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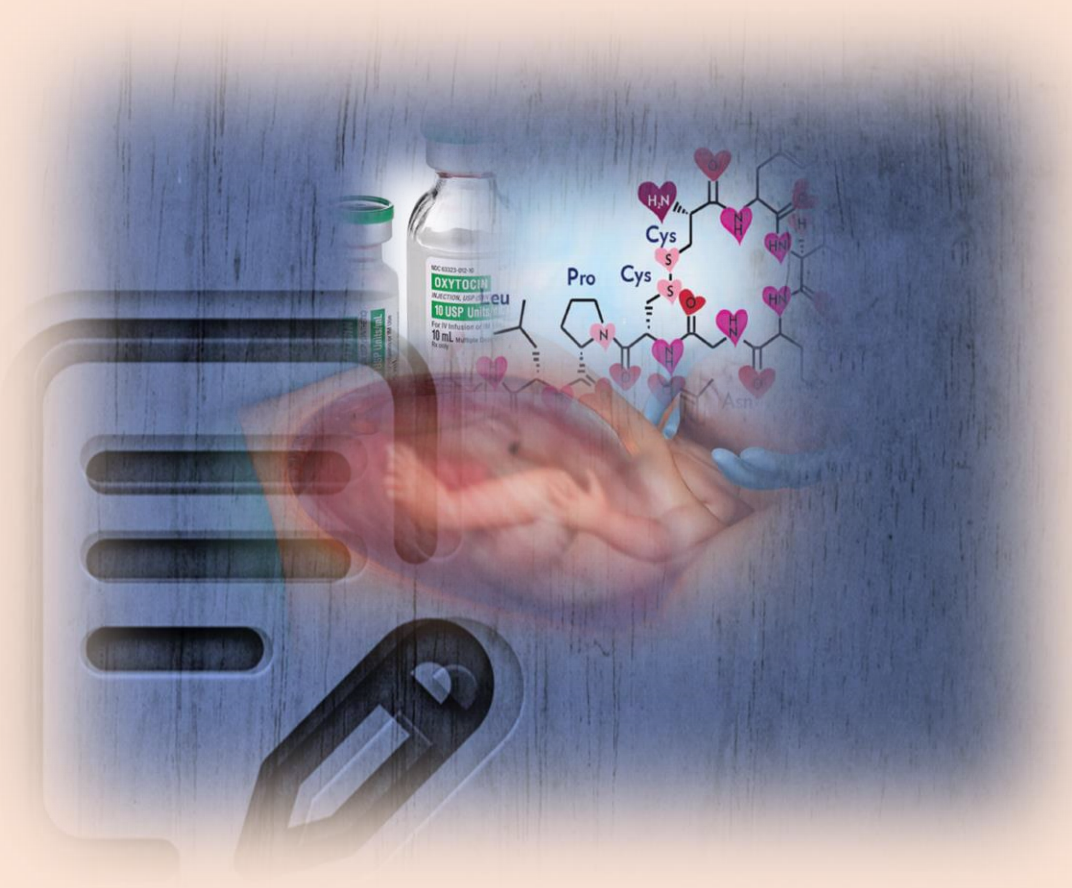

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Original Article

Management of Unstable Per-trochanteric Fracture in Old Patient by Primary Prosthetic Replacement

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ABSTRACT

Introduction and Aim: Peritrochanteric fractures are frequent of the proximal femur and represents about half of all proximal femur fractures. They are associated with disability, mainly in elder patients. Its management aiming to achieve immediate ambulation and to regain the pre-operative ambulation. The current work designed to evaluate and assess the functional and radiological outcomes of primary prosthetic replacement in old age cases of unstable per-trochanteric femur fractures.

Patients and methods: The current work was an interrupted time series clinical trial (quasi experimental), included 15 patients suffering from unstable per-trochanteric fracture presented to us within a week of sustaining injury. They were clinically assessed and checked for fitness for surgery. Then and after surgery, they were followed by for functional outcome by Harris Hip Scale and any complications were recorded.

Results: Patients age ranged between 61 and 94 years. Females were more affected than males (80.0% vs 20.0%). Associated comorbidities were hypertension, diabetes and both conditions among 33.3%, 6.7% and 33.3%, successively. Falling was the commonest mode of injury (60.0%), and the left side was more affected than the right (60.0% vs 40.0%). Associated injuries were 1(6.7%) fracture surgical neck hummers, 1(6.7%) contralateral both bone leg fracture, 1(6.7%) had fracture mid shaft ulna. Regarding outcome, all cases were free from postoperative complications. However, blood loss was reported among 11(73.3%). Twelve (80%) patients had an excellent, 2 (13.3%) had good and 1(6.7%) had fair functional outcome. There was significant association between functional outcome and patients, gender, associated comorbid medical conditions, mode of trauma, side of trauma, or blood loss.

