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*Case report*

# Insufficiency fracture of the femoral neck after intramedullary nailing

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**Abstract:** We report a patient with insufficiency fracture that occurred after intramedullary nailing for a subtrochanteric fracture. Intramedullary nailing is speculated to have increased the stress in the already osteoporotic subcapital region. It therefore should be recognized as a causative factor in insufficiency fracture of the femoral neck. Careful follow-up is needed for patients with this condition.

**Key words:** insufficiency fracture, intramedullary nail, femoral neck

## Introduction

Insufficiency fractures occur under a variety of conditions in which bone mineral density or elasticity is decreased. Total knee replacement is a known causative factor in postoperative fracture involving the femoral neck,[6] but, to our knowledge, no cases associated with intramedullary nailing have been reported.

## Case report

For the treatment of a left subtrochanteric fracture (Fig. 1), a 77-year-old woman underwent intramedullary nailing of the left femur on January 31, 1994. There were no postoperative complications. Afterward she used a cane outdoors but could walk without assistance indoors. She did well until June 1996 when left coxalgia began spontaneously on walking. There was no history of trauma. Radiographs revealed an insufficiency fracture of the left femoral neck (Fig. 2). She was readmitted on June 27, 1996. Blood test and urinalysis findings were all within normal limits. On the basis of Singh's index, dual-energy X-ray absorptiometry, and radiographs of the lumbar spine, significant osteoporosis was diagnosed. After removal of the nail, on July 9, 1996 internal fixation was done with cannulated screws (Fig. 3). At 24 months after surgery, she is able to walk without pain, using a cane.

## Discussion

An incomplete or complete fracture resulting from the inherent inability of a bone to withstand stress applied without violence in a rhythmic, repeated, subthreshold manner is defined as a stress fracture. Stress fractures are classified as fatigue and insufficiency fractures.[5] Fatigue fractures are considered to occur when abnormal stress is applied to bone that has normal elastic resistance. Insufficiency fractures are considered to occur in abnormal bone that has less than normal elastic resistance to stretching, compression, shearing, bending, and torsion.[5]

Devas[2] identified two forms of stress-induced fractures of the femoral neck, both associated with painful motion of the hip. The first is characterized by the formation of internal callus in the inferior part of the femoral neck, and is representative of compression fracture. The treatment suggested for this type of fracture is rest, followed by weight-bearing as tolerated. The second type of fracture, which was present in our patient, begins in the superior part of the cortex of the femoral neck and extends across the neck. As it may result in a displaced fracture, internal fixation is recommended. In our patient, internal fixation was performed with cannulated screws.

Of the causes of insufficiency fractures described by Cooper,[1] shown in Table 1, two factors apply to our

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**Fig. 1.** Radiograph at the time of the initial fracture, showing a subtrochanteric fracture (*arrow*)

**Fig. 2.** Anteroposterior radiograph showing insufficiency fracture of the femoral neck. Note that the fracture line is perpendicular to the femoral neck axis (*arrow*)

**Table 1.** Causes of insufficiency fractures[1]

| |
|---|
| Generalized osteopenia |
| Osteoporosis |
| Postmenopausal |
| Senile[a] |
| Idiopathic |
| Osteogenesis imperfecta |
| Steroid-induced osteoporosis |
| Hyperparathyroidism |
| Osteomalacia |
| Arthritis |
| Inflammatory, particularly rheumatoid |
| Degenerative |
| Posttraumatic |
| Radiation therapy |
| Reconstructive surgery in the lower extremity |
| Paget's disease |
| Regional osteopenia of disuse |
| Postoperative[a] |
| Posttraumatic |

[a] Factors applying to our patient

patient, senile osteoporosis and postoperative status. Intramedullary nailing is speculated to have increased the stress in the already osteoporotic subcapital region. At the time of the first operation, this patient had already been predisposed to a fracture as a complication of intramedullary nailing. For patients with severe osteoporosis it is necessary to carefully select the operative procedure.

Postoperative fractures were reported to occur after total knee arthroplasty,[3,4] but there have been no re-

**Fig. 3.** Radiograph at the time of patient's discharge showing that screw fixation resulted in union without aseptic necrosis

ports of these fractures being associated with intramedullary nailing.

Although the incidence of insufficiency fracture is low, to minimize the risk of insufficiency fractures of the femoral neck, patients with osteoporosis would probably benefit from graduated exercise and physiotherapy, as well as careful follow-up for at least 2 years after intramedullary nailing.

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