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Case Report

The treatment of femoral bone loss by axial external fixation and susbequent locking plate application: a case report

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KEYWORDS

femoral shaft bone loss
damage control orthopaedics
monolateral external fixation
bone transport
docking site non-union
knee stiffness
locking plate
Judet procedure
plastic reconstruction

ABSTRACT

A 20-year-old man was admitted to our hospital having sustianed bilateral high-energy femoral fractures. The right femoral fracture was an open grade 3B with OTA grade 3 bone loss. The patient had also a brain contusion with a subdural haematoma and a closed fracture of the left clavicle. Initial management included temporarily stabilisation of the femoral fractures wth external fixators and prompt transfer to the intensive care unit. Three weeks later the external fixator of the right femur was converted to an hybrid system, and the fixator of the left side was removed and a reamed intramedullary locking nail was applied. Two months after the accident the patient underwent bone transport (11 cm long) of the right femur with an monolateral external fixation. When the final length was achieved there were knee stiffness (ROM 0° to 30°) and non-union of the docking site. Therefore, the patient underwent a Judet's procedure to treat the knee stiffness and stabilisation of the non united femur with a locking plate (LISS). After the operation the patient started progressive weight bearing. A year after trauma and following union of the femur, the patient underwent soft tissue reconstruction of the anterior side of the thigh with a free vascularised flap. At final follow upo the patient had a good functional recovery with return to his previous occupation.

Introduction

Femoral fractures due to high energy trauma are relatively frequent in motorcycle accidents. Many of those fractures involve the shaft and sometimes the knee joint, with variable soft tissue injuries and often bone loss [1].

The treatment of bone loss is routinely performed using external fixation, with circular systems, according to Ilizarov [2] or monolateral implants such as Dynamic Axial External Fixator [3].

Major complications of bone transport in the femur include knee stiffness [4], due to the proximity of the screws or K wires to the joint, and non-union of the docking site [5]. In addition to this, the implants must be kept in place for a long time in order to achieve complete bony consolidation, thus reducing the patient compliance to the treatment, especially in long bone transport procedures [6,7].

Case report

A 20-year-old man was admitted to our hospital after a motorcycle accident. Initial diagnastics inlcuding plain radiographs and a pan CT revealed bilateral femoral fractures, (closed type 32.B3 on the left side and open Grade 3B type 32.C3 with distal articular extension on the right side). Furthermore, a brain contusion with a small extradural haematoma and a diaphyseal fracture of the left clavicle were diagnosed.

Initial surgical manegement was carried according to damage control orthopaedis principles with a knee spanning fixator on the right side and a monosegmental fixator on the left side (Fig. 1).

The patient was transferred to ICU for supportive care where he stayed for 10 days. Three weeks after the date of injury, a reamed intramedullary nail was inserted on the left femur as definitive treatment. On the right femur the spanning fixator was converted into an hybrid system with screw fixation of the articular fracture to allow knee flexion (Fig. 2).

Two months after initial trauma the patient underwent boen trasport using an axial external fixator (Orthofix LRS Advance). A bone resection and transport according to De Bastiani for an amount of 11 cm was performed (Fig. 3).

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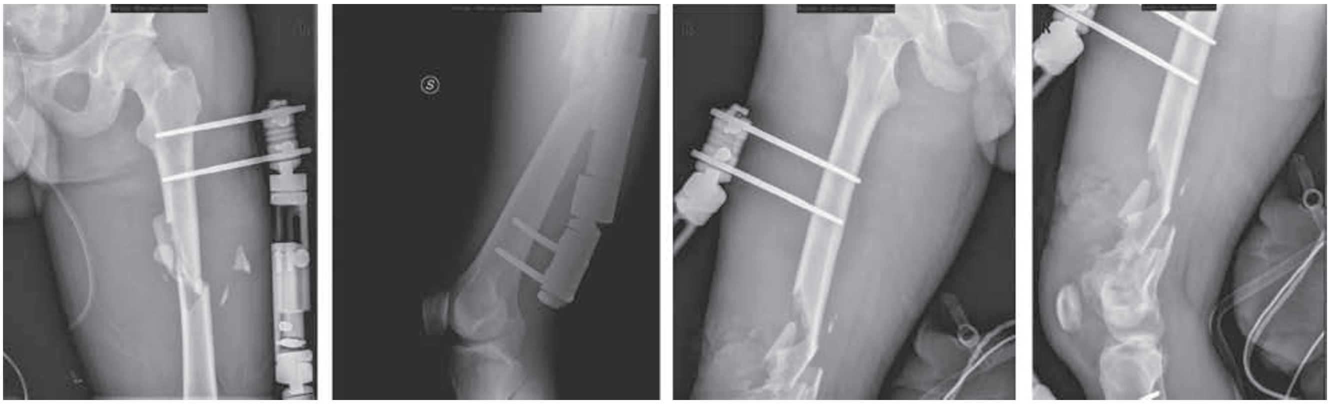

Fig. 1. X-rays after DCO. Bilateral femoral fracture (type 32.B3 on the left side and open grade 3B 32.C3 with distal articular extension type).