Conclusion: Primary prosthetic replacement is a valid surgical option in management of unstable trochanteric fractures in elderly. The main advantages are the safety, effectiveness and early full weight bearing.

Keywords: Proximal Hip; Unstable fractures; Pertrochanteric; Osteoporosis; Elderly.

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INTRODUCTION

Hip fractures are frequent and encompass about 20% of the operative workload of orthopedic trauma [1]. Intertrochanteric fractures are described as extracapsular fractures of the proximal femur. It occurs between the greater and lesser trochanter. The intertrochanteric part of the femur is positioned between the greater and lesser trochanters and is a dense trabecular bone is the main composition of this part. The greater trochanter functions as an insertion site for different muscles (e.g., the glutei medius and minimus, obturator internus, piriformis), while it serves as the site of origin for the vastus lateralis. However, the iliacus and psoas major muscles (i.e., the iliopsoas) were inserted in the lesser trochanter [2- 4].

Elderly populations are prone to pertrochanteric femoral fractures. These fractures are responsible for > 50% of all hip fractures in this age group [5], and are associated with substantial morbidity and mortality [6]. Many classification systems are in work to classify these fractures.

In elderly, the treatment of unstable osteoporotic per-trochantric fractures, is challenging due to difficult anatomical reduction, poor quality of the bone, and sometimes a need to guard the fracture against stresses of weight bearing. Internal fixation (cephalomedullary nail and dynamic hip screw) in fixation of pertrochanteric fractures usually includes prolonged bed rest or limited ambulation, to avoid implant failure due to osteoporosis. This might lead to a higher chance of the development of complications like pulmonary embolism, deep vein thrombosis (DVT), lung infection (pneumonia), and bed sores (decubitus ulcer) [7].

The unstable pertrochanteric femoral fractures are unstable represented 40% and are prone to a higher failure rate with traditional treatment options (like dynamic hip screw (DHS) and cephalomedullary nails) when compared to stable patterns. This instability is due to multiple factors (e.g., loss of the posteromedial calcar support or lateral femoral wall insufficiency) [8]. Thus, the reconstruction of the lateral wall plays a significant role in stability achievement and preservation in these fractures; and thus, affects the overall functional outcome. This works by providing a buttress effect to the proximal fragment lateral wall, excessive collapse of the fracture, significant limb shortening, varus malposition, and medialization with eventual fixation failure are prevented [9].

The aim of work was to evaluate and assess the role of primary prosthetic replacement in old age cases of unstable per-trochanteric femur fractures.

PATIENTS AND METHODS

This study was completed at the department of orthopedic Surgery, Al-Azhar University Hospital (New Damietta).

This was an interrupted time series clinical trial (quasi experimental) study, that included twenty patients with unstable per-trochanteric femoral fracture presenting within a week of sustaining an injury.

Inclusion and exclusion criteria:

Patients were included if they had unstable per-trochanteric fracture type III to V according to Evan's classification [10], within a week of sustaining injury. We included all subjects 60 years or older. On the other side, patient was excluded if he/she was unfit for anesthesia, refused to participate, younger than 60 years of age, who had polytrauma or associated fractures, who had stable fractures with an intact lesser trochanter, head injury, bilateral intertrochanteric fractures or who's with long recumbency period before injury.

Ethical Aspects:

This study was approved be Damietta Faculty of Medicine, Institutional Research and Ethics committee, Al-Azhar University. All patients were voluntarily signed an informed consent. The research and reporting was completed according to Helsinki declaration of research reporting and conduct.

Methods:

Each patient was subjected to full history about his/her personal data and trauma characteristics. All were clinically evaluated in a systematic standard manner. Local examination assessed the affected side, deformity, swelling, tenderness, movement, skin condition and other injuries.

Laboratory investigations was achieved to assess the anesthetic fitness of the patient.

The radiological assessment included standard anteroposterior (AP) and lateral plain X-ray views. An internal rotation view was obtained according to need. Computed tomography scans were done for patients with suspected fractures of intertrochanteric part of the femur while plain X-ray didn't show fracture. First aid included analgesia according to need and skin retraction for the affected hip.

