

# Penetration of anterior-lateral cortex in proximal femur fractures treated with short intramedullary nails

## Report of two cases

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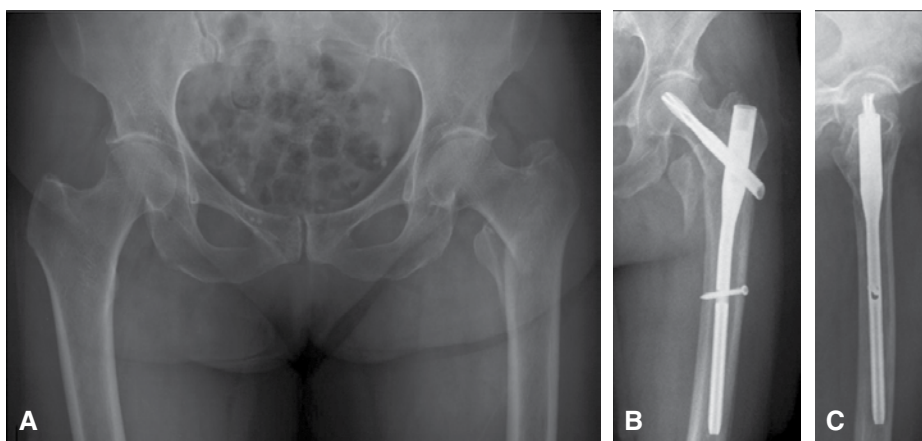
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### Case 1

A 69 years old female with no relevant events in medical history, after a fall from standing height suffered a left intertrochanteric femur fracture (Figure 1A) (AO classification 3.1 A.2). She was treated with reduction and osteosynthesis with a 235-mm cervico-diaphyseal intramedullary nail (TFN, Synthes®). She was in hospital for 72 hours until she was discharged with indi-

cation of home care and no interurrences. Since the immediate postoperative period she stuck to walking rehabilitation with walker as tolerated. The patient had done well both medically and radiologically (Figures 1B and C) at one-month postoperative follow-up. Two months after the surgery while walking she started feeling progressive pain on the anterior aspect of the thigh, what led to functional impairment in month 3 after the surgery.

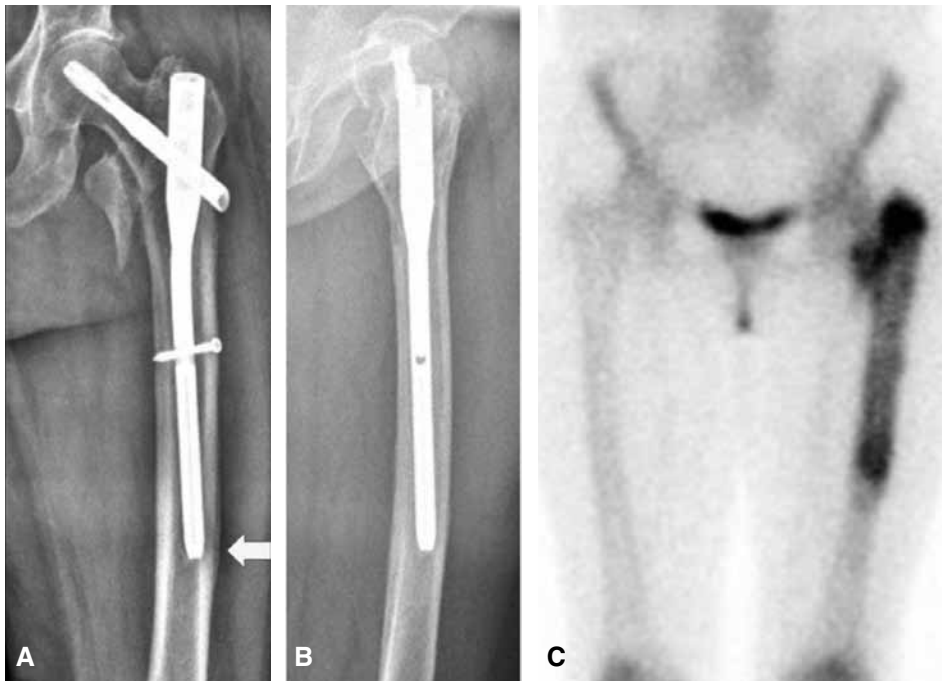


▲ **Figure 1.** A. Patient's X-ray at admittance: left hip intertrochanteric fracture.  
B y C. Anterior-posterior and lateral X-rays at one-month postoperative follow-up.