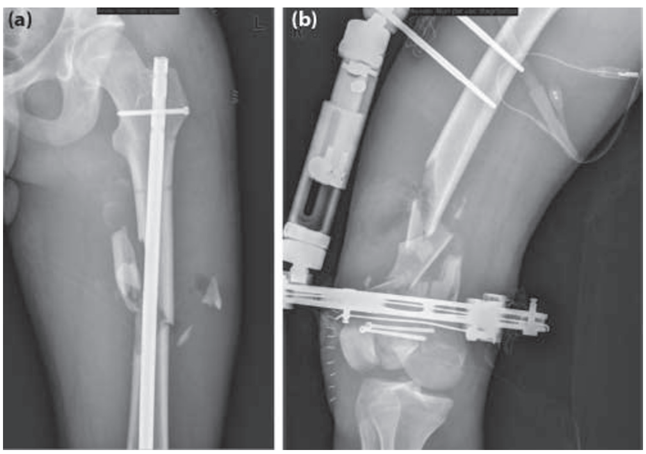

Fig. 2. a) AP radiograph left femur and b) lateral radiograph right femur after the second procedure.

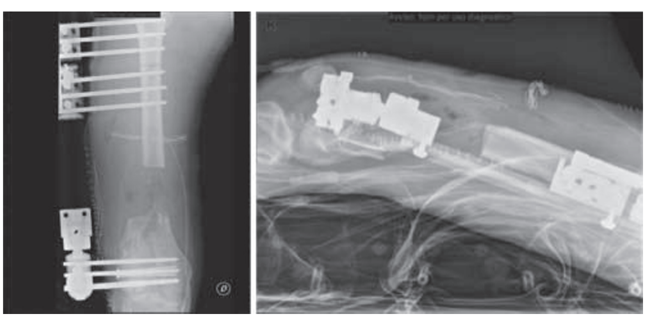

Fig. 3. AP and lateral radiographs of configuration of fixator for bone transport.

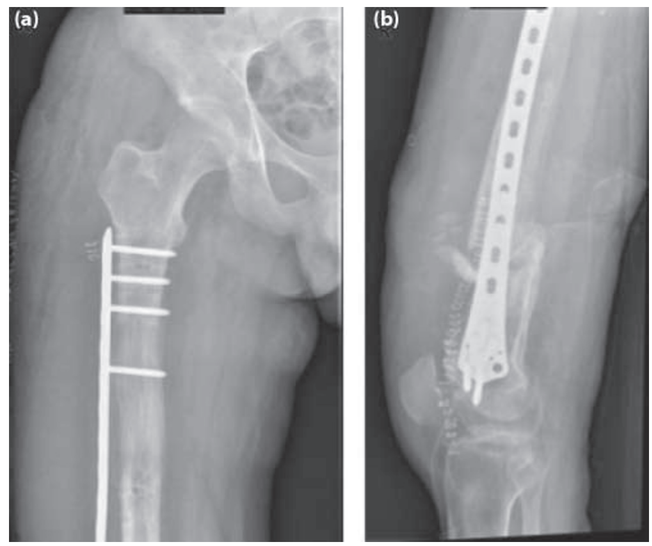

Fig. 5. a) AP and b) lateral radiographs showing docking site grafting, Judet's procedure and plate stabilisation.

At the end of the bone transport procedure (8 months after trauma), when the final limb length was achieved, severe knee stiffness (ROM 0–30°) was present. Furthermore, a non-union of the docking site was present (Fig. 4). Consequently, the patient underwent a Judet's procedure to treat the knee stiffness, bone graft of the docking site and the external fixator was replaced with a locking plate (DePuy Synthes LISS) at the same setiing (Fig. 5).

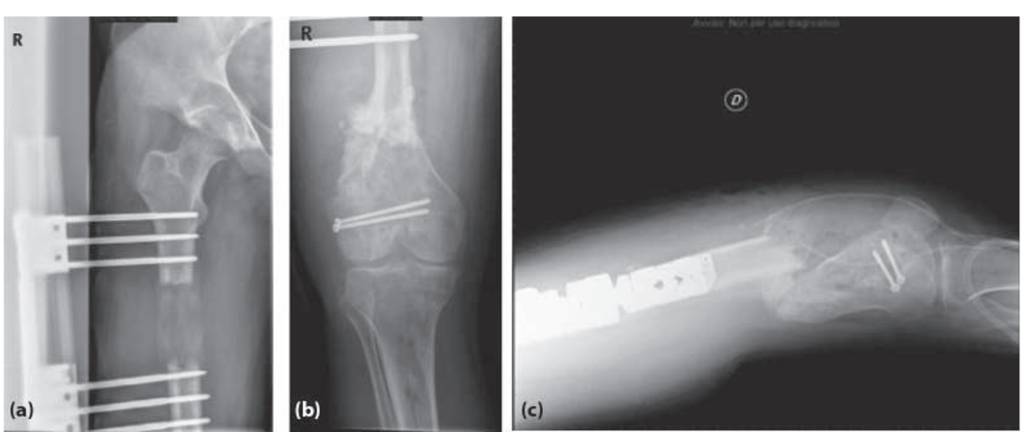

Fig. 4. a) AP radiograph illustrating the presence of regenerate bone. b) AP radiograph showing docking site non-union. c) Lateral radiograph showing docking site non-union.