Operative technique:

All patients underwent surgery under spinal anesthesia, and they received prophylactic antibiotics (2g cephalosporin) half an hour before surgery. The surgery completed in the lateral decubitus position (Figure 1).

The hip was exposed through lateral approach; begin 5 cm proximal to tip of greater trochanter. Longitudinal incision centered over tip of the greater trochanter and extends down the line of the femur, the iliotibial band and vastus lateralis muscle were created (Figure 2).

The proximal femur, the capsule, and the acetabulum were exposed. The joint capsule was opened by a T-shaped capsulotomy. The fracture anatomy was assessed and a cut was taken high up in the neck (almost at the subcapital level) to facilitate removal of the femoral head. femoral head and neck extracted and femoral head was measured.

Temporary reduction and fixation of the greater and lesser trochanter were performed to determine femoral length and antetorsion.

In some cases, the lesser trochanter and the greater trochanter were fixed to the shaft using steel wires. In others, the lesser trochanter was comminuted, the trochanter pieces were left attached to the soft tissue and the medial defect was reconstructed using a cement cover.

The femoral medullary canal was then reamed to the appropriate stem size and diameter. The implant was inserted into the femur and joint was reduced (Figure 3).

Traction was then applied with implant in situ to achieve the desired limb length by comparing with the opposite limb on table.

Applied traction causes the femur to be pulled distally and, a note of distraction between the prosthesis and the femoral cut was made and the level on the prosthesis was marked.

This gives an idea of how much the femur implant should sink into the proximal femur so as to achieve limb length at the time of final cementing of the implant (Figure 4).

After fragment fixation, cemented femoral stems (Figure 5) were used in all the cases due to poor bone quality. Low viscosity cement was used due to better penetration through drilled holes and the prostheses are used.

The range of motion and stability were checked again. In some cases, we used cemented bipolar prostheses (Figure 6) with calcar and in other cases used cemented total hip with calcar according to severity of hip osteoarthritis.

If cemented bipolar prostheses with calcar was used, and after draying of the cement around the stem, the capsule was repaired, the gluteus medius reattached, and the wound closed over a suction drain.

For acetabulum component in cemented total hip with calcar, careful, nonaggressive reaming with frequent observation of the acetabular bed was carried out to prevent iatrogenic protrusion.

We tend to use larger femoral heads in the total hip replacement (THR) setting because the patients usually have poor preoperative abductor tension and shortening, which increases the risk for postoperative dislocation.

The capsule was repaired, and the wound closed over a suction drain (Figure 7). Finally, the wound was closed in layers and dressed.

