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Management of Unstable Trochanteric Fractures with Hip Arthroplasty in Elder Patients

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Abstract: Older people frequently experience unstable trochanteric femur fractures, which can greatly affect their ability to move around. The treatment's primary goal is to restore function as quickly as possible while minimizing the risk of complications and death. The majority of these fractures are best treated surgically with internal fixation. In cases when the bone quality is poor, the fracture is unstable, or if there are many complications, the overall complication rates are still high, even when intramedullary nails are used. For elderly patients who have intertrochanteric femur fractures and are at high risk of fixation failure or who have associated intraarticular diseases, hip arthroplasty is an alternative to consider. Hip arthroplasty is a good option for patients who cannot stay in bed for an extended period of time due to their condition and who could worsen significantly if their ability to move around is not restored quickly. The surgeon's personal inclination as well as the specifics of the fracture will determine the surgical approach used. The majority of primary and revision femoral stem prostheses are bipolar hemiarthroplasty. Hip arthroplasty had fewer problems and fewer reoperations than intramedullary nails and better early functional result. Although there is no regular pattern of results and a statistically significant difference is not always possible to achieve, intramedullary nails do likely to have a better functional outcome and lower mortality rate in the long run. The function of hip arthroplasty in the management of intertrochanteric femur fractures in the elderly is not yet defined by any standards. The literature provides a general outline of hip arthroplasty's potential applications; however, there are numerous methodological limitations and a lack of proof. Additional research is required to discover the best surgical approach, the features that identify patients who might gain the most from hip arthroplasty, and the types of intertrochanteric fractures most likely to fail internal fixation.

Keywords: *trochanteric fractures, femoral fractures, hemiarthroplasty, total hip arthroplasty, total hip replacement,*

Introduction.

Older individuals are particularly vulnerable to the consequences of intertrochanteric femur fractures (IFF), which pose a significant threat to public health [1]. Regardless of the therapy, these fractures are associated with a worse quality of life, immobility, increased reliance, and mortality in the first year after injury [2].

The goal of treatment in this vulnerable population is to restore function as quickly as possible while minimizing complications and death [3]. This is why the majority of IFFs are treated primarily with surgical management. Internal fixation (IF) is frequently chosen as the treatment modality among the many surgical options [4]. An assortment of extra- or intramedullary devices serving this function are commercially accessible.

Having said that, IF isn't a panacea for all therapy aims. Decent fracture reduction and adequately secure fixation are particularly challenging to achieve in IFFs with unstable fracture patterns (e.g., AO/OTA type 31.A2 and A3 or Evans type III, IV, or V), significant comminution, and poor bone quality. As a result, the rate of problems increases significantly and the return to full weight-bearing is affected. While intramedullary nails (IM) have improved results and are now the method of choice for these fractures, they still haven't solved all difficulties [5].

So, since the 1970s, hip arthroplasty (HA) has been used instead of IF. Its prospective benefits include a low complication rate and the ability to bear full weight right after surgery [6,7].

2. The Significance

If an IFF has a high chance of IF failure, HA is a recognized viable therapeutic option. Implant mispositioning increases the risk of implant failure [8,9]. Patterns of fracture instability, such as posteromedial cortex comminution, thin lateral wall thickness, subtrochanteric extension, and reverse obliquity, as well as severe comminution and osteoporosis, make fracture reduction more difficult. It is worth mentioning that even with these qualities, IF can still effectively treat most IFFs. When it comes to determining which fractures are most likely to fail after internal fixation (IF) or to have fixation that is not secure enough to allow for an early return to full weight-bearing, there is currently no reliable preoperative diagnostic tool. When deciding on a surgical approach, the surgeon's background and personal preferences for therapy are crucial factors [10].

Additional indications for HA include the presence of coexisting intraarticular diseases such inflammatory illness, femoral head necrosis, or osteoarthritis. On the one hand, surgery can fix the intraarticular problem and the fracture in certain instances. The opposite is true for patients with osteoarthritis; the operation should alleviate stress at the fracture site caused by joint stiffness and decreased mobility, which is thought to be a factor in nonunion [11]. Nevertheless, the second sign is currently under-investigated. Despite the fact that osteoarthritis is the most commonly reported joint illness (Figure 1), there is still no consensus on how severe the symptoms should be or what degree of osteoarthritis should be treated with HA for IFFs.

(a)

(b)

Figure 1; (a) Preoperative anteroposterior pelvic radiograph of an intertrochanteric femur fracture with concomitant advanced osteoarthritis of the right hip; (b) anteroposterior pelvic radiograph at 1 year after total hip arthroplasty with a cemented femoral stem and a cemented double-mobility acetabular cup.

