Fractures around a previous proximal femur fixation

A simple solution to a complex problem

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Abstract

The number of hip fractures in the elderly elevates as life expectancy increases. Therefore it is not infrequent to observe a femur fracture, distal to a previous proximal femur fixation (dynamic hip screw or fixed angle plate) used in intertrochanteric femur fractures, despite the reported annual mortality rate of 30-50% in patients with a femoral fracture. Given this situation, we used a retrograde intramedullary nail together with the percutaneous removal of previously implanted screws. We present eight cases of peri-osteosynthesis fractures in patients with an average age of 85.6 years (5 women and 3 men) and an average time from the proximal femur fixation to the new fracture of 3.5 years. The follow-up was 36 months and postoperative motion and pain were evaluated. Consolidation of the fracture was achieved in all cases. We found this technique effective; it was possible to achieve a stable fixation without adding morbidity due to the possibility of overlapping two implants, thus reducing the potential risk of a new fracture between implants.

Key words: Femur fractures; osteosynthesis; peri-implant.

Level of Evidence: IV

Fracturas alrededor de una osteosíntesis extramedular previa de fémur proximal. Una solución simple para un problema complejo

Resumen

El número de fracturas de cadera en pacientes ancianos aumenta proporcionalmente al incremento de la expectativa de vida. Por lo tanto, no resulta infrecuente hallar una fractura de fémur, distal a un implante de osteosíntesis extramedular (clavo compresivo deslizante o clavo placa de ángulo fijo) previamente colocado en fracturas intertrocantérica o subtrocantérica de cadera, pese a la tasa de mortalidad anual comunicada del 30-50% en los pacientes con fractura de cadera. Ante dicha situación, hemos utilizado un clavo endomedular retrógrado asociado a la extracción, de forma percutánea, de los tornillos del implante previo.

Se presentan ocho casos de fracturas periosteosíntesis en pacientes con una edad promedio de 85,6 años (cinco mujeres y ocho hombres) y un tiempo promedio desde la osteosíntesis de fémur proximal hasta la fractura periosteosíntesis de 3,5 años. El seguimiento fue de 36 meses y se evaluaron la movilidad y el dolor posoperatorios. Se logró la consolidación de la fractura en todos los casos. Dicho procedimiento nos ha resultado una técnica eficaz, se puede lograr una fijación estable sin agregar morbilidad debido a la posibilidad de solapar los dos implantes y disminuir el potencial riesgo de una nueva fractura interimplantes.

Palabras clave: Fractura de fémur; osteosíntesis; perimplante.

Nivel de Evidencia: IV

Conflict of interests: The authors have reported none.

Introduction

The number of hip fractures in the elderly increases proportionately as life expectancy does. According to epidemiological studies, hip fractures will keep increasing in the years to come.[1,2] Even though mortality due to hip fracture within the year is 30-50%,[3] it is hardly infrequent to find a femur fracture distal to an implant or osteosynthesis previously used for treatment of an intertrochanteric or subtrochanteric proximal femur fracture.

On such occasions, previous osteosynthesis implants, either a dynamic hip screw (DHS) or a fixed- angled nail-plate, together with the patient's osteoporosis, pose a challenge when it comes to treatment. The use of retrograde intramedullary nailing plus percutaneous removal of the implant distal screws is an option that allows the whole femur stabilization with no added morbility.[2]

Materials and Methods

Between March 2001 and January 2011, we performed 110 femur retrograde intramedullary nailing, 75 in supracondylar femur fractures and 35 in femur shaft fractures**.** Eight cases were all about a fracture surrounding a previous hip osteosynthesis (6%) (Table 1).

Patients averaged 85.6 years old (ranging from 73 to 95). Five were females and three, males. Based on preoperative assessment, six patients were classified as ASA 2 and two, as ASA 3[4] (Table 2). Mechanism of injury was a low-impact trauma in every case. Time from osteosynthesis of proximal femur to the peri-osteosynthesis femur fracture averaged 3.5 years in all of the patients.