Figure (1): showing intraoperative patient positioning

Figure (2): showing surgical incision

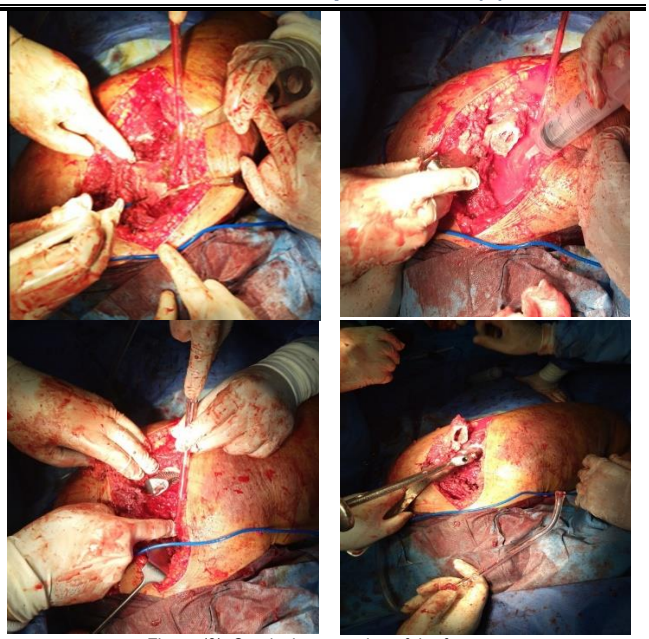

Figure (3): Surgical preparation of the femur

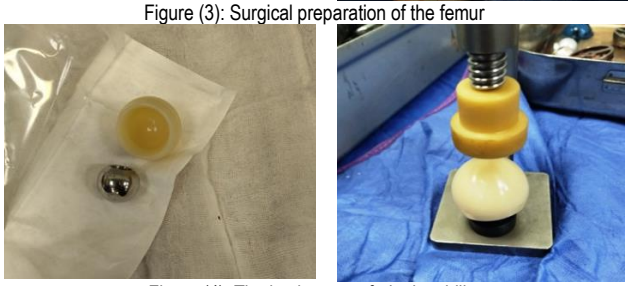

Figure (4): The implant set of dual mobility

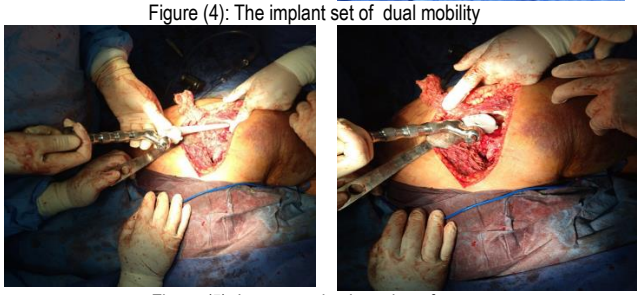

Figure (5): Intraoperative insertion of stem

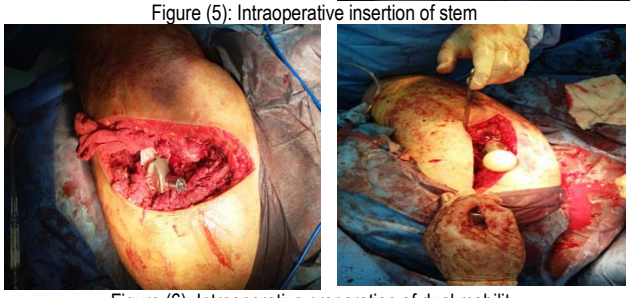

Figure (6): Intraoperative preparation of dual mobility

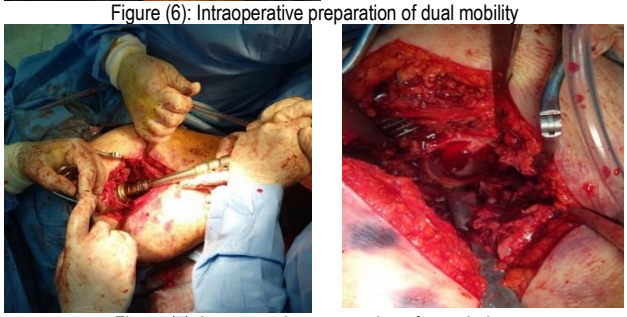

Figure (7): intraoperative preparation of acetabulum

Postoperative care and follow-up included routine recording of the vital signs, an intravenous antibiotic (1 g of cephalosporin given two times a day for three days), appropriate analgesia and anticoagulants. Check X-rays were done in the first postoperative day, and full weight bearing was permitted in the first day after operation. Sutures were removed after 2 weeks. Follow up visits were scheduled on 1-month intervals and check X-rays were done with every follow up visit.

The postoperative clinical assessment: It included questioning the patient about the pain during activity and rest and about ability to walk and stand. The range of hip motion was determined by modified Harris Hip Scoring System [11]. The outcome is considered poor if the score is <70, fair from 70 to 79, good for the score 80-89 and excellent if the score was 90 to 100. The union was assessed by plain X-rays and any postoperative complications were recorded.

Statistical analysis

Data were analyzed by the Statistical Package of Social Science (SPSS) software package for Windows (Standard version 16; SPSS Inc., USA). The normal data distribution was tested by Shapiro test. Qualitative data were described by relative frequency (number of occurrences) and percentages. Association between categorical variables was tested using Chi-square test or its equivalent when the cell count less than 5. Continuous variables were presented by the arithmetic mean (for central tendency) and standard deviation (SD) (for dispersion) for normally distributed data and analysis of variance (ANOVA) test was used to compare more than two groups. The threshold of significance was fixed at 5% level. The results were considered significant when p value ≤ 0.05.

RESULTS

In the current work, patient age ranged between 61 and 94 years. The majority (40.0%) were below 70 years of age, and females were more affected than males (80.0% vs 20.0%). Associated comorbidities were hypertension, diabetes and both conditions among 33.3%, 6.7% and 33.3%, successively. Falling was the commonest mode of injury (60.0%), and the left side was more affected than the right (60.0% vs 40.0%). Associated injuries were 1(6.7%) fracture surgical neck hummers, 1(6.7%) contralateral both bone leg fracture, 1(6.7%) had fracture mid shaft ulna (Table 1).

