

Musculoskeletal images. Femoral fracture in adult osteogenesis imperfecta

A 42-year-old woman with osteogenesis imperfecta (OI) fell and had immediate pain in her right thigh. Before this, she was occasionally ambulatory, using 2 canes to walk short distances. She had had multiple fractures as a child, undergoing intramedullary nailing of both

her femurs and tibias, but as an adult had sustained only a single fracture 17 years previously, requiring fixation of a right femoral neck fracture with a Richards hip screw (Smith & Nephew Richards).

She was of short stature and had extreme varus bowing of both lower extremities. She was in severe pain and could not move her right lower extremity. The injured limb was slightly larger than the contralateral limb; however, both had a significant amount of adipose tissue. Further examination revealed multiple surgical scars along the length of the femur. Motor and sensory examinations of her right foot and ankle were nor-

mal, and there were strong symmetrical pulses. Radiographs revealed a transverse fracture distal to the previous hip screw implant (Fig. 1). The femur had a severe varus bow. The bone was osteopenic and the cortices were extremely thin.

With modern medical and surgical treatment of children with OI, we now commonly see fractures in adults with OI. These are often the result of minor trauma. The disease process in the patient presented here posed several difficulties for treatment. The patient was too heavy and the femoral canal was too large for most of the traditional flexible nailing and wiring techniques used in

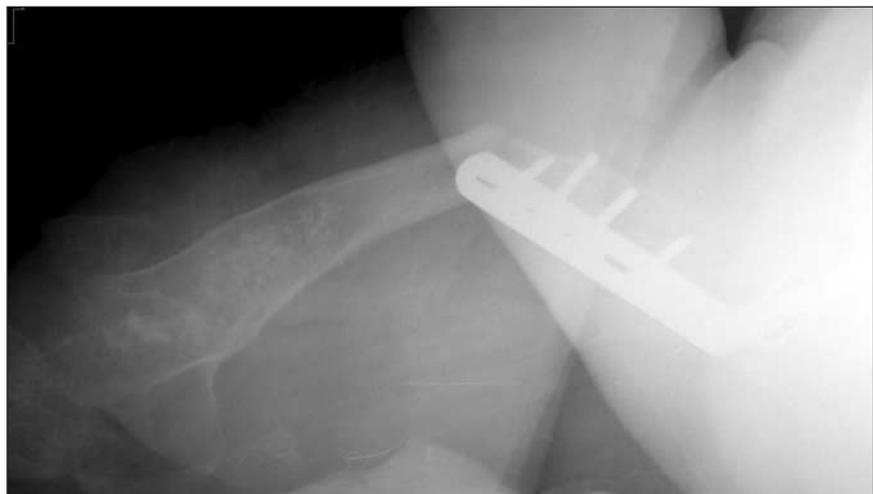


FIG. 1. Admission anteroposterior (left) and lateral (right) radiographs of the femur in a 46-year-old woman with osteogenesis imperfecta. Internal fixation devices for proximal femoral fractures are in place.

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pediatrics, and too narrow and fragile for nails used in adult femoral fractures. In this patient, the severe bowing of her leg, the fragility of her bone as well as the small diameter and length of the femoral canal were important. It was impossible to use a traditional femoral intramedullary nail, so a flexible humeral nail was used for internal fixation of her femur (Flexnail; Synthes, Canada*). This nail is composed of intercalated segments that allow 5° of motion at each link. After insertion of the nail into the intramedullary canal of a long bone, an internal cable system within the nail is tightened. This action compresses the segments and diminishes the motion at each segment, thus increasing the rigidity of the nail. This nail is intended for use in acute and pathologic fractures of the humerus. It can be inserted in antegrade and retrograde fashion. It comes in 2 diameters, 7.5 and 9.0 mm, and standard lengths 180–300 mm. The nail has a potential 30° bend to facilitate off-axis insertion. Because of its small diameter and flexibility during insertion, the nail theoretically can be inserted into a varus bowed femur having a small diameter canal without breaching the opposite cortex.

The diaphyseal screws of the patient's hip implant were removed through a previous lateral incision. Next, a distal anteromedial approach to the femur was chosen for the entry point of the nail allowing a 30° angulation of the nail to the long

*This nail is not distributed by Synthes for lower extremity fracture fixation. Its biomechanical strength is insufficient for fixation of a femoral fracture in an average patient. A review of the literature reveals it has been used in isolated cases in the lower extremity.

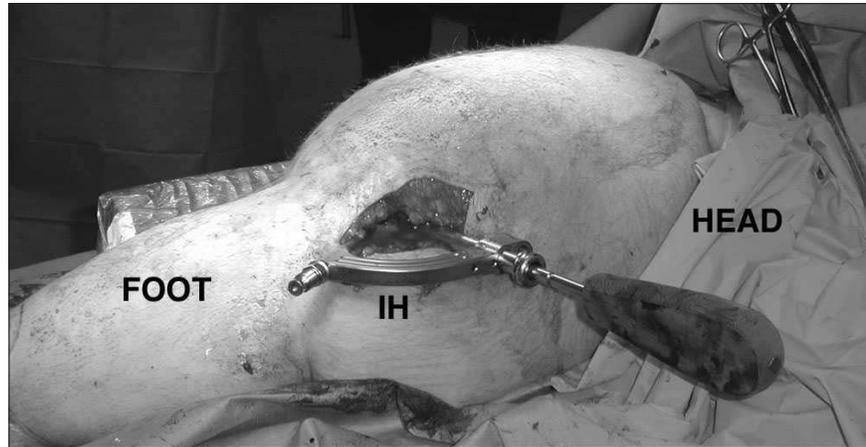


FIG. 2. Insertion of the flexible humeral nail through an anteromedial incision in distal femur. IH = insertion handle with locking bolt insertion screwdriver in place.

axis of the femur. An awl was used to open the canal medially. The bone was very fragile, as in most OI patients, receiving medical therapy with bisphosphonates. The canal was reamed by hand using 6- and 8-mm reamers (Synream; Synthes Canada). A guide wire was placed in the canal until it reached the previous hip screw. The canal was reamed further using the 8.5-mm reamer. At all times fluoroscopy was used to ensure the canal was not breached.

A 7.5-mm × 210-mm flexible humeral nail was inserted (Fig. 2) from an anteromedial insertion point in the distal femur. The tensioning bolt was inserted to stiffen the nail. Stiffening the nail also functioned to realign the fracture fragments. After this, a distal transverse locking bolt was inserted. The small peripheral wires of the nail were advanced in a bouquet fashion for proximal fixation. Radiologically and clinically, the fracture was stable both rotationally and axially. Postoperative radiographs revealed a well-aligned femur (Fig. 3).



FIG. 3. Postoperative radiographs showing the flexible humeral nail in the femur. Tightening of the nail locking mechanism partially corrected the varus deformity.