In six cases, fractures occurred in the supracondylar area of the femur, whereas in two cases, fractures were in the femur shaft immediately distal to the implant. Among supracondylar fractures, four were AO type 33A1, and two, AO type 33A2. Regarding the shaft fractures distal to the implant, the two of them were AO type 32A2.[5]

Medical and X-ray assessment was performed at week 2 and week 6, and then on a monthly basis until bone healing. Bone healing was considered as patients tolerating weight load with no pain and X-rays showing bone bridges in three cortical bones. Average follow-up was 36 months. We lost one patient's follow-up because of death within 3 months after the surgery, related to previous medical conditions (patient with ASA 3). We evaluated the knee range of motion (ROM) and subjective pain using the visual analogue scale (VAS) [6] (Figure 1).

Surgical Technique

All the patients were given subarachnoid regional anesthesia. They were operated on using a fluoroscopic operating table, in a supine position, with a bulge under their knee to keep approximate knee flexion of 40º. First we removed percutaneously the plate screws from the proximal femur in order to place an intramedullary nail of adequate length (Figure 2). In only one case it was not possible to remove a screw that was broken and was anchored to the medial cortical bone, something that did not interfere with nailing.

Through a transpatellar approach and using fluoroscopy, we located the bone opening aligned with the intramedullary canal in the anterior-posterior and lateral views, identifying the Blumensat line to establish the right bone opening (Figure 3).[7] We always got closed reduction. We reamed the intramedullary canal progressively until 1 mm more than the chosen nail.[7] We placed retrogradely the nail chosen for its length in the surgi-

Table 1. Patients with previous peri-osteosynthesis fractures

Sex	Age	Type of fracture	Initial implant	Time from osteosynthesis to fracture	Walking/Aid	Follow-up
F	73	Intertrochanteric Hip Fracture	DHS	5 years	With aid	48 months
F	81	Subtrochanteric Hip Fracture	Fixed-angle	8 years	With aid	36 months
F	87	Intertrochanteric Hip Fracture	Fixed-angle	8 years	With aid	36 months
F	95	Subtrochanteric Hip Fracture	Fixed-angle	1 year	She did not walk	18 months
F	88	Intertrochanteric Hip Fracture	DHS	1 year	With no aid	36 months
M	90	Intertrochanteric Hip Fracture	DHS	1 year	With aid	18 months
M	78	Intertrochanteric Hip Fracture	Fixed-angle	2 years	With no aid	48 months
M	82	Subtrochanteric Hip Fracture	DHS	2 years		Death three months after the surgery

F = Female; M = Male.

Table 2. *American Society of Anesthesiologists* (ASA) classification system to assess anesthetic risk in different patients' status.

Deficit	Bone healing
Class I	Healthy patient not subject to elective surgery.
Class II	Patient with mild systemic disease, controlled and not disabling. It can or cannot be related to the indication for surgery.
Class III	Patient with serious systemic disease, but not disabling, such as serious or decompensated heart disease, decompensated diabetes mellitus accompanied by systemic vascular disorders (diabetic macroangiopathy and micorangiopathy), moderate to serious respiratory failure, angina pectoris, old heart failure, etc.
Class IV	Patient with serious and disabling systemic disease, permanently life-threatening, and that cannot always be corrected by surgery. For example: Serious heart, respiratory and renal failure (decompensated), persistent angina pectoris, active myocarditis, decompensated diabetes mellitus with serious complications in other organs, etc.
Clase V	Terminal disease, dying patient whose life expectancy is not expected to be greater than 24 hours with or without surgical treatment. For example: Aortic aneurysm rupture, serious hypovolemic shock, cranio-encefalic trauma with serious brain edema, massive pulmonary embolism, etc. Most of these patients undergo surgery as a heroic act, with very mild anesthesia.

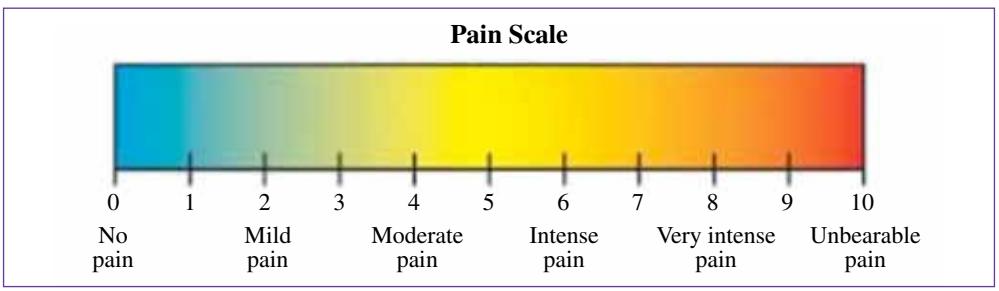

Figure 1. Visual analogue scale for pain.[2]