Regarding outcome, all cases were free from complications. However, blood loss was reported among 11(73.3%). Twelve (80%) patients had an excellent, 2 (13.3%) had good and 1(6.7%) had fair functional outcome (Table 2). There was significant association between functional outcome and patients, gender, associated comorbid medical conditions, mode of trauma, side of trauma, or blood loss (Table 3).

Table (1): Demographic data among the studied group

Variables		Values
Age (years)	Mean±SD	72.80±10.57
	Min.-Max.	61-96
Age groups (n,%)	< 70.0 years	6(40.0%)
	70-80 years	4(26.7%)
	> 80 years	5(33.3%)
Sex (n,%)	Male	3(20.0%)
	Female	12 (80.0%)
Comorbidities	None	4(26.7%)
	Hypertension	5(33.3%)
	Diabetes	1 (6.7%)
	Diabetes and hypertension	5(33.3%)
Mode of injury	Road traffic accident	6(40.0%)
	Falling	9(60.0%)
Injury side	Right	6(40.0%)
	Left	9(60.0%)
Associated injuries	None	12(80.0%)
	Fracture surgical neck of the humeres	1 (6.7%)
	Contralateral both bone leg fractures	1 (6.7%)
	Fracture mid shaft ulna	1 (6.7%)

Table (2): Outcome among studied patients

Variables		Values
Complications	Yes	0(0.0%)
	No	15 (100.0%)
Blood loss	Yes	11(73.3%)
	No	4(26.7%)
Functional outcome	Excellent	12(80.0%)
	Good	2(13.3%)
	Fair	1 (6.7%)

Table (3): Association between outcome and different variables

		Excellent	Good	Fair	P value
Age (years)	Mean ± SD	70.00±9.89	82.50±2.12	87.00±0.0	0.109
Sex (n,%)	Male	3 (25.0%)	0 (0%)	0 (0%)	0.64
	Female	9 (75.0%)	2 (100.0%)	1 (100.0%)	
Comorbid medical conditions	No	3 (25.0%)	1(50.0%)	0 (0%)	0.63
	Yes	9 (75.0%)	1(50.0%)	1 (100.0%)	
Associated injuries	No	9 (75.0%)	2 (100.0%)	1 (100.0%)	0.62
	Yes	3 (25.0%)	0 (0.0%)	0 (0.0%)	
Mode of injury	Road traffic accident	5 (41.7%)	1(50.0%)	0 (0%)	0.68
	Falling	7 (58.3%)	1(50.0%)	1 (100.0%)	
Side of trauma	Right	6(50.0%)	0 (0.0%)	0 (0%)	0.29
	Left	6(50.0%)	2 (100.0%)	1 (100.0%)	
Blood loss	Yes	9 (75.0%)	2 (100.0%)	0 (0%)	0.174
	No	3 (25.0%)	0 (0.0%)	1 (100.0%)	

DISCUSSION

The per-trochanteric fractures (PFs) and fractures of the neck of the femoral bone, are frequent femoral lesions. Elderly are more prone to such injures due to osteoporosis and low energy trauma is responsible (e.g., ground-level falls). Medical diseases and changes associated with advanced age lead to what is so called "Death spiral". Associated mortality remains high in the first year after injury (up to 30%). Thus, prevention and proper management present a major challenge from medical, social and economic points of view. Early surgical treatment with anatomical reduction are associated with better outcome. PFs usually treated by dynamic hip screw (DHS), trochanteric gamma nails, and reconstruction nails. Trauma of advanced age groups represented a challenge to orthopedic surgeons in treatment of musculoskeletal trauma. A significant rise of PFs fractures is expected in the next decades. Thus, they are going to be a real challenge to public health as the leading cause of orthopedic hospitalization. The goal of surgery is to permit a rapid mobilization and reduce complications [12-15].

In the current work, we aimed to evaluate the role of primary prosthetic replacement in old age cases of unstable per-trochanteric femur fractures. The outcome in the current work was excellent in 80%, good for 13.3% and fair for 6.7%.

Our subjects were older than 60 years (as per inclusion criteria) and the mean age was 72.80 years. They were mainly females (80.0%). These results are in line with Hasan *et al*. [16] who showed in a systematic review of 1534 patients, that, females were 54.3% and their age ranged from 60 to 85 years.

Comparable results were reported by Radhakrishna *et al*. [17] who stated that the average age was 73.2 years with the range of 70 to 85 years. Females represented 60.0%.

Hassankhani e*t al.* [18] reported that fracture type and age had no significant influence on general complications or outcome (as in the current work), but 81.25% of these complications had been occurred in female patients.

