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LETTER TO THE EDITOR

Iatrogenic fracture of the proximal tibia as a complication of knee manipulation under anaesthesia in a haemophilia patient with an ipsilateral stiff knee secondary to a supracondylar non-union of the femur

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A 35-year-old man suffering from congenital severe haemophilia A came to us with intense pain in his right knee associated with severe loss of mobility [30º of range of motion (ROM): full extension, 30º flexion]. He told us that 18 months before he had an open fracture on his right knee resulting from a traffic accident, which was diagnosed and treated in the city where he lived. He added that he underwent a surgical procedure there. He brought with him a couple of radiographs, in which we could clearly detect a supracondylar non-union of the femur and a severe haemophilic arthropathy of the ipsilateral knee (Fig. 1). On the basis of the aforementioned information we concluded an open reduction and internal fixation of a supracondylar fracture of the femur was carried out in the city where he lived by means of a dynamic condylar screw (DCS) from the Association for Osteosynthesis/Association for the Study of Internal Fixation (AO/ASIF) (Synthes Stratec, Madrid, Spain). Apparently he developed a painful non-union, probably secondary to excessive motion of the bony ends in the fracture site, and a secondary severe loss of knee mobility.

The patient further told us that, before this fracture, his knee ROM was 90º (full extension, 90º flexion), and that the severe arthropathy of his right knee was nearly painless and allowed him to perform his daily activities without any problem. Also, that over the last 3 months he had lost a lot of mobility on his right knee.

With all the above information in mind, we decided to perform a new surgical procedure to carry out manipulation under anaesthesia (MUA) to gain some knee mobility, and at the same time, to solve the painful non-union. Three months later, under general anaesthesia, we performed the MUA and we got 90º of knee flexion. Unfortunately, at the last moment of the MUA we heard a crack, which pointed at an iatrogenic fracture. By means of radioscopy (image intensifier) we detected a non-displaced fracture of the proximal tibia. Then, we started the surgical procedure. First, we removed the hardware (DCS); secondly, we carried out fixation of the tibial fracture by means of an L-shape AO/ASIF plate (Synthes Stratec) plus two lag screws; finally, we treated the supracondylar non-union of the femur. The latter consisted of revitalization of the non-union site as well as of the bony ends, and the implantation of morsellized cancellous bone from the Bone Bank (one femoral head) in the non-union site followed by bone fixation by means of a non-contact bridging plate (Zimmer, Warsaw, IN, USA).

The procedure was carried out under cover with plasma derived factor VIII (pdFVIII). The patient received a pre-operative bolus continued to receive every 8 h through postoperative day 1, then reducing dosage and intervals from postoperative day 2–15. Factor VIII levels were maintained at 0.96–1.6 IU mL^{-1}. After that the patient received a daily bolus dose of 40 IU kg^{-1} body weight to cover

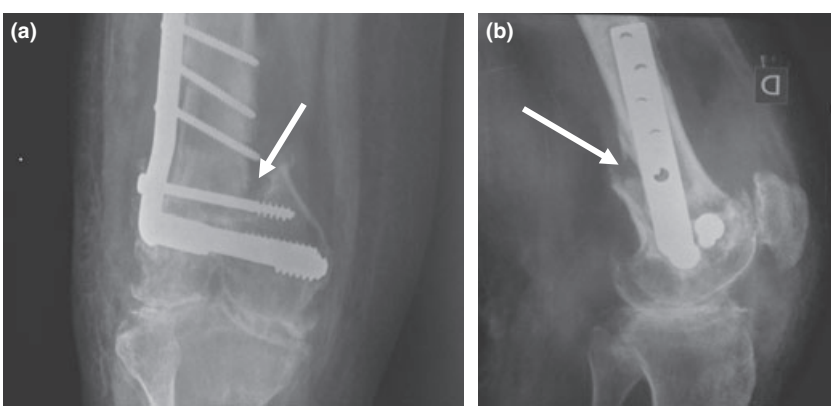

Fig. 1. Non-union of a supracondylar fracture of femur is clearly visible both in the antero-posterior view (a) (arrow) and in the lateral view (b) (arrow). Note that the initial open reduction and bone fixation was performed by means of a dynamic condylar screw.