Who would be the best HA candidate is another topic on which there is no agreement. The signs that have been documented in the literature are many and typically rather general. When it comes to elderly individuals, Haentjens et al. [12] suggested HA for those who have a short lifespan. However, according to Zhou et al. [13], HA should not be administered to patients who have a life expectancy below two years, significant co-morbidities, or a history of poor surgical tolerance. Furthermore, the authors stipulated that only patients over the age of 75 who could not withstand prolonged bed rest were eligible for the indications. Patients with many internal disorders, including hypertension, cardiovascular disease, diabetes, and renal disease, were chosen for HA by Park et al. [14]. Xie et al. [15] found that HA could help patients over the age of 80 who were able to endure surgery and had ambulatory capacity before the accident, allowing for early mobilization and an improved quality of life. Patients with low functional demands who cannot endure further functional loss in a short time should be saved for HA, according to Öztürk et al. [16], who discovered a strong association between mortality and patient's functional condition. Patients with a sufficient level of functional capacity should ideally undergo IF, according to their suggestions.

3. Methods of Surgery

3.1. Method of Surgery

When treating IFFs with HA, there is currently no set protocol for the preferred method. When deciding on a method, it is crucial to take into account the surgeon's background, personal preferences, and the specifics of the fracture. The posterolateral or direct lateral approach is the most common method employed in these types of research, but there are other feasible options as well. As an example, Grune et al. [17] performed total hip arthroplasty (THA) on IFFs using anterior and anterolateral methods.

When comparing the various approaches, it's important to keep in mind the potential risks associated with each, such as hip joint exposure and fracture, the ability to prolong the approach if necessary, and the aggravation of preexisting hip abductor muscle damage. Cases involving a fractured greater trochanter should be approached directly laterally with a modified trochanter sliding osteotomy, as proposed by Fichman et al. [18]. This method preserves the surrounding musculature while utilizing existing fracture lines to provide great exposure. Plus, it's usually possible to retract the greater trochanter completely at once depending on where the fracture line is, so a second osteotomy is usually unnecessary.

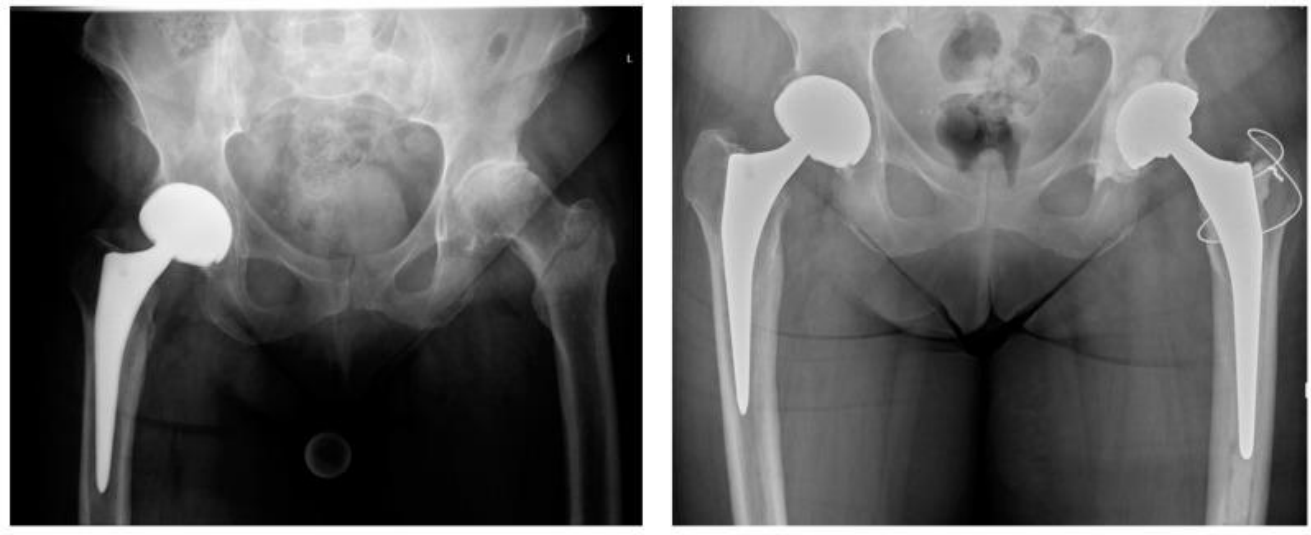
3.2. Choosing an Implant

Hip prosthesis come in a variety of styles and materials, and the literature reports a wide range of implants used to treat IFFs with HA. Nevertheless, there is a dearth of research that compares various technologies. Hence, no definitive suggestions on the hip prosthesis to treat these fractures can be made at this time. Once again, the existence of concurrent intraarticular diseases and the surgeon's personal preference and experience with hip prosthesis are the primary factors in this case. Bone quality and fracture characteristics also play a role.

