

Post-traumatic non-union of the femoral neck: an alternative treatment method

TO THE EDITOR: Femoral neck fractures in the younger patients happens as a result of a high-energy trauma. Displacement of the femoral head is common and every effort should be made to obtain anatomical reduction to preserve the femoral head blood supply. The frequency of non-union was significantly higher in those fractures inadequately reduced or fixated. In the case of a non-union, a Pauwels valgus osteotomy followed by a new fixation is an effective salvage procedure. If a non-union happens in association with osteonecrosis, a carefully evaluation is mandatory. In the early stages (Arlet-Ficat stage 1 and 2) a core decompression with or without bone grafting are reported to be successfully treatments. In the late stages (Arlet-Ficat stage 3 and 4), when collapse and deformation of the femoral head occurs, reconstruction with a prosthetic replacement is the procedure of choice.

A 29-year old male motorcyclist presented to our outpatient clinic 4 months following a major trauma. He reported a right hip mid-cervical neck fracture and an ipsilateral femoral shaft fracture treated respectively with two cannulated bone screws and

a LCCDP plate. The patient was non-weight bearing using a full-time wheelchair. He reported severe pain and limited range of motion of the right hip. Radiographic evaluation revealed two displaced cannulated screws and non-union of femoral neck fracture. Signs of osteonecrosis were non detectable (Figures 1, 2). A preoperative triphasic ^{99}Tc bone-scan revealed a surprising viability of the femoral head (Figure 3).

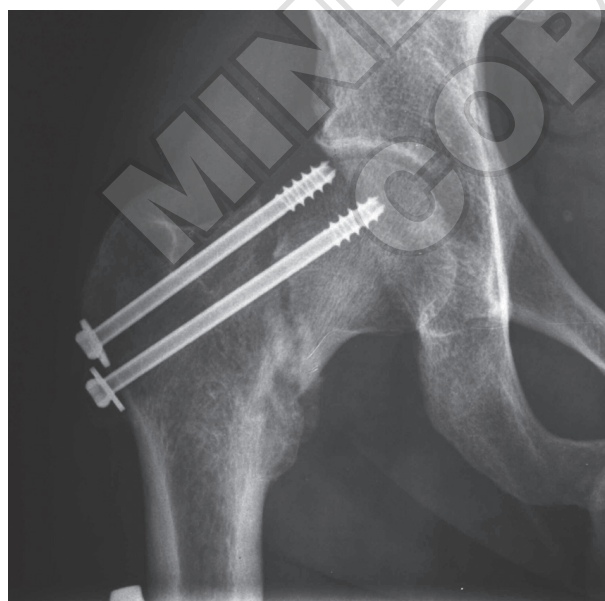


Figure 1.—Non-united right femoral neck fracture.

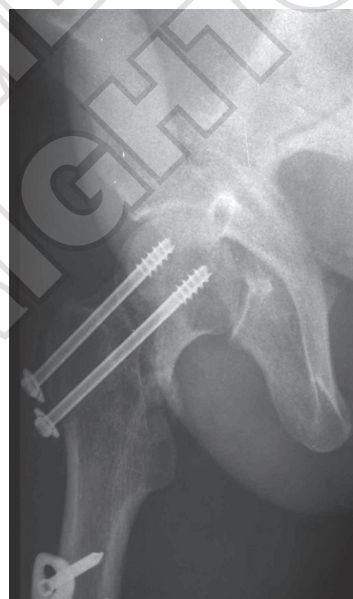


Figure 2.—Non-united right femoral neck fracture.

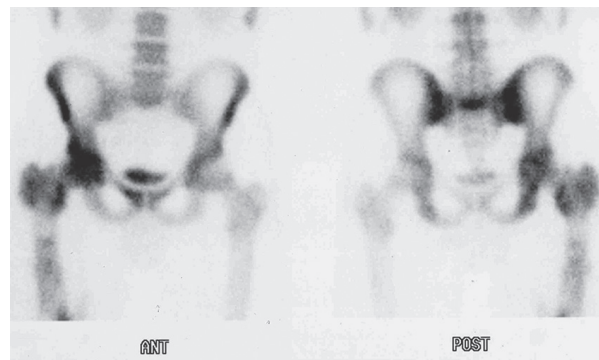


Figure 3.—Preoperative triphasic ^{99}Tc bone-scan.