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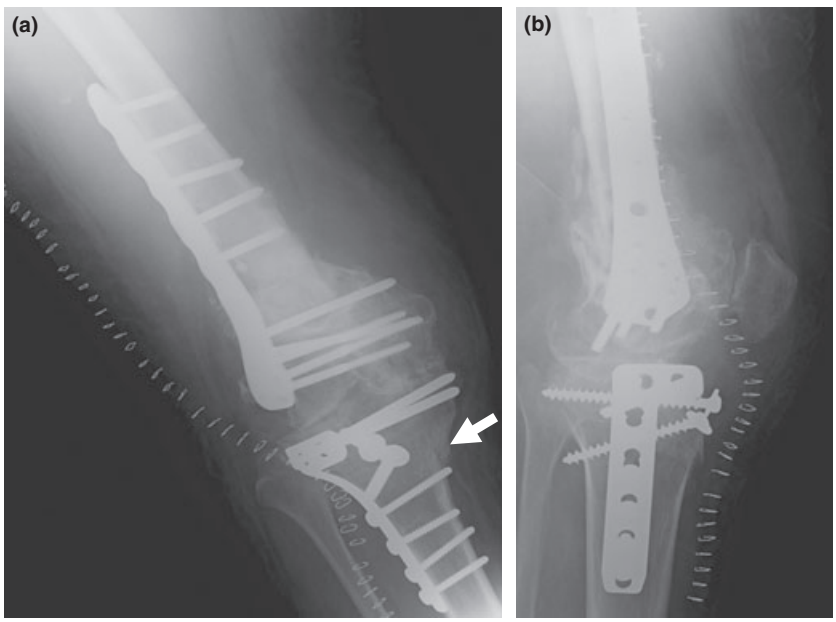

Fig. 2. Postoperative radiographs: (a) In the antero-posterior view and in the lateral radiograph (b) you can see that the new bone fixation used to treat the non-union was a non-contact bridging plate. The iatrogenic fracture of the proximal tibia (arrow) secondary to mobilization under anaesthesia was stabilized by means of an L-shaped Association for Osteosynthesis/Association for the Study of Internal Fixation plate plus two lag screws.

postoperative rehabilitation through several weeks after surgery. Overall haemostatic efficacy was considered good. Pharmacological thromboprophylaxis was not used and thrombotic adverse events were not developed.

At the end of the surgical procedure knee ROM was 45° (full extension, 45° flexion). Postoperative radiographic control was satisfactory (Fig. 2) and postoperative physiotherapy started 3 weeks later under secondary haematological prophylaxis. Two months later knee ROM was 30° (full extension, 30° flexion). Eight months after our surgical procedure bone healing was achieved both clinically and radiographically (Fig. 3) and the knee was therefore painless.

The goal of modern fracture treatment is to obtain an optimal outcome, with the patient's return to full activity as soon as possible. Nowadays, internal fixation is indicated in most closed

Fig. 3. Antero-posterior (a) and lateral radiographs (b) taken 8 months later. Bone healing of the non-union site had been achieved and the pre-operative knee pain had disappeared.

displaced fractures in adults. If a fracture is correctly treated in a haemophilic patient, it will progress to bone healing in a similar time-frame to fractures occurring in the general population [1]. Rigid plate fixation and autologous bone-grafting is an effective technique for the treatment of non-unions of the supracondylar region of the femur [2].

According to Ipach *et al.* [3] the prevalence for stiffness after primary total knee arthroplasty (TKA) is 4.54%, for revision-knee procedures 5.11%, and for other forms of intra-articular surgery 1.29%. No statistically significant difference exists according to time (>/<30 days) of MUA. The MUA is a valuable technique to increase ROM after TKA in patients with stiff knees, for 'revision-knees' and in all other patients with reduced flexion after different forms of intra-articular knee surgical procedures. The best management is prevention by avoiding intraoperative technical errors and performing intense postoperative physiotherapy in a well-motivated patient.

In the present case the most interesting facts are the following: (i) development of a non-union after a closed displaced fracture of the supracondylar region of the femur associated with a stiff knee, and (ii) the iatrogenic fracture of the proximal tibia that occurred during MUA. Although the painful non-union was successful, we could not solve the severe loss of knee mobility. In future the patient will require a difficult TKA due to the severe knee arthropathy associated to his loss of knee mobility.

It is important to emphasize that iatrogenic fracture is not a so uncommon complication of MUA. That is why a carefully controlled technique of manipulation must be performed. On the other hand, osteopaenia due to prolonged immobilization could contribute to the iatrogenic fracture that we had in this patient. Alternative treatments to MUA are arthroscopic release of plica and intra-articular adhesions, quadricepsplasty and TKA. We think that in this case a quadricepsplasty could have been effective [4,5]. However, we considered that it was a very extensive surgical procedure to be done in a single surgical stage. The final alternative could have been a TKA using a tumour-like prosthesis. We did not consider this alternative due to the young age of our patient.

In conclusion, it is important to avoid non-unions of fractures by means of a rigid bone fixation. Intense postoperative physiotherapy in a well-motivated patient is also paramount. The MUA is commonly used to treat a stiff knee, and its results are usually satisfactory [3]. However, the main complication of MUA is the development of an iatrogenic fracture.

Disclosures

The authors stated that they had no interests which might be perceived as posing a conflict or bias.

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