Subcapital femoral neck fracture after fixation of an intertrochanteric fracture with a proximal femoral nail: a report of two cases

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ABSTRACT

Subcapital femoral neck fractures are a rare complication after fixation of an intertrochanteric fracture with a proximal femoral nail. We report 2 such cases where the patients had severe osteoporosis, based on Singh’s index and pathological findings. In one case there was a technical error leading to a tip-apex distance of more than 20 mm, but osteoporosis appeared to be a more significant cause than any technical problems.

Key words: femoral neck fractures; fracture fixation, intramedullary; postoperative complications

INTRODUCTION

We report on 2 cases where patients developed subcapital femoral neck fractures after fixation of an intertrochanteric hip fracture with a proximal femoral nail.

CASE REPORTS

Case 1

In September 2006, an 85-year-old woman sustained an intertrochanteric fracture of the right hip, with no femoral neck fracture, after a fall. She underwent closed reduction and internal fixation with a proximal femoral nail. The blade was inserted to the centre of the femoral head, with a tip-apex distance of 23.6 mm (Fig. 1). Postoperatively, she started bed-to-chair transfer on day 1 and progressed to full-weight-bearing ambulation with a walking frame on day 7. She began walking with a T-cane in week 6 and was discharged in week 9.

In week 12, she complained of pain after twisting her right hip. Radiographs taken in week 14 showed a displaced subcapital femoral neck fracture and a healed intertrochanteric fracture (Fig. 1). The nail blade had damaged the acetabular cartilage. She underwent nail removal and a total hip arthroplasty (Fig. 1). Histological evaluation of the femoral head showed osteoporosis with no evidence of osteonecrosis. Her
Singh’s index grading was grade 2.

Case 2

In December 2007, an 83-year-old woman sustained an intertrochanteric fracture of the right hip, with no femoral neck fracture, after a fall. She underwent closed reduction and internal fixation with a proximal femoral nail. The blade was inserted to the centre of the femoral head, with a tip-apex distance of 18.3 mm (Fig. 2). Postoperatively, she started bed-to-chair transfer on day 1 and progressed to partial-weight-bearing walking on day 7. Full-weight-bearing ambulation with a walking frame was allowed during week 2. She was discharged in week 5 and could walk with the aid of one crutch.

Four months after surgery she complained of right hip pain of insidious onset. Radiographs showed a displaced subcapital femoral neck fracture and a healed intertrochanteric fracture (Fig. 2). The nail blade had damaged her acetabular cartilage and bone. She underwent nail removal and a total hip arthroplasty (Fig. 2). Histological evaluation of the femoral head showed osteoporosis with no evidence of osteonecrosis. Her Singh’s index grading was grade 2.

DISCUSSION

Subcapital femoral neck fractures have been reported after fixation of intertrochanteric fractures using fixed-angle devices (e.g. Zickel nail fixation, McLaughlin nail plates, Enders nails, and AO blade plate fixation), dynamic compression screws, and compression hip screws. Such subcapital fractures are rare after fixation with a proximal femoral nail; some complications are related to nail protrusion, with incidences of these ranging from 1.6% to 3.9%.

Technical errors may cause subcapital fractures when the fixation device is inserted well short of the bone. The ideal position for a fixation device (such as a lag screw) is 5 to 25 mm from the subchondral bone, in the centre to inferior quadrants on both anteroposterior and lateral radiographs. This ensures adequate fixation of the proximal fragment and prevents subcapital fractures.

When fixing intertrochanteric fractures with a fixed-angle sliding hip screw, the tip-apex distance should be <20 mm to prevent protrusion of the screw from the femoral head. This is the distance from the tip of the lag screw to the apex of the femoral head as seen on anterior and lateral radiographs.
REFERENCES

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Placing the lag screw within 5 to 8 mm of the subchondral bone reduces the force acting on the femoral neck and prevents subcapital fractures and screw protrusion. Nonetheless, subcapital fractures can occur despite proper positioning of the implant. There is a correlation between the degree of femoral neck osteoporosis and the occurrence of spontaneous subcapital fractures after healing of an intertrochanteric fracture. The incidence of spontaneous subcapital fractures after healing of an intertrochanteric fracture is almost the same as that of intracapsular fractures without trauma. In our study, both patients had severe osteoporosis as measured by Singh’s index and their pathological features. Patient 1 had technical issues because the tip-apex distance was >20 mm, but osteoporosis rather than technical problems seems to be the main reason for these subcapital fractures.

Figure 2 Patient 2: radiographs showing (a) an intertrochanteric fracture of the right hip, (b) fixation with a proximal femoral nail, with a tip-apex distance of 18.3 mm, (c) a subcapital fracture and a healed intertrochanteric fracture at week 16, and (d) nail removal and total hip arthroplasty.