Conflict of interests: The authors have reported none.

X-rays showed periosteal reaction on the anterior-lateral femoral cortex. (Figure 2A y B), that was interpreted as the consequence of the implant impaction at such level. Due to the functional impairment that followed the symp-

toms, and risking potential peri-implant fracture, it was decided to perform revision surgery with removal of the osteosynthesis material and insertion of a new 420 mm-long nail (Figure 3).



▲ **Figure 2.** A y B. Hip anterior-posterior and lateral X-rays at two-month follow-up, which show cortical injury and periosteal reaction (arrow). C. Bone scan with increase in the up-take of the radionuclide in the area of the injury.

The patient remained in hospital for 96 hours until she was discharged with indication of home care and no inter-currences. Since the immediate postoperative period she stuck, as usual, to the walking rehabilitation protocol with walker as tolerated. She had done well both medically and radiologically (Figure 3) at six-month postoperative follow-up.

We also ordered a bone scan that showed an increase in the up-take of the radionuclide in the involved area (Figure 2C).



► **Figure 3.** Femur anterior-posterior (A) and lateral (B) X-rays six months after the surgery.

## Case 2

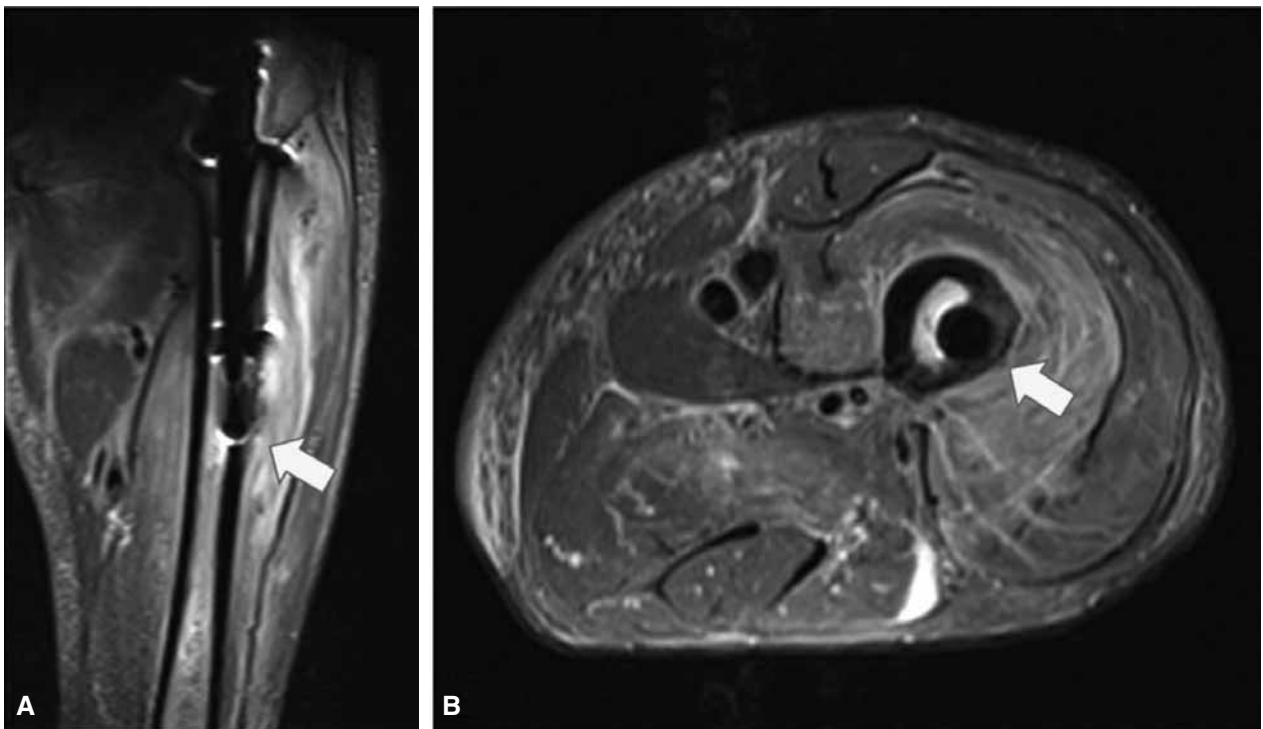
A 65 years old male with medical history of high blood pressure, smoking and non-Hodkin lymphoma suffered a left intertrochanteric femur fracture (Figure 4) (AO classification 3.1 A.2) after a fall from standing height. He received reduction and osteosynthesis with a 170-mm cervico-diaphyseal intramedullary nail (TFN, Synthes®). He remained in hospital for 96 hours until he was discharged with indication of home care and no intercurrents. Since the immediate postoperative period he stuck, as usual, to the walking rehabilitation protocol with walker as tolerated. The patient did well both medically and radiologically until postoperative month five, when he started feeling dull pain in his thigh and his knee beginning at night, with intensity and frequency increasing progressively.