Bipolar hemiarthroplasty (BHA) is the most frequently reported type of HA used to treat IFFs among the numerous varieties. The indications and consequences of THA, on the other hand, are not well understood, and it is rarely employed. Due to the substantially greater dislocation rate compared to BHA, Geiger et al. [19] cautioned against using THA, particularly for unstable IFFs. Regrettably, the dislocation rate may be impacted by the absence of information regarding the femoral head size utilized in THA in this publication. Even when the study was limited to patients with osteoarthritis, the differences in functional outcomes between individuals treated with THA or BHA that Bonnevialle et al. [20] found did not achieve statistical significance.

A variety of revision and primary femoral stem designs have been utilized effectively in the treatment of IFFs. There was no statistically significant difference in the frequency of complications or reoperations when Grote et al. [21] compared revision stems to cemented primary stems for the treatment of unstable IFFs. The proximal

femur commonly has bone loss in IFFs, which might make prosthesis anchoring difficult. To account for the distal extension of the fracture line and the bone stock, the majority of writers suggest adjusting the stem length according to the fracture pattern (Figure 2). When there is severe damage to the metaphysis, diaphyseal fixation or calcar replacement stems are viable alternatives. Modular revision femoral stems are advantageous because they enable stabilization of the stem by impacting it into the diaphysis, followed by adjustments to the length, version, and offset of the entire femoral component through the proximal body.



(a) (b)

Figure 2: (a) Preoperative anteroposterior pelvic radiograph of an intertrochanteric femur fracture with concomitant osteoarthritis of the left hip; (b) postoperative anteroposterior pelvic radiograph after total hip arthroplasty with a cemented femoral stem, fixation of the greater trochanter by a figure-of-eight wire cerclage, and a cemented acetabular cup.

Additionally, there is still disagreement over the best methods for fixing the femoral stem. In the absence of contraindications, Bonnevialle et al. [20] advised cementing femoral stems since cemented stems had a better functional outcome than uncemented ones. To guarantee the prosthesis's endurance over time, Zhou et al. [13] argued for cementless stems. Without conclusive evidence favoring one approach over another, the surgeon is left to make the call. Pros and drawbacks are present with both stem fixation procedures.

Cement enhances stem fixation in elderly patients with low bone density and extremely thin diaphyseal cortices by reducing the likelihood of intraoperative periprosthetic fracture and offering instant stability. Some of the disadvantages of cement include the following: increased operating time; the potential for delayed fracture healing as a result of cement in the proximal femur; and the danger of fat or bone marrow embolism, which is more common in patients with compromised cardiopulmonary function.

Cementless implants have been more common due to advancements in both design and materials. Hip revision surgery and periprosthetic fractures are common uses for them. Shorter operating times, biological integration, and the lack of cement-related difficulties are the primary benefits of cementless stems. A periprosthetic fracture during surgery is more likely to occur, though.

Step 3.3: Restoring the Hip Abductor Mechanism

It is common for IFFs to leave the greater trochanter in pieces. Appropriate therapy is required since it is critical for the hip joint to function properly. Restoring stress to the gluteus medius and increasing the prosthesis' stability are both achieved by careful reduction and fixation of the trochanter fragment.

