

Spiral fractures in the distal third of the femoral shaft in elderly treated with antegrade nailing and STABLE-LOK Nut[®]: case report

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ABSTRACT

We present the case of a 90-year-old woman with traumatic spiral distal femur shaft fracture. The patient underwent surgery for reduction and fixation of the fracture with an intramedullary antegrade nail. The patient was re-evaluated during the course of a clinical and radiographic follow-up. There were no infectious problems and the patient was able to resume normal activities for her age. Distal femur shaft fractures can result from high-energy trauma in young patients or from a fall or minor trauma in the elderly. They are always challenging for the surgeon, especially in terms of choosing the correct fixation method. Early reduction and stable fixation with a mini-invasive approach are essential for a good outcome in elderly patients.

KEYWORDS

Case report, elderly, femoral fracture, nailing.

Introduction

Fractures of the distal femur continue to be very difficult injuries to treat. These fractures account for between 3% and 6% of all femur fractures^[1,2]. The surgical management of distal femur fractures continues to evolve, the aims being to reduce surgical trauma, restore range of motion as soon as possible, and allow early rehabilitation. With appropriate surgical planning, these injuries can be managed with a variety of methods and techniques, while taking into account patients' functional goals, fracture characteristics, health comorbidities, bone quality, and risk of malunion and nonunion^[3]. Anatomic reconstruction and stable fixation in distal femoral fractures of the elderly is operatively demanding. After excluding open fractures, unsuitable soft tissues or other contraindications, these fractures can be treated with plate and screw, antegrade nailing or retrograde nailing.

Case report

In February 2021, a 90-year-old female presented to the Department of Orthopedics and Traumatology of the Carlo Urbani Hospital in Jesi (Ancona, Italy) after a domestic ground level fall. The patient lived alone at home where she walked with a walking frame. She denied hitting her head or losing consciousness. Physical examination revealed a shortened and externally rotated left lower extremity without open wounds. The patient experienced pain upon any manipulation of the left lower extremity, but had no neurovascular injury. She had no history of malignancy, systemic inflammatory diseases or

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neurologic disorders. She suffered only from hypertension for which she took medication daily. She denied allergies or use of anticoagulant medications.

Primary radiologic study with x-rays showed a spiral distal femur shaft fracture. In order to study the fracture in more depth and choose the most appropriate means of fixation, a CT scan was requested (Fig.1). The fracture was classified as 32A1c according to the AO/OTA classification and as a grade III fracture according to the Winquist/Hansen classification^[4]. We chose to use antegrade nailing with a cephalic screw in order to strengthen the proximal part of the femur and avoid the risk of proximal femur fractures. Indeed, secure bone fixation is often compromised by osteoporosis in elderly patients. We used a Trigne META-TAN Trochanteric Antegrade Nail[®] by Smith and Nephew (Smith & Nephew, Inc., Memphis, TN, USA).

Then, in order to ensure a greater stability and allow safe and more rapid mobilization, we used a Trigen STABLE-LOK Nut and Washer[®] (Fig.2) in 2 of the nail's 3 distal locking screws^[5]. In this way we hoped to apply suitable compression to the fracture and achieve angular and rotational stability of the distal spiral fragment.

Hoffmeier *et al.*, in a biomechanical study^[2], showed how,

in an artificial osteoporotic bone, nuts and washers could obtain good results in torsional loading and even better results in axial loading. The intra-operative controls and post-operative x-rays were satisfactory (Fig.3). There were no intra- or post-operative complications. The patient needed just a single blood transfusion the day after surgery. She was allowed to start FKT immediately with gradual full weight bearing. After 1 month the patient returned for a routine check-up. She was well, and able to walk independently with the help of a walker. She had no pain at the fracture site or at the entry point of the nail and screws. Figure 4 shows the x-rays at this follow up; the fracture edge appeared to be healing correctly and without malunion or bony defect. The stability and range of motion of the hip and the knee were recovered. Finally, the patient returned for a final clinical and radiological assessment, 3 months after surgery. Her ability to walk had improved, she had no pain, and the fracture seemed radiologically well fixed.

Figure 2 Trigen STABLE-LOK nut and washer®.



Figure 1 Pre-procedure images.



Figure 3 Post-operative X-rays.

