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Primary Hemiarthroplasty for Unstable Intertrochanteric Fractures in Octogenarian Patients with Multiple Medical Ailments

[1]Bhavya Sirohi, [2]Pritish Singh and [3]Bharat Jindal

[1]Department of Orthopaedics, Military Hospital, Agra, Uttar Pradesh, India

[2]Department of Orthopaedics, Maulana Azad Medical College, New Delhi, India

[3]Department of Orthopaedics, 151 Base Hospital, Guwahati, Assam, India

ABSTRACT

This retrospective study evaluates the clinical and radiological outcomes of cemented bipolar hemiarthroplasty in octogenarian patients (aged 80-89) with unstable intertrochanteric fractures and multiple medical comorbidities. Given the unique challenges posed by this demographic, including severe osteoporosis and impaired mobility, traditional internal fixation methods often result in high failure rates and extended recovery times, leading to serious systemic complications. A total of 92 patients were analyzed following surgery between January 2018 and July 2022, with a mean follow-up of 22.6 months. The study highlights a combined 2-year mortality rate of 29.3% and a first-year mortality rate of 17.4%, underscoring the significant risks associated with this patient population. Functional outcomes were measured using the Harris Hip Score and the Modified Functional Ambulation Classification (MFAC), revealing that 85.2% of patients regained their preoperative ambulation levels within three months post-surgery. Complications included one case of superficial infection and two instances of trochanteric nonunion, yet overall, the procedure demonstrated high rates of trochanteric union (97.7%). The findings suggest that cemented bipolar hemiarthroplasty is a viable primary treatment for octogenarians with unstable intertrochanteric fractures, promoting early ambulation and reducing the risks associated with fixation failure. The study advocates for this surgical approach as a means to facilitate quicker rehabilitation and mitigate complications inherent to traditional fixation methods in a frail elderly population.

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Key Words
Unstable intertrochanteric fractures, bipolar hemiarthroplasty, osteosynthesis, outcomes, infection

Corresponding Author
Bharat Jindal,
Department of Orthopaedics, 151 Base Hospital, Guwahati, Assam, India
bharatjindal92@gmail.com

Author Designation
[1,3]Assistant Professor
[2]Professor

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INTRODUCTION

Octogenarian patients with unstable intertrochanteric fractures and multiple medical co-morbidities constitute a discrete cohort among patients with similar fracture by virtue of accentuated risk of mechanical failure and mortal events. Severe osteoporosis, residual instability at fracture site, bone comminution, mobility impairment and slow rehabilitation are few attributing factors towards complications of osteosynthesis by internal fixation[1,2]. Poor bone mass and residual fracture instability preclude resumption of full weight bearing ambulation even after internal fixation. Partial weight bearing is also difficult to follow in this group of patients and adds to fixation failures[3]. Failure rates of 3-16.5% have been reported[3,4]. Additionally, prolonged post-surgery convalescence increases risk of systemic complications like decubitus ulcers, deep venous thrombosis, hypostatic pneumonia, cerebro-vascular accidents etc. Replacement arthroplasty as a primary surgical procedure in this peculiar cohort of octogenarian patients with unstable intertrochanteric fractures and multiple medical co-morbidities have been reported as viable and successful option[5]. A stable cement fixed endo-prosthesis facilitates early ambulation with full weight bearing, excludes instances of fixation failure and their consequent morbidities in this complication prone patient group[6]. We retrospectively evaluated clinico-radiological outcome and complication profile in a consecutive series of 92 patients with unstable intertrochantric fractures in octogeneraian patients with multiple medical co-morbidities surgically treated with cemented bipolar hemiarthroplasty. There is scanty literature evaluating this treatment modality specifically in the mentioned patient group. A brief review of results reported in literature with this treatment modality is also presented.