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Treatment was planned following extensive discussion with the patient. The decision between a new osteosynthesis or a total hip arthroplasty was leaved at the surgery time. The operative intervention, performed on a traction table, included a standard Watson-Jones approach. The capsulotomy was performed in a reverse T manner, with a split over the anterior surface of femoral neck and another one on the intertrochanteric ridge. Debridement at the non-union site was performed using thin bone scalpels. Attention was given in removing all of the hypertrophic bone avoiding any iatrogenic damage to the femoral head arteries. A distraction force of 20 kg was applied along the axis of the leg. Once the fracture has been disimpacted, the surgeon applied a load on the anterior aspect of the joint to drive the hip into internal rotation. This maneuver was repeated until a satisfactory reduction was observable under fluoroscopic assessment. The authors decided to perform a new osteosynthesis using cannulated screws and an On Rod device. (Zimmer, Warsaw, USA) The reduction was held provisionally with Kirschner wires. Under fluoroscopic assessment a 3.2 mm guide pin was inserted in the center of the femoral neck closer to the calcar. The starting point was the lateral cortex at the level of the lesser trochanter. Progressive cannulated reamers were used, taking care to maintain 5 mm from the endosteal surface of the femoral head. Following hole tapping, a 90 mm On Rod was inserted. To improve the mechanical stability, two 90 mm cannulated screws were placed superior to the "On Rod" reproducing a reversed triangular configuration. The tips of the screws were 7mm under

the endosteal surface of the femoral head. The early postoperative radiographic examination showed a satisfactory reduction and a stable fixation (Figure 4).

The patient was managed postoperatively avoiding weight bearing for 40 days, daily passive range of motion exercises, NSAIDs medications for two weeks, antithromboembolic prophylaxis with Sodic Enoxaparin 4000 UI/d for 90 days. Follow-ups were done at 3 weeks, two, six, 12 and 24 months.

Hammer¹ reported that the incidence of nonunion was correlated with the Garden classification: 1% for Garden I fractures and more than 25% in Garden III and IV fractures. A poor reduction prevents re-establishment of the blood supply to the femoral head and decreases the amount of apposition of bone between the fragments, leaving poor mechanical stability after fixation.²⁻⁴ A valgus reduction (more than 20°) is associated with a higher rate of osteonecrosis. A varus deformity is associated with high rates of both osteonecrosis and non-union. Furthermore, anterior or posterior angulations of more than 10° should not be accepted, because the increase risk of a potential new displacement.

This case report shows that in a young patient with an inveterate femoral neck non-union, the attempt of a newly open reduction followed by internal fixation should be considered. A Watson-Jones approach allows a direct visualization of the femoral neck. Particular care must be taken in removing the callus avoiding, at the same time, any damage at the vascular network. Once reduction has been performed, the employ of three cannulated screws are the best choice. Bobyn *et al.* studied the tanta-



Figure 4.—Healed femoral neck fracture at 24-month follow-up.



Figure 5.—Healed femoral neck fracture at 24-month follow-up.

lum proprieties. They demonstrated a rapid tissue ingrowth and improved fixation strength. Tantalum can induce a good osteoblastic response promoting new bone apposition.⁵

The authors goal was to extend the indications at the treatment of non-united femoral neck fractures.

Despite an elastic modulus next to the bone, the use of an "On Rod" doesn't provide alone an optimal mechanical stability. For this reason, it was considered like a "healing" device. To obtain a mechanical stability, two superior cannulated screws were used to make the construct stiffer.

At 4-month follow-up the patient reported complete absence of pain on the right hip, he dismissed the wheelchair and started to walk without crutches and full weight bearing. The results at 24 month-follow-up, X-rays revealed a stable and perfect healed femoral neck fracture (Figures 4, 5). The R.O.M. of the right hip joint was complete in absence of pain. The patient was fully ambulatory and reported its complete return at his non-agonistic sports activity.

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