Case report

Paget's disease of the femur: Peri-implant fracture 39 years later

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1. Introduction

Surgical management of femoral shaft fractures in Paget's disease of bone is a challenging condition. The femur is involved in approximately 46% of patients with Paget's disease and is the second most common bone to be fractured after the vertebral body. Fractures through the distal third account for 11% of femoral fractures. Non-operative and conventional surgical methods were recommended in the past. Intra-medullary nailing is considered as the standard method of treatment for sub-trochanteric and femoral shaft fractures, but is problematic in the deformed Pagetic femur.

We report a case of a 91-year-old lady who had a fracture of the mid-femoral shaft at the distal end of a previous osteosynthesis plate inserted 39 years ago for fixation of a more proximal fracture.

2. Case report

A 91-year-old lady presented to our emergency department with pain, swelling and deformity of the left thigh after a simple fall from standing height in her friend's house. She was unable to weight bear. On questioning, she had no previous pain in her thigh "for years". X-rays showed a transverse mid-shaft complete femoral fracture at the level of the distal tip of a previous osteosynthesis plate that was inserted 39 years ago for fixation of a more proximal fracture, (Fig. 1). The original procedure was done in a different country and we had no access to the medical records, but the patient is aware of her Paget's disease since her primary surgery. She reported a good level of independent mobility using a single walking stick.

The patient was taken to the operating theatre after being deemed fit for surgery, 24 h after the injury. The operating surgeon started the procedure by opening the fracture site and removing the distal screws from the 4.5 mm plate. A supracondylar locked nail was then inserted via a trans-patellar tendon approach. The nail was passed beyond the level of the fracture and locked proximally and distally by 2 locking screws, an adjuvant demineralized bone matrix (DBM) was applied to the fracture. The old plate was left in situ to avoid creating a new stress riser. Operating time was 90 min and estimated blood loss around 500 cm.

Post-operatively, the patient made an uncomplicated recovery and mobilized, partially weight bearing (PWB), 48 h after the procedure. She was discharged from the hospital to a rehabilitation facility on day 10 after the operation. She had full painless range of motion at the knee prior to discharge.

Outpatient department follow up at 6 weeks established that the patient was managing well with the walking frame and no pain in the thigh. X-rays showed early callus formation and full weight bearing was encouraged. At 16 weeks, patient was using two walking sticks. At 22 weeks, X-rays showed radiological union (Fig. 2).

3. Discussion

Peri-prosthetic fractures in Pagetic bone is a well known complication after prosthetic implantation in the femur, this has been shown with regards to total hip arthroplasty with custom designed curved femoral stems. Re-fracture at the plate end due to the disease ‘outgrowing’ the implant have been recognized, but we could not find any study documenting the heightened risk of peri-prosthetic fracture of a pagetic bone following osteosynthesis. Our patient had no clinical evidence of stress or fissure fracture at the area of the distal end of the plate, as she was not complaining of thigh pain prior to this admission. It is evident from the mechanism of injury, fracture location and pattern that this injury occurred due to a stress riser at the junction of the plate and native bone.

The options for managing this injury were dictated by the location of the fracture, the proximal femoral bowed deformity and the presence of the old plate. The operating surgeon's choice of a supracondylar, retrograde, nail was to avoid creating a new stress riser at the proximal tip of the nail. Thus, the decision was to retain the previous implant and create an overlapping load sharing/load bearing construct without a new stress riser. The only technical difficulty was to remove the distal screws as we had no exact information about the type or model of screws used. Fortunately, we had no difficulties during the procedure and a normal AO screwdriver was sufficient, the plate being an original 4.5 mm AO plate without dynamic compression or slotted screw holes.

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By choosing the retrograde method of nailing, we avoided a more complex procedure that would have involved removal of the old plate and a conventional cephalo-medullary nailing with possible requirement of an additional corrective osteotomy for the proximal femoral deformity. We did not consider conservative management in this case due to the age of the patient, previous mobility status and the well documented complications of conservative management in these patients. The technique is limited to the less common distal fractures of the femur. Early mobilization rather than correction of the femoral deformity was the aim. This approach was particularly useful in our frail, elderly patient in whom corrective osteotomy and cephalo-medullary nailing would have represented a major surgical assault. The risk of iatrogenic fracture of the neck of the femur resulting from a medial (to piriform fossa) entry point of an ante-grade nail is eliminated and the increased operative trauma of diaphyseal osteotomy is avoided.

Dove reported a 38% of non-union in Pagetic femoral shaft fracture, and showed that there was no difference between union rates for operative versus non-operative treatment. Thus, in our case, we augmented the fracture site with DBM as an adjuvant to promote osseous healing. DBM has shown superiority over iliac crest autologus bone grafting (ICABG), especially in elderly and higher co-morbidity patients. Full union time was judged by X-ray findings and by the ability of the patient to o back to her pre-injury mobility status. It was 22 weeks in this case which is shorter than the average established in large studies that addressed union times of femoral fractures in Paget’s disease. As far as we are aware, this is the first report of using DBM in management of a fracture in a Pagetic bone.

4. Conclusion

After the successful outcome of this case, and due to the technical ease, minimal operative time and blood loss, strong biomechanical construct and rapid healing time, it is our belief that...
supracondylar nailing augmented with DBM bone grafting is a strongly valid option for managing such complex cases.

References