MATERIALS AND METHODS

In a retrospective study between January 2018 to Jun 2022 in tertiary care teaching hospital, 103 consecutive patients in age group 80-89 years (Octogenarian) with unstable intertrochanteric fracture and multiple medical co-morbidities were surgically treated with cemented bipolar hemiarthroplasty. 11 patients were either lost to follow up or have post-surgery follow up less than 6 months. There by, clinical data of 92 patients was used for study purpose. Written informed consent was obtained from all the patients authorizing treatment/ procedure, radiographic examination, and photographic documentation. Authorization from institutional ethics committee was obtained before commencing the study. AO/OTA fracture types 31-A2.2 and 31-A2.3 were included in study. Using Evan's criteria for instability at fracture site, all fractures qualified as unstable configuration[7]. Ambulation status was ascertained using Modified Functional Ambulation Classification(MFAC) and its grade was recorded for preinjury period and post-surgery follow-ups[8]. All fractures were considered osteoporotic in etiology and further investigations to definitively quantify osteoporosis were refrained. Pathological fractures, post-metastasis fractures, fractures in non-ambulatory patients (Grade 0 and 1 MFAC level of ambulation), patients with preexisting hip pathology were excluded from study.

Fig. 1: Unstable Displaced Intertrochantric Fracture in an Elderly Patient

Comprehensive medical evaluation was performed on all patients to ascertain medical co-morbidities and operative fitness. Presence of two or more medical conditions from a pre-determined list was counted as instance of patient with multiple medical co-morbidities. All patients were operated within 48 hours of admission. Preoperative optimization of medical conditions was done by a dedicated team of specialists.

Surgical Technique: All the patients were operated by same surgeon/senior author(SA). Surgical exposure was done using modified Hardinge's approach to hip in lateral position. A linear incision 10-12 cm in length was placed in line of femoral shaft centering over greater trochanter. Iliotibial band was incised in line of incision, tensor fascia lata muscle was separated. This exposes greater trochanter and its fracture lines. Insertions of Gluteus medius and Gluteus minimus muscles were identified on greater trochanter and Gluteus minimus insertion was lifted off subperiosteally from bone surface by sharp dissection to further improve visualization of fracture lines in inter-trochanteric plane and calcar femorale.

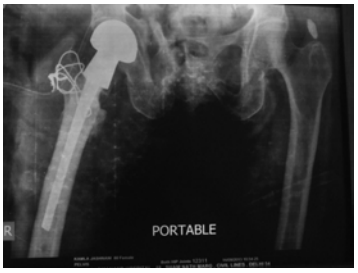

Fig. 2: Unstable Displaced Intertrochantric Fracture Managed with Cemented Bipolar Hemiarthroplasty

Fracture anatomy and communition in calcar femorale area is reviewed keeping in view to reconstruct anatomy of posteromedial cortex and its alignment with proximal femur. Capsule is longitudinally incised along the length of neck. Head fragment is extracted after securing with cork screw and releasing residual capsular attachments. Before proceeding with femoral canal preparation, trochanter fragments are provisionally fixed with stainless steel wire construct. Charnley's method of biplaner trochanteric wiring was used in all patients[9]. Optimal length of femoral neck was ensured by either trimming calcar fragment or augmenting with autologous bone graft from extracted head. Femoral canal was prepared by serial rasps. Epicondylar axis at distal femur and reconstructed anatomy of proximal femur helps in comprehending femoral anteversion. Provisional fixation over trial prosthesis was held in place and hip joint stability is judged. Monoblock bipolar hemiarthroplasty prosthesis with cement fixation was used in all cases. Continuity of proximal femoral cortices was ensured with provisional fixation in situ. A bone graft harvested from femoral head was used in cases with cortical non-contact. This prevents bone cement extrusion and facilitates bony union across fracture lines. Trochanteric fixation was finally tightened before cement sets in, while position of prosthesis is held firmly by assistant till bone cement sets in completely. Finally, head is relocated in acetabulum. Gluteus minimus is reattached to trochanter.

Postoperative Care: Early post-operative care was done in intensive care unit settings. Breathing exercises, knee bending and sitting on couch were encouraged on first day. Ambulation and gait training with walker was promoted from second post-operative day. Patients were followed at monthly interval for 3 months and then every 3 months for a year and then yearly. Follow-up assessments were done by same assessor(ST) for all patients. Any mortality in 2 years follow up period was recorded and segregated as early (within 3 month), intermediate (3 month-12 months), late (13 month-24 month). Early mortality was considered as direct result of hip trauma and burden of surgery. In Intermediate period mortality, hip trauma and surgery has directly contributed towards mortal event, while late mortality may be due to causes unrelated to hip trauma and surgery. Functional outcome was assessed using Harris Hip score and graded as Excellent(90-100), good(80-89), fair(70-79), Poor(<70). Modified Functional Ambulation grade was noted and compared with preinjury level. Radiological assessment was done to exclude complication like nonunion greater trochanter, loosening of stem, acetabular erosion/protrusion and peri-prosthetic fractures. Maintained integrity of trochantric fixation construct and bridging of fracture lines was construed as an evidence of trochantric union.