X-rays showed the anterior-lateral femoral cortex penetrated by the distal end of the intramedullary nail. We ordered a bone scan that showed an increase in the uptake of the radionuclide in the involved area and an MRI whose results were reported as follows: “the nail can be seen contacting the lateral cortex endosteum, which can be seen thin and showing changes in the signal. There is no cortical discontinuity that can be seen, although the devices due to the magnetic susceptibility generated by the nail decrease diagnostic sensitivity.” As we did in the previous case, we performed revision surgery to replace the 170-mm nail with a 420-mm implant.

Both patients did well in the immediate postoperative period, with total remission of the pain that motivated revision surgery.

## Discussion

Proximal femur fractures represent an important public health issue worldwide,<sup>1</sup> and they are one of the more frequent reasons for admittance at Orthopedics departments. Surgical treatment with stable fixation allows the patient to move early and decrease complications. Intramedullary devices are often used in both stable and unstable fracture lines.<sup>2,3</sup> Associated complications have been studied thoroughly—non-union, lose of fixation or shaft fractures distal to the implant.<sup>4-6</sup> Distal penetration of the anterior femoral cortex with long nails has also been described.<sup>7,8</sup> Such complication comes as the result of the incongruity between some intramedullary implants and the femoral anatomy, where the anterior femoral arc is not reproduced by the nail curvature radius.<sup>9</sup> The penetration of the anterior cortex of the distal femur has been described with the use of long intramedullary nails, but not with the use of short ones. Robinson et al.<sup>10</sup> reported 6% of impaction of the nail against the anterior femoral cortex with the use of long cervico-diaphyseal intramedullary nails in the treatment of subtrochanteric fractures. Two percent of the patients (5 out of 302) of such series showed a fracture distal to the distal end of the nail, all with impaction against the anterior femoral cortex.



▲ **Figure 4.** Hip MRI. **A.** Coronal section **B.** Transverse section, where penetration of the anterior-lateral femur cortex by the implant can be verified.

Annually at the center we work at, an average of 150 intertrochanteric femur fractures are treated with short cervico-diaphyseal intramedullary nails. The advantages associated with such implants are a proved superior biomechanic performance as compared to that of extramedullary devices, insertion by minimally invasive techniques, shorter surgical time and lower bleeding than those verified in open techniques. As disadvantages, as seen with extramedullary implants, we can mention the risk of potential fracture at stress level at the distal end of the implant, or below, in the unprotected femoral area.<sup>11,12</sup>

We have not found publications about the effects that the contact between the distal end of the short nail and the femoral cortex can have, which, on the contrary, have certainly been described as complications related to the use of long nails.<sup>7,8</sup> Our objective was to report two cases associated with such complication that had to be subject

to revision. The design of most of the short cervico-diaphyseal nails is universal; they are straight and not differentiated into right and left. So, as implants do not reproduce the femoral curvature, this characteristic results in undue contact between the distal end of the nail and the anterior femoral cortex. This is common at the time of using short nails, and this contact can be seen in most postoperative X-rays. However, so far we have not found publications about this condition with medical impactation worth revision surgery.

In the two reported cases, we found that the femoral anterior curvature was associated with a femoral lateral curvature (varum), what caused contact at the level of the anterior-lateral cortex. This could determine the complication just described; therefore, we treat patients with peritrochanteric fractures associated with femoral varum deformities with stabilization by long cervico-diaphyseal nails.

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