In this study, we made calcur with cement in cases where LT reconstruction was not possible. In our study, the average age of patients was 70 years. We recruited patients aged 61 to 91 years. These patients were admitted to our hospital between 1-13 days of injury for surgery. The average presentation of patients was reported as 4.33 days after injury. After surgery, we allowed patients to bear weight on average 3.52 days. On day 4th and 5th day of surgery, we asked our patients to walk without support. One patient started his walk with support after 28 days however, one patient refused to walk at all. Except for 8 cases all the patients walked without support after one month. Early mobilization of our patients reduced the risk of complications and minimize probability of prolonged hospital stay. The average hospital stay was noted as 9.48 days with a minimum of 7 and maximum of 25 days (in one patient). Our results are comparable with the previous study of Thakkur et al³., in which they performed surgery on average 80.7 years old patients. His mean time from injury to surgery was of 3 days. Another study conducted by Ahmed Emory et al⁹., observed a mean interval of 8.78 of hospital stay. Furthermore, his study reported an average of 2.9 days from injury to surgery. A total of 41 patients was recruited in his study and 27 patients were able to walk with walker support whereas 13 cases need assistance along with a walker. Regarding Hip Harris score, a study of Sachet et al¹⁰., observed 10 excellent results, 15 good, 2 poor, 7 fairs, and one failed result with an average score of 84.8 ± 9.72 . On the other hand, the study of Choy et al¹¹., observed an 80.6 ± 9.3 HSS score in the final follow-up with 8 excellent, 19 good, 9 fair, 4 poor results out of 40. In our study, we observed 85.24 final mean HSS with 9 excellent, good in 7 cases, fair in 3 cases, and poor in 2 cases. A total of 76.19% of patients had better than fair results. Our results are far better than the study of Choy et al¹¹., in which he observed 67.5% cases with better than fair results. Overall we observed very few complications however, we observed one case of bedsores, after the 13th day of surgery. Although he was healed with nursing care and dressing still patient refused to walk and had poor outcomes. One patient reported a superficial surgical site infection which was managed with

antibiotics. One case of revision surgery was reported due to superficial surgical site infection on the 6th week after surgery. This case was managed with removal and reimplantation. The patient was already suffering from diabetes with improper control of blood sugar which leads to complications and results in surgical revision. However, we did not observe any case of dislocation or loosening. Our results are comparable with the international literature. In the study of Nikunkj et al¹, he observed one case of superficial SSI, one case of deep SSI, a single case of acetabular erosion, nonunion GT in four patients, and 2 cases of GT wire breakages out of 28 patients. His final follow-up HSS score was 84.8.

On the other hand, the study of KV Puttakemparaju et al¹², observed a single case of implant removal due to SSI, grade 1 bedsores in one patient. A study by Gashi et al¹³, revealed that Hemiarthroplasty had significantly better results when compared to DHS. Another comparative study conducted by Mohamad Emmi et al¹⁴, revealed better significant results of flexion range, external rotation, and HHS in the bipolar Hemiarthroplasty group. However, his findings failed to observe a significant difference in pain severity in bipolar Hemiarthroplasty versus the DHS group. A comparative study by Yee Suk Kim et al¹⁵ observed early mobilization in the elder age group with AO type 2 Intertrochanteric fractures treated with Hemiarthroplasty. However, his study failed to calculate the significant differences in clinical results, hospital stay, surgery time in both groups (Hemiarthroplasty versus hip screw fixation). In contrast, a study by Mansukhani et al¹⁶ reported high mortality at 12 months after Hemiarthroplasty. However, his study observed less intraoperative blood loss with fewer postoperative complications. For early mobilization, hemiarthroplasty can be an alternative treatment for managing unstable Intertrochanteric fractures in elderly patients¹⁷.

Limitations of the study:

Our sample size was so small and we did not conduct comparisons with other techniques like DHS and PFN. The study timeframe was less and we failed to analyze long-term complications.

Conclusion:

We concluded that bipolar Hemiarthroplasty is best alternative method to manage unstable Intertrochanteric fractures in patients with severe osteoporosis. It helps in early weight bearing, allow early mobilization, reduce prolonged hospital stay and minimize post-operative complications.

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