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A CASE STUDY OF UNSTABLE INTERTROCHANTERIC FRACTURES MANAGED WITH PROXIMAL FEMORAL NAIL ANTI-ROTATION AND CEMENT AUGMENTATION

Orthopaedics

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ABSTRACT

This case report deals with cement augmentation in the treatment of unstable intertrochanteric fractures using a proximal femoral nail anti-rotation device. Intertrochanteric, particularly unstable, fractures are challenging due to the substantial risk of fixation failure, and subsequently, complications. In this paper, the authors present the case of an elderly patient with an unstable intertrochanteric fracture managed by the PFNA technique, which is designed to provide better stabilization and reduce rotational movements. This was further augmented with cement augmentation to improve fixation stability. Bone cement is injected around the screw to enhance anchorage in osteoporotic bone, reducing the risk of screw cut-out and allowing early weight-bearing. The surgical procedure was successfully performed without any complications, and the operation was well tolerated by the patient. Postoperative care included regular monitoring, with a tailored rehabilitation program instituted to facilitate recovery. Radiographically and clinically, follow-up results showed excellent fracture healing and stable fixation. Patients' pains were significantly relieved with regained functional mobility, hence achieving satisfactory outcomes both in the short and long term. This case illustrates the advantages of using PFNA combined with cement augmentation in the management of unstable intertrochanteric fractures, particularly in elderly patients with reduced bone quality. Therefore, increased stability after this procedure could be equated with better patient outcome in terms of earlier mobilization, reducing the risks of complications from prolonged immobility. This report adds to the increasing literature on cement augmentation combined with PFNA for its effectiveness in treating complex fractures and as a viable option for an orthopedic surgeon when faced with similar challenges.

KEYWORDS

INTRODUCTION:

Intertrochanteric fractures are common for hip fracture, especially in the elderly population due to osteoporosis and other degenerative changes associated with aging that occur in the structure of bones. These fractures occur between the greater and lesser trochanters of the femur and are classified according to their fracture pattern and degree of comminution as stable and unstable types. Unstable intertrochanteric fractures are those that are significantly displaced, and the complication rates in these are more significant. Thus, this forms one of the most challenging situations for an orthopedic surgeon. Effective management of such injuries becomes of extreme importance because the management outcome of these kinds of fractures is of extreme importance in the restoration of mobility to the patient and decreasing morbidity and mortality rates[1].

Epidemiology and Burden

The world's population is aging, and the incidence of these intertrochanteric fractures has increased. Intertrochanteric fractures form a considerable part of hip fractures, which are associated with huge health expenses and consumption of resources. In most elderly patients, intertrochanteric fractures are generally associated with multiple comorbidities, further complicating the management of these fractures. Main treatment approaches aim at stabilizing the fracture, reduction of pain, early mobilization, and restoration of the patient back to their pre-fracture functional status[3].

Classification of Intertrochanteric Fractures

Intertrochanteric fractures are primarily classified by the Evans classification or the AO/OTA classification system. According to the Evans classification, fractures are classified as stable or unstable, depending on the presence of posteromedial comminution and the integrity of the lateral wall. The stable ones have usually little displacement, with cortices intact and otherwise unstable, with marked displacement and comminution and a greater risk of fixation failure. It is in the AO classification that one gets a more detailed system, wherein the three main types of fractures are A1, A2, and A3, showing an increase in complexity and instability from A1 to A3[5].

Treatment of Unstable Intertrochanteric Fractures—Challenges

The treatment of unstable intertrochanteric fractures is challenging for a variety of reasons. Much more often than not, such fractures are attended by heavy comminution, poor bone quality, and little mechanical stability, which makes traditional methods of fixation not very effective. Besides, in many cases, elderly patients have osteoporosis that adds problems to the stabilization of the fracture fragments. The main complications connected with the treatment of unstable intertrochanteric fractures are nonunion, malunion, hardware failure, and a high risk of reoperation[4,5].