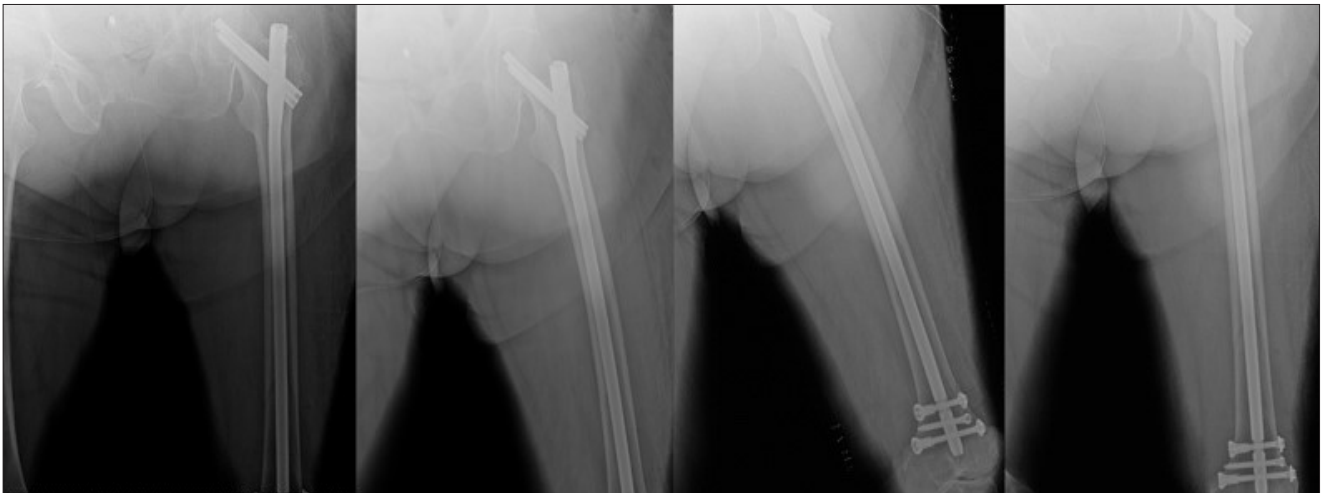
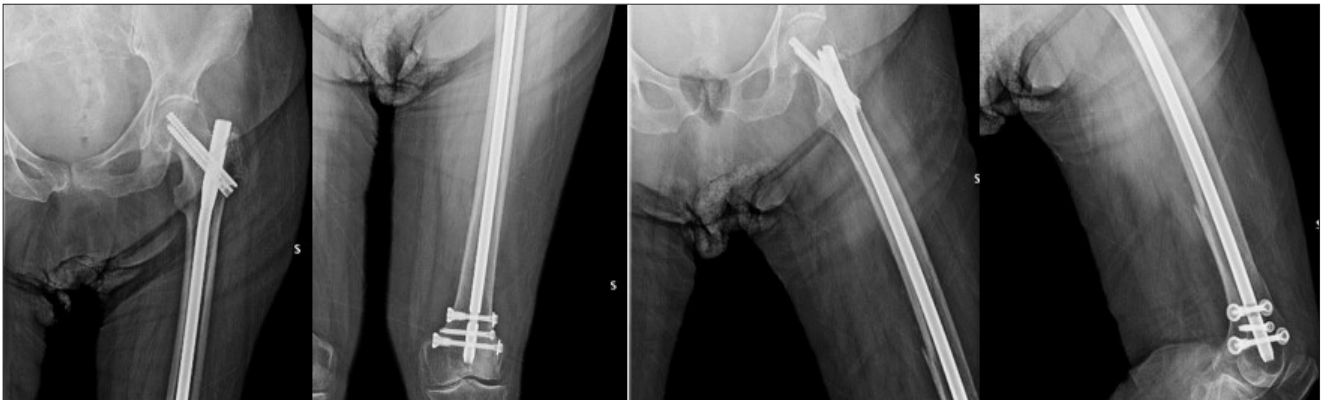


Figure 4 X-rays 1 month after surgery.



Discussion

When discussing the choice of fixation, we preferred the advantages of close reduction and intramedullary nailing (i.e., shorter operation time, lower infection rate and less risk of bleeding), compared with biological fracture healing, and we hoped to be able to obtain rapid mobilization and full weight bearing. Moreover, osteoporosis in elderly patients compromises secure bone fixation with plate and screw [6]. Plate osteosynthesis is particularly advantageous in situations where an intramedullary nail may be contraindicated or technically not feasible: polytrauma patients, ipsilateral femoral neck and shaft fractures, fracture in the proximal or distal shaft, pediatric femoral shaft fracture, or an excessively narrow intramedullary canal. With modern plating techniques, it is possible to obtain stability for fractures and to preserve biology [7]. When possible, it is better to choose minimally invasive plate osteosynthesis compared with open reduction and internal fixation (ORIF), in order to respect, as much as possible, the biology of the healing process [7]. However, some authors have recently shown better results with ORIF + strut bone graft for multifragmentary femur fractures [8].

The advantages of plate and screw fixation are that fracture can be reduced (length, angular and rotational control are obtained) and there is a reduced incidence of fat embolization compared with intramedullary nailing.

However, possible disadvantages are greater blood loss, exposure of the fracture zone/risk of interference with the healing process, and more extensive operative soft-tissue trauma [9]. Closed intramedullary nailing of the femur remains the gold standard treatment for a femoral shaft fracture [7]. It reduces operation time, infection rate and risk of bleeding, and allows rapid mobilization and full weight bearing. Furthermore, this type of fracture can be reduced with antegrade or retrograde nailing. Each option has some advantages. Antegrade nailing is the oldest and most widespread means of fixation. Reliable outcomes have been reported with antegrade reamed and unreamed nailing techniques.

However some disadvantages of antegrade nailing are reported, including the limited application of this method to ipsilateral femoral neck and femoral shaft fractures, the risk of heterotopic ossification around the hip, the risk of injury to the pudendal nerve, and the need for a fracture table [10]. Retrograde intramedullary nailing is a useful method for the treatment of distal femoral fractures. In initial reports of retrograde nailing of the femur for fractures of the femoral shaft, the technique was used for the treatment of ipsilateral femoral shaft and femoral neck fractures and used a medial femoral condylar starting point; now, the indications for retrograde nailing of femoral shaft fractures have expanded to include 10 pregnant patients, patients with ipsilateral pelvic or acetabular injuries, multiple fractures or polytrauma (floating knee) [11], and traumatic arthrotomy of the knee or through-the-knee traumatic amputation. According to the literature there is no evidence of differences in union rate, complications and outcome between antegrade or retrograde nailing [10,12,13].

Conclusions

In the present patient, careful evaluation of all the possible surgical techniques allowed us to pick the right one. The choice was made on the basis of its reduced operation time and intra-operative bleeding, and possibility of early mobilization. Although the fracture could have been fixed with retrograde nailing, we chose to use antegrade nailing with cephalic screw in order to protect the proximal part of the femur and avoid the risk of proximal femur fractures, like lateral or medial fractures, which are very common in elderly people with low density or osteoporotic bone. The early and middle term outcomes could be defined satisfactory. However, the long-term clinical efficacy of the method for elderly patients remains to be evaluated with more case reports.

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