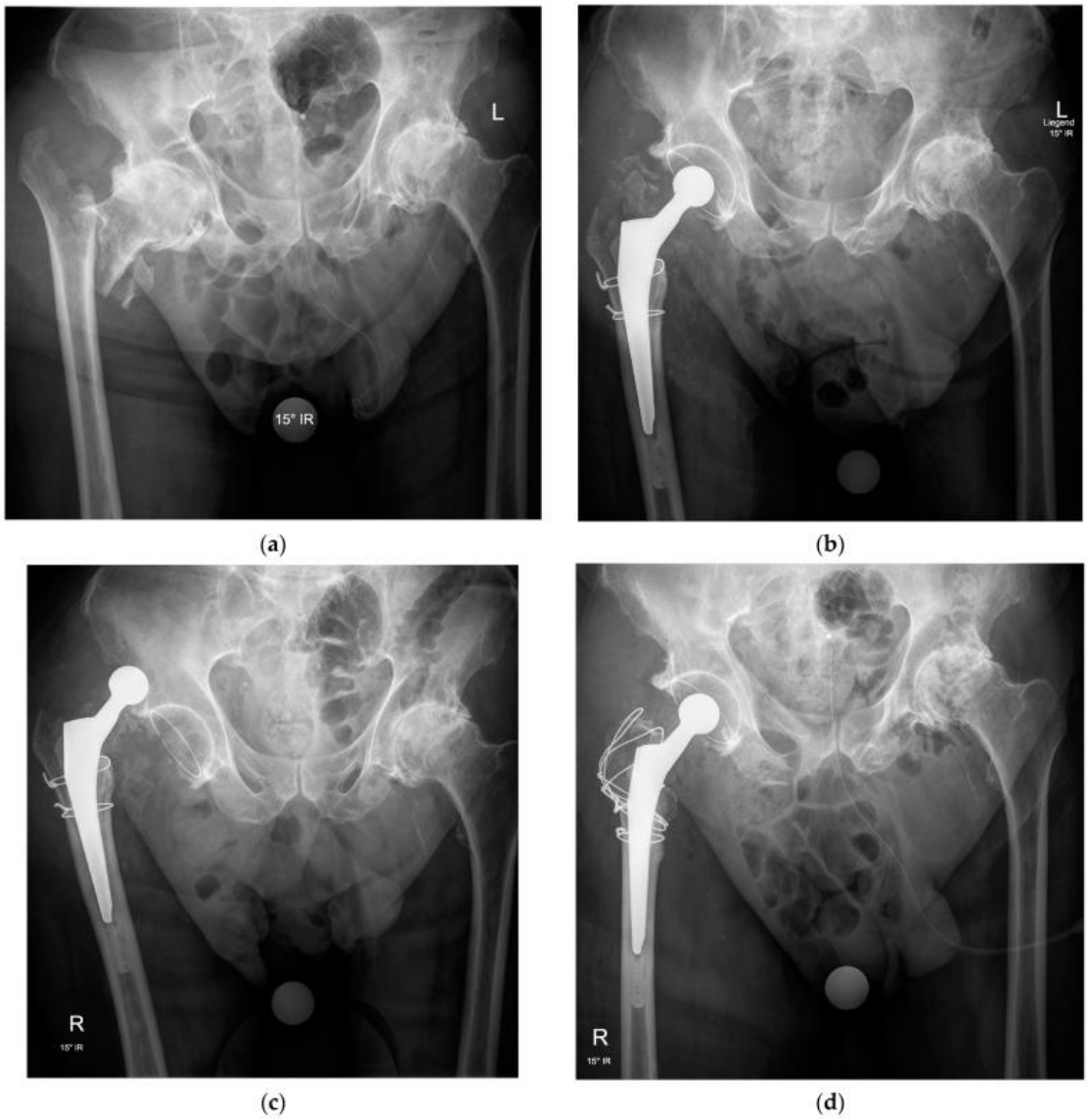


Figure 3: Anteroposterior pelvic radiographs of an intertrochanteric fracture with advanced osteoarthritis (a) treated by total hip arthroplasty with a cemented femoral stem, a cemented acetabular cup, and two wire cerclages to stabilize the metaphyseal fragments around the femoral stem but without fixation of the greater trochanter (b), resulting in recurrent dislocations in the early postoperative period (c) and requiring revision surgery for fixation of the greater trochanter by a figure-of-eight wire cerclage technique allowing restoration of hip stability and healing of the fracture fragments in a good position with no further dislocation (d).

The surgeon's preferences, the nature of the fracture, and the patient's bone density are the primary factors that dictate the fixation approach. There are a number of options. If the fragment size and bone quality are enough, wire or cable cerclage can be considered as viable solutions. If the bone quality is bad, the pieces are tiny or comminuted, a cerclage with non-absorbable sutures is the way to go. Trochanteric plates come in various kinds, but they are often thick and can be painful and irritating. Lastly, a claw-like attachment is used in certain prosthetic designs to stabilize the greater trochanter [22].

Although subsequent displacement of the fractured greater trochanter is a common complication that can arise from any method of treatment, it is generally well-tolerated and causes no symptoms in older individuals who do not require a lot of physical activity.

A large body of literature describes the efficacy of HA in IFF treatment. The problem is that this topic does not have enough scholarly writing that is grounded on evidence. There are a lot of case series studies. Some research compared HA and IF, but they employed different kinds of implants, studied groups that were not homogeneous, and failed to differentiate between IFFs that were stable and those that were unstable. There are also frequent restrictions in terms of methodology. A power analysis was seldom provided by the few randomized trials that were available [23,24,25], the methodologies used to quantify the various outcome variables were rarely described, and the rehabilitation procedure for HA and IF patients sometimes differed. Results in the literature are sometimes contradictory in this setting, making it hard to compare research or derive practical recommendations. Comparative studies focusing on subgroups of patients with unstable IFFs, intraarticular diseases, or other characteristics that might predict outcomes are also uncommon. However, in order to determine which patients might benefit most from the two treatments, this data is crucial.