Surgical Treatment Options

Surgical options for intertrochanteric fractures include dynamic hip screws, proximal femoral nailing, and arthroplasty. Each technique has its benefits and shortcomings, and the choice of technique in many cases will be determined by the general condition of the patient, the bone stock, and the features of the fracture.

DHS— Dynamic Hip Screw: The DHS is an appliance applied to stabilize intertrochanteric fractures. It consists of a lag screw inserted into the femoral head linked to a side plate fixed to the femoral shaft. While DHS is very effective for stable fractures, the use of DHS in unstable fractures has higher rates of failure attributed to lack of adequate control over rotational and axial forces[1].

PFN: This is an intramedullary device with a better biomechanical principle of load distribution through the femoral canal. Advantages of PFN include less operative time, reduced blood loss, and more control over rotational forces. PFNA is a variant of proximal femoral nail with an anti-rotation screw for added stability in fixation; it is, therefore, the implant of choice in unstable fractures.

Arthroplasty: In some cases, mostly in elderly patients with high-degree comminution or prior hip arthritis, an arthroplasty should be performed. This may provide immediate stability and the alleviation of pain but at the expense of increased surgical risks and a longer time to recover.

Cement Augmentation in PFNA

Cement augmentation is one of the techniques aimed at increasing internal fixation device stability in osteoporotic bone. In PFNA, it involves the injection of bone cement around its proximal screw to increase its grip within the femoral head, reducing the risk of cut-out. This method is especially useful in poor-quality bones, wherein conventional methods of fixation often fail.

PFNA with cement augmentation in unstable intertrochanteric fractures is very promising. The reinforced fixations provide

immediate stability to the bone, allowing for early weight-bearing and reducing the risks of complications, such as nonunion or hardware failure. In addition, cement augmentation distributes the load more uniformly and minimizes the stress applied to the implant and bone[2,3].

Patient Presentation
A 78-year-old female presented to the emergency department following a mechanical trauma at home. She described severe left hip pain and an inability to weight bear on the affected leg. Physical examination demonstrated generalised tenderness over the left hip to palpation and a left leg that was externally rotated and shortened.

Diagnostic Workup
The radiographic examination of the left hip revealed a rather unstable intertrochanteric fracture, with rather marked displacement and comminution. The pattern of this fracture was classified as the AO/OTA type 31-A2.2. In consideration of the osteoporosis in the bone and the complexity of the fracture, a decision was made to perform surgical intervention with PFNA and cement augmentation for advanced stability in fixation.

Figure 1 Pre Op X Ray Showing Left Intertrochanteric Fracture

Pre-Operative Preparation :
Positioning
The patient is placed supine on a fracture table.

The contralateral leg is tied in a leg holder, and the affected leg is kept free so that manipulation and reduction of fracture can be done.

The pelvis is fixed so that it does not move during the performance of the procedure.

Adequate padding is given so that pressure sores and nerve injuries are prevented.

Anesthesia
General or spinal anesthesia, depending upon the medical condition of the patient and the preference of the surgeon is given.

Preparation and Draping
The affected hip and limb are cleansed using an antiseptic solution. Sterile drapes are applied to lay out a sterile field of surgery.

Surgical Technique:
Fracture Reduction:
The fracture is reduced by closed technique under fluoroscopic guidance. Traction and internal rotation are applied to the affected limb to help align the fracture fragments. Fluoroscopy confirms appropriate alignment in AP and lateral views.

Incision and Exposure:
A 3-5 cm long longitudinal incision is made lateral to the greater trochanter. The fascia lata is incised and dissection is carried down to expose the greater trochanter.

The tip of the greater trochanter forms the entry point for the nail.

Guide Wire Insertion:
A guide wire is inserted into the medullary canal through the entry point. The guide wire is advanced under fluoroscopic control to ensure its proper placement.

Reaming:
The femoral canal is gradually reamed up to the required size for the proximal femoral nail.

Reaming is done meticulously to prevent iatrogenic fractures.