Comorbidities in the current work reported two thirds of patients had medical comorbid conditions (mainly diabetes and hypertension) and no significant association was reported with functional outcome.

El Ganzoury *et al*. [19] compared intramedullary fixation and hip arthroplasty in treatment of unstable, comminuted trochanteric fracture in elderly. Both groups were comparable, with no significant difference regarding mean personal data (Age, sex), side of the fracture, pre-existing comorbidities, and fracture type according to AO classification.

Ajaykumar *et al*. [20] reported that the most common associated medical problem was hypertension (40%), anemia (35%), diabetes (15%), chronic obstructive pulmonary disease (5%) and ischemic heart disease (5%). Blood transfusion was reported in 35% and 25% in the preoperative and postoperative times.

Falling was the commonest mode of trauma (60.0%) followed by road traffic accidents (40.0%). The outcome had no significant association with mode of trauma.

Gawronska and Lorkowski [21] reported similar results. They reported that, fall was the common cause of trauma in elderly patients.

Anandasivam *et al*. [22] estimated that 87% of fractures in the 65+ age group are caused by falls. Radhakrishna *et al*. [17] documented that the commonest mode of injury was due to trivial fall, while walking at house. This is could be related to severe osteoporosis, the commonest finding in the elderly age group.

Ajaykumar *et al*. [20] reported that 15 patients had trivial trauma, 5 patients had a road traffic accident.

Our results showed that left side was affected more than the right one (60.0% vs 40.0%), with no significant association with surgical outcome.

Gawronska and Lorkowski [21] showed that in the dynamic hip screw (DHS) group, 17 were on the left side and 19 were on the right side. In the Gamma group, 19 were on the left side and 23 were on the right side. These results are different than the current work and this may be attributed to different sample size and inclusion criteria. However, our results are in line with Ajaykumar *et al*. [20] who reported that 9 patients had right-sided fracture and 11 patients had left-sided fracture.

In the current study, associated injuries were reported among 20% and blood transfusion was reported in 73.3%. The outcome did not significantly be associated with blood transfusion or associated injuries.

Hasan *et al*. [16] reported significant blood loss among different studied in their meta-analysis. Radhakrishna *et al*. [17] reported superficial infection in two patients and in one patient, a deep infection was reported. Limb length discrepancy was observed among three patients [>1 cm]. There were no postoperative dislocations of the prosthesis. Also, one patient had an implant loosening, and another one had sinking. A pain-free mobile hip, with a full range of motion (for flexion, adduction, abduction, and rotations) was reported in most of the patients. Their complications were different than the current work. This attributed to different sample size and inclusion criteria.

Bassiony *et al*. [23] who used cemented calcar replacement hemiarthroplasty technique. They reported that, the technique allowed safe and early weight-bearing on the injured hip and had a lower rate of complications. As most of the patients were out of bed on an average of 3 days postoperatively, there were neither chest complications nor thromboembolic complications.

Nie *et al*. [24] concluded that the use of arthroplasty is associated with a significant reduction of implant-related complications and reoperation rate. They suggested that arthroplasty may be set as the primary treatment option in highly unstable factures and poor bone quality, ipsilateral hip arthritis, or other conditions known to have a higher risk for early failure.

Dash *et al*. [25] in a multicentric prospective comparative study between cemented bipolar and PFN in management of unstable trochanteric fracture in elderly, concluded that primary cemented hemiarthroplasty in unstable hip fractures in elder population is reliable, technically simple with lower complication rate (highly safe procedure). Its major advantage is the early mobilization, immediate full weight bearing, rapid recovery and rehabilitation, shorter hospital stay (reduced healthcare-related cost) and early return to work. In addition, cemented arthroplasties prevent periprosthetic dislocations and fractures in non-union and high-risk patients suffering from psychiatric disorder.

In their study, Shetty *et al*. [26] reported that, 9 of 32 patients had excellent results, 10 had good outcome, nine had fair and four had poor results. They concluded that, DHS fixation of unstable intertrochanteric fractures is an effective treatment method with a good radiological and functional outcome.

Conclusion: Primary Prosthetic Replacement is considered a valid treatment option for unstable trochanteric fractures in elderly, giving the advantages of early full weight bearing.

Study limitations and future recommendations: The small number of patients (sample size) and short follow up durations, are the main limitation of the current work. Thus, future large-scale study with longer duration of follow up are highly recommended. In addition, the late complications issue and the sufficient durability of the reconstructions are are yet to be addressed.

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