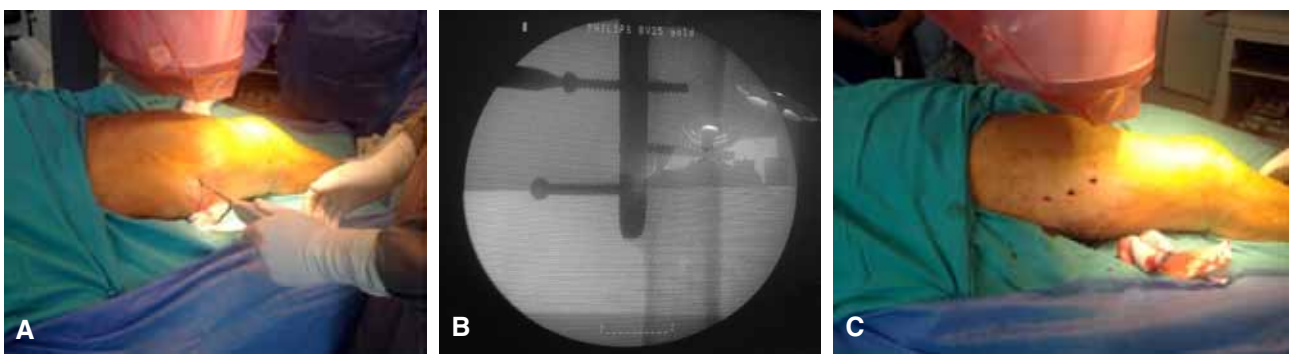

Figure 2. Percutaneous screws removal. **A.** Percutaneous approach for screws removal **B.** Fluoroscopic location of the screws. **C.** Percutaneous approach for complete removal of the previous osteosynthesis screws.

cal planning, trying that its proximal holes get the lesser trochanter level and confirming complete introduction at the femur distal end (Figure 4). We performed distal blockage and, after controlling limb rotation, we performed proximal blockage in anterior-posterior direction with free hands (Figure 4). We washed the bone opening abundantly and stitched the surgical wounds in surgical planes. We used no drainage.

Figure 3. Fluoroscopic location of bone opening. Identification of the Blumensat line **A.** Anterior-posterior fluroscopic knee view. **B.** Lateral fluroscopic knee view. **C.** Surgical image of bone opening.

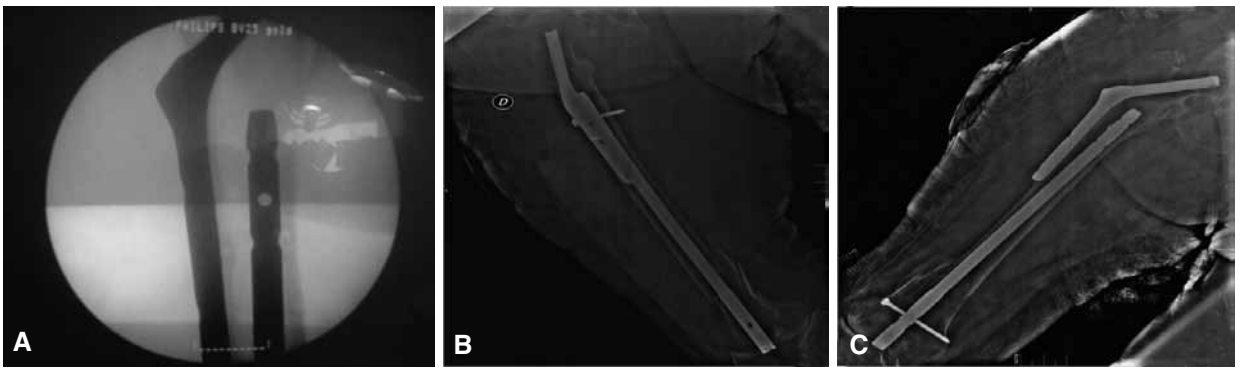

Figure 4. Retrograde endomedullary nailing until the outstretching of the osteosynthesis plate **A.** Endomedullary nail overlapping the osteosynthesis plate **B.** Anterior-posterior proximal blockage **C.** Lateral-medial distal blockage.