Nail Insertion:
The selected PFNA is mounted on the insertion handle.

The nail is passed over the guide wire and inserted into the femoral canal.

Fluoroscopy is used to confirm that the nail is properly positioned with its proximal end aligned at the level of the greater trochanter.

Blade Insertion:
A targeting device is attached to the insertion handle to guide the placement of the helical blade.

The guide pin for the blade is inserted through the targeting device into the femoral head.

Fluoroscopy confirms the correct position of the guide pin. A cannulated drill is used to prepare the path for the helical blade. Next, a helical blade is introduced over the guide pin and advanced into the femoral head with excellent purchase in the subchondral bone

Cement Augmentation:
Polymethyl methacrylate, a bone cement, is prepared as described by the manufacturer.

The cement is injected through the cannulated helical blade with the help of a cement delivery system.

The cement is meticulously injected to fill up the gaps around the blade and increases the stability of the fixation. Fluroscopy to be monitored for the distribution of the cement and not allow it to extravasate into the joint space.

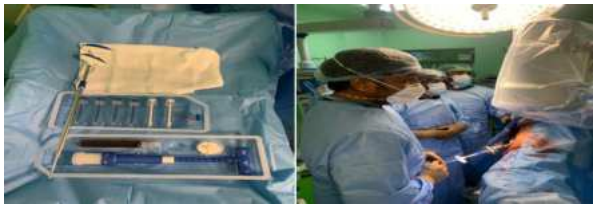

Figure 2 Bone Cement
Figure 3 Bone Cement Augmentation

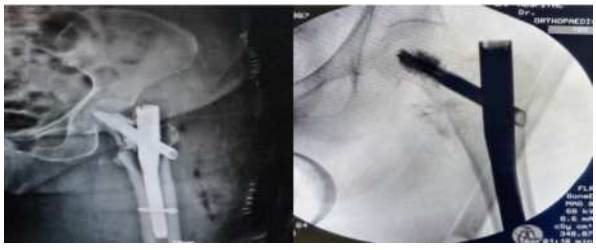

Figure 4 Augmented Cement In Ap View
Figure 5 Augmentated Cement In Lateral View

Distal Locking:
The nail is locked at its distal end by distal locking screws.

A targeting device guides the screw placement through the nail's distal holes.

Fluoroscopy confirms the correct position of the screws.

Closure:
The insertion handle and targeting device are removed.

The fascia lata and subcutaneous tissues closed with absorbable sutures.

The skin is closed with non-absorbable sutures or

Postoperative Imaging:
Final fluoroscopic images are taken in the operating room to ensure that the fracture is satisfactorily aligned and fixed.

Anteroposterior and lateral X-rays are taken in the recovery room to confirm the position of hardware and adequacy of reduction.

Figure 6 Post Op X Ray Ap View

Postoperative Care :
Pain Management:
Multimodal analgesia is provided with opioids, NSAIDs, and regional anesthesia as indicated.

Antibiotics:
Prophylactic antibiotics are continued for 24 hours postoperatively to prevent infection.

Early Mobilization:
Weight-bearing as tolerated is initiated on the first postoperative day. A physiotherapist helps with mobilization exercises and ambulation training.

Thromboprophylaxis:
Anticoagulant therapy is given to prevent DVT.

The use of compression stockings or intermittent pneumatic compression devices.

Monitoring:
Monitoring for any complications like infection, hardware failure, or thromboembolic events Follow-up on regular basis to check on the fracture healing and functional recovery.

Rehabilitation:
A careful rehabilitation program is initiated to restore mobility and strength of the patient.

Followup radiographs are obtained to monitor the healing process of the fracture and the integrity of the implant.

CONCLUSION :
PFNA with cement augmentation is thus a stable fixation procedure for osteoporotic bones with unstable intertrochanteric fractures. Such a method allows for further improvement in implant stability, early weight bearing, and improved functional outcome in the elderly. The surgical steps described in detail offer a structured approach toward achieving optimal results.

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