RESULTS AND DISCUSSIONS

Mean age of 92 patients (male-39; female-53) was 84.2 years. Mean delay for surgery was 4.1 days(range, 1-18) with delay due to late presentation or pre-operative optimization of medical conditions. 29 patients had AO/OTA type 31-A2.2 fracture, 63 had AO/OTA type 31-A2.3 fracture. Mean operative time was 71 minutes(range,45-130). Mean peri-operative blood loss was 210 ml(range,90-350ml) with blood transfusion requirement in 14 patients. One mortality occurred during hospital stay due to escalation/ of preexisting renal function derangement. Combined first year mortality rate was 17.4%(n=16 and 0-3month period- 3 patients.), while mortality at 2 year follow-up was 29.3%(n=27). Mortality in octogenarian patients is a significant event, so we counted them all. Average follow up was 22.6 months(range. 3-61 months) for 92 patients. All patients except one could be ambulated with support during hospital stay. At the end of 3 months, 85.2%(n=75) patients regained preoperative MFAC level of ambulation. In 12.5% patients(n=11), there was deterioration by one MFAC level of ambulaion, while in 2.2% patients(n=2), regained ambulation level was 2 MFAC levels less than preoperative status. None of patient had limb length discrepancy more than 1 cm. abductor lurch was present in 7 patients. At latest follow up, Mean Harris hip score was 86.3(range, 46-98). Functional outcome graded as excellent in 51, good in 23 , fair in 11, poor in 2 and failed in 1. There was one instance of superficial infection which responded to debridement and short course of antibiotics. Incision site hematoma was encountered in one patient and treated by surgical drainage. one patient dislocated hip at 3 weeks after surgery , which was managed by closed reduction and abduction splinting. Trochantric fragment union was present in 97.7% patients (n=86). One case of trochantric nonunion was managed by implant extraction and conversion to total hip arthroplasty. One more patient of trochantric nonunion was managed conservatively and ambulated with support. One patient sustained periprosthetic fracture after a repeat trauma and was managed by locking compression plate with autologous bone graft augmentation. None of patient had acetabular erosion and implant loosening necessitating surgical intervention. Secondary surgical intervention was required in 7.9% patients (n=7).

Intertrochanteric fractures in any age group are preferentially treated by operative methods with singular purpose to allow early ambulation[5]. Risks of non-ambulation are high and bring along serious complications/morbidities like hypostatic pneumonia, lung atelectasis, decubitus sores , thromboembolic events etc. These risks are proportional to age and physiological condition of patient[10]. Major determinants of successful osteosynthesis in such fractures are internal fixation construct stability and