Results

We got fracture healing in all of the patients (Figure 5). Average knee ROM was 130º (ranging from 100º to 150º). Two patients reported pain in the knee lateral aspect, due to the distal lock, which was considered moderate as classified by the VAS. In both cases pain did not restrict daily activities neither did it ask for a second surgery to remove osteosynthesis. Six patients were able to walk again—four with the aid of a cane and two with no assistance.

One patient that was 95 years of age was not able to walk again after the surgery. There were no cases of wound infection.

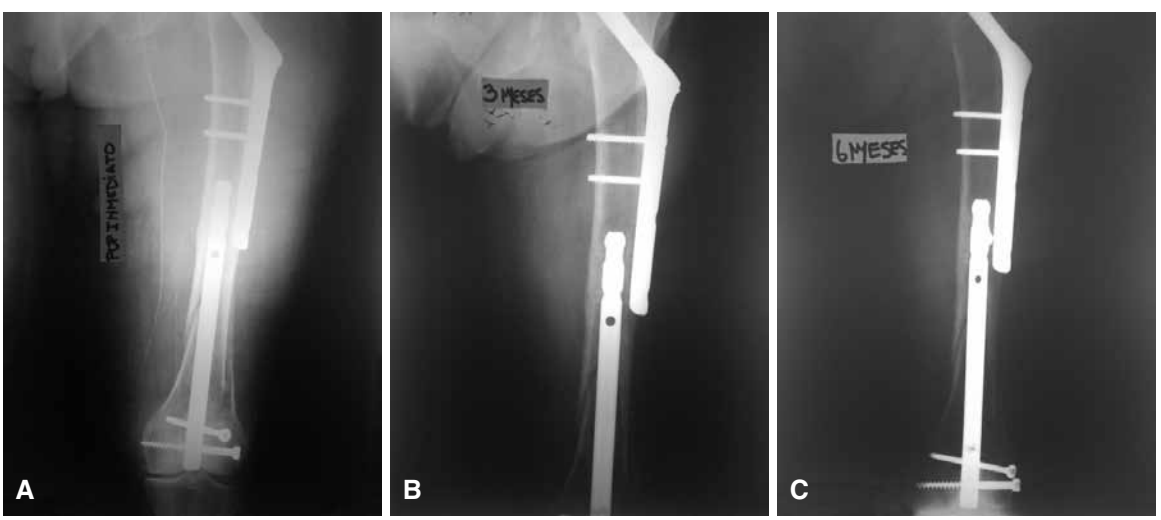

Figure 5. Bone healing in one case. **A.** Immediate postoperative X-ray. **B.** X-ray three months after the surgery **C.** Six-month X-ray.

Discussion

Nowadays, distal femur fractures represent 1% of all fractures and 3-6% of femur fractures.[8] In the elderly, these fractures follow low-impact trauma in osteoporotic bone. The aim of a stable osteosyntheis that allows early motion, especially in this group of patients, is threatened by implant fixation to the bone.[9]

It is increasingly frequent to find fractures in patients with proximal femur osteosynthesis due to a previous hip fracture.[2] The area of high stress concentration potentially created between hip osteosynthesis and the osteosynthesis aimed at treating the distal femur fracture could come as a problem for the final outcome of the treatment, due to both stress and the likelihood of inter-implant fracture.

We found scarce literature on femur fractures surrounding a previous implant. Mosheiff et al.[2] report their experience with this technique in patients with femur fracture and previous hip osteosynthesis, but contrarily to our procedure, they perform proximal nail blockage through the holes of the proximal plate. On the contrary, we prefer to use nails with the option of proximal blockage in anterior-posterior direction, because this is technically easier for blockage, no matter where the proximal femur plate is. As proved by Rina et al. in corpses, the anterior-posterior blockage proximal to the lesser trochanter is not associated with greater neurovascular risk.[10]

Conclusions

It is widely acknowledged that the mortality rate within the year following a hip fracture is high; however, femur fractures distal to previous osteosynthesis is not infrequent any longer. With the purpose of keeping the biological advantages of intramedullary osteosynthesis and overlapping implants for them not to leave unprotected bone, in all the patients of our series we used a retrograde intramedullary nail associated with percutaneous removal of the distal screws of the plate, with no need to remove completely the previous osteosynthesis.

We find such technique useful for the whole femur stabilization, with no added morbidity and the advantage of the nail outstretching the distal plate end and, this way, decreasing the risk of peri-implant and inter-implant fracture.

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