Research comparing HA and IM has shown that IM is the superior IF technique for IFFs with a higher risk of complications [13,14,18,20,24,25,26,27,28].

One of the most common types of outcomes that researchers look at is functional outcome. Overall function is enhanced after surgical treatment of IFFs, whether with HA or IM. Even while this improvement doesn't go back to how it was before the injury, it does last for up to two years following surgery. Evaluations that go beyond this time frame are scarce in the literature. The rate of improvement over time is one area where these two treatment approaches diverge significantly [23,29]. In the immediate aftermath of surgery, HA tends to perform better functionally. This outcome is likely influenced by the potential for instantaneous complete weight-bearing [28]. Rehabilitation following IF, on the other hand, often involves a protective weight-bearing period whose length differs from surgeon to surgeon and from institution to institution, particularly in cases where a sufficient reduction and stable fixation were not accomplished. This causes a postponement of the beneficial impact of IM on functional outcome. After the patient is free to move around, the functional improvement begins quickly, and between six and twelve months after the surgery, the outcomes are comparable to those of HA. Results are mixed after this time point, leaning toward IM despite the fact that the differences between the two methods are rarely statistically significant. It is speculated that this outcome could be influenced by the preservation of the native hip joint [30,31].

Medical problems and general surgical complications are the two main types of complications that can arise after the surgical treatment of IFFs. Medical problems with HA and IM occur at comparable rates. The potential impact on any organ in the body might range from mild to severe. When comparing the rates of postoperative intensive care unit admissions for HA and IM, Ucpunar et al. [28] did not see a difference. However, patients who were administered HA, had an ASA score of 3 or 4, and had less independence in ADLs before to the injury had an increased risk of total morbidity three months after the operation. Nevertheless, this decline was transient and disappeared six months after the operation. Also, there were no discernible changes in the death rates, thus it wasn't represented there either.

It would indicate that the rates of general surgical complications and reoperation are higher in IM compared to HA. It is important to remember that there is insufficient power in individual studies to draw any firm conclusions about these outcomes; nonetheless, when these studies are combined in a meta-analysis, a distinct difference becomes apparent [32,33,34]. Complications from the two treatment approaches are distinct in kind. Fixation failure, nonunion, cut-out or protrusion of the lag screw, and malunion are the most commonly reported complications of IM. Dislocation or a significant difference in leg length is the most prevalent consequence of HA. For both treatments, the infection rate is almost the same.

Last but not least, the mortality rate after one year is substantial irrespective of the treatment method. However, comparative studies have shown conflicting results; for example, some have found that IF has a lower mortality rate than HA [33,34], while others have found no difference [35,36,37]. Additional risk factors for increased mortality following surgical treatment of IFFs by IM or HA include being female, being over the age of 80, having a lower functional level before the injury, having chronic pulmonary diseases, diabetes, an ASA

score of 3 or 4, a large volume of blood transfusion, a longer hospital stay overall, and an increase in the time between the injury and surgery [16,27,38].

5. Finally

For most IFFs, surgical surgery with internal fixation is still the gold standard of care. If the likelihood of fixation failure following IF is high, or if there are concurrent intraarticular diseases, HA may be an option for the fracture treatment. It is probable that HA will be beneficial for elderly patients who had low functional demands but were ambulatory before the fracture, whose condition does not allow for prolonged bedrest, and who are at danger of serious deterioration if their locomotor function cannot be restored quickly.

The surgeon's personal preference and the specifics of the fracture are the primary factors in determining the surgical approach. When it comes to primary or revision femoral stems, cemented or cementless, BHA prostheses are by far the most popular choice. Reoperations and surgical problems are less common with HA compared to intramedullary nails, and the early functional success is better. Although the results are inconsistent and a statistically significant difference is not always possible to acquire, IM tends to favor the functional outcome and the mortality rate in the longer term. Both treatments have about the same rate of medical problems.

In conclusion, there are currently no recommendations outlining the function of HA in the management of IFFs in the elderly. The existing research provides a general outline of HA's potential applications; nevertheless, there are numerous methodological constraints and scant proof. We need more research to find out which IFFs are most likely to have fixation failure, which patient traits make HA effective, and what kind of surgery is best.

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