quality of bone. Unstable fractures have higher rate of construct failure related complications[2,10]. Octogenarian population pose a separate and additive challenge while treating unstable intertrochantric fractures. Such an age of patient invariably invites many medical ailments. Coexistence of multiple medical comorbidities with unstable hip fracture adds to complexities to treatment and rehabilitation[11-13]. Such patients invariably have osteoporosis, senile cognitive attrition and impaired mobility levels. Residual Instability at fracture and poor bone quality preclude full weight bearing ambulation even after internal fixation. Instructions for partial weight bearing to protect internal fixation are difficult to follow and exposes patient to fixation failures. Conversely, a delayed and prolonged rehabilitation exposes an already physiologically compromised patient to risks like hypostatic pneumonia, decubitus ulcers, thromboembolic events, gastro-intestinal malfunction etc[3,5]. Overall failure rate with internal fixation of intertrochnatric fractures is 3-16.5%[12]. this rates will be higher for unstable fractures. Failure rates specific to octagenerian patients could not be found in literature, but will be significantly higher than the other patient groups. Each failure necessities a repeat surgical intervention with incremental risks. Burden of morbidity and mortality associated with primary procedure, its complications and secondary interventions nacessates to exercise an effective and alternative treatment modality which averts above mentioned shortcomings[14,15]. Replacement arthroplasty as primary treatment for unstable intertrochantric fractures in octogenarian patients with multiple medical morbidities averts complications of fixation failure and allows early full weight bearing ambulation with good return of function[1,2,3,4,5,6,11,16]. Authors have used option of hemiarthroplasty and total hip arthroplasty as primary treatment for unstable fractures in elderly patients of age groups[1,5,6,11,16]. We used single assembly hemiarthroplasty prosthesis. It is adequately long stemmed for cement augmented fixation in intertrochantric fractures, while constrained bipolar articulation provides sufficient protection against tendency of dislocation[16,17]. Additional advantages are less surgical time and ease of use. Addition of acetabular procedure for total hip replacement brings forward it's own set of complications and postoperative morbidities and in authors opinion, grossly against principles of surgery on very elderly and physiologically compromised patients. Conventionally, option of arthroplasty is used as salvage procedure for failed fixation of intertrochanteric fractures[18,19]. But citing difficult rehabilitation and early ambulation in elderly patients, it has been used by many authors as primary treatment of unstable intertrochantric fractures. Stern and Goldstein Angerman earlier used Leinbach prosthesis, which was specifically designed for intertrochanteric fractures with long straight stem and trochantric fixation holes. Their results were encouraging with favorable results in 88-94% cases and benefit of early weight bearing ambulation[20]. Harwin *et al.* reported use of bipolar prosthesis in 58 elderly patients with mean age 78 years with 91% good results. He reported 2 instances of trochantric nonunion and no dislocation[21]. Rodop et al treated 54 patients with mean age 75.6 years with unstable intertrochnatric fracture using bipolar type Leinbach prosthesis with advantage of early ambulation in 98% cases. He also reported a gradually decreasing inner motion of bipolar head without comment on its clinical implications[22]. Sancheti *et al.* surgically treated 37 patients with mean age 77.1 years having unstable intertrochanteric fractures with bipolar prosthesis. He reported 91% excellent to good results and advantage of early ambulation[16]. We also found similar results with 80.4% patients(n=74) having excellent to good results. Earlier studies included patients with differing age groups making patient cohort inhomogeneous. Medical morbidities were not included as inclusion parameter in earlier studies as we did in our study. Impact of hip trauma and consequent surgical treatment on ambulation grade was measured using MFAC grade of ambulation. Octogenarian patients have physiological attrition with realistic contribution to gait changes with hip fracture having additive effect. MFAC is a reliable and valid gait assessment tool for patients with coexisting hip fracture and neuro-cardiac compromise[8,23]. It assesses both preinjury and post-surgery quality of ambulation and helps understand overall benefits of surgery on a frail patient. In our series, although all patients were able to ambulate after surgery, but there was deterioration of one grade of ambulation in 12.5% patients and 2 grades in 2.2% patients. Although most of authors used posterior approach for hip exposure, we used modified lateral approach for hip exposure with benefit of intact posterior soft tissue restraints, lesser dislocation rate and avoiding discomfort of abduction splitting. Haentjens[24], Broos[2], Stappaerts[4] did comparison studies between internal fixation and hemiarthroplasty and found comparable long term functional results but remarkable benefit of early and full weight bearing ambulation with hemiarthroplasty. There patient cohort was inhomogeneous regarding parameter of age. None of study specifically examines physiologically compromised elderly age group of 80-89 years or higher age to reveal clinical benefits of one modality over other. A randomized control trial with larger sample size is needed to decipher exact clinical superiority of hemiarthroplasty over other modalities in octogenarian population. Variable severity of medical ailments adds to inhomogeneity of cohort which needs to be comprehended in further

studies. We think that Age of patient and presence of medical ailments have realistic impact on functional outcome. A relatively younger age and absence of medical co-morbidities will have different course of functional recovery and spectrum of complication profile, while more elderly age group like octogenarian or nonagenarians will have different course of recovery, final outcome, complication profile and mortality rates. Coexistence of medical morbidities will have negative impact on post-surgery recuperation[13]. Although primary motive of early reinstatement of ambulation remains same for all cohort of patients, modalities need to be reconsidered depending fracture configuration, life expectancy and senile physiological deterioration.

CONCLUSIONS

We conclude that hemiarthroplasty is a prudent surgical modality for unstable intertrochanteric fracture patients in octogenarian age group having multiple medical ailments. This procedure ensures faster rehabilitation, faster reinstatement of preinjury activity level while altogether excluding spectrum of complication related to inadequate internal fixation construct and mechanical failure. Antero-lateral hip approach for procedure eases rehabilitation by decreasing need of abduction splinting of limb and postural restrictions.

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