Learning from errors

Failure of knee arthroplasty secondary to inadequate technique in cephalomedullary nailing of a subtrochanteric hip fracture

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Summary

A case of total knee replacement loosening caused by a failed cephalomedullary nail is presented. The nail was inserted for the treatment of an unstable subtrochanteric femoral fracture. The distal locking screw of the nail subsequently fractured allowing the leg to shorten and causing the nail to displace the femoral component of the knee replacement leading to a valgus alignment and deformity of the knee. In order to revise the knee the long γ nail had to be replaced by a shorter nail to allow a femoral component with a long stem to be used. This case illustrates the importance of using shorter nails in patients with prosthetic knees.

BACKGROUND

It is important to highlight the consequences of poor surgical technique and to discuss ways in which repeat mistakes can be avoided.

The use of cephalomedullary nails for the treatment of subtrochanteric hip fractures is well recognised and the literature supports their preferential use over other fixation methods in certain fracture subtypes¹ and in selected patients.²

There are a number of reported complications secondary to the use of cephalomedullary nails including infection, non-union, nail cut-out, nail breakage,³ arterial injury⁴ and peri-prosthetic fracture.⁵ As far as we are aware this is the first time a case of arthroplasty failure has been reported.

With an ageing population it is likely that both hip fractures and knee replacements will become more common. The likelihood of a surgeon treating a patient with a hip fracture and ipsilateral knee replacement is high and

therefore knowledge about the complications that can occur secondary to cephalomedullary nail use is essential.

CASE PRESENTATION

A 79-year-old lady with rheumatoid arthritis and bilateral knee replacements had a simple fall sustaining a subtrochanteric fracture of the right femur (figure 1).

This was treated with a cephalomedullary nail without any intraoperative complications. The postoperative films

Figure 1 Anteroposterior radiograph of the pelvis demonstrating a subtrochanteric femoral fracture.

Figure 2 Initial postop radiograph demonstrating fixation of the fracture has been inadequate with residual distraction at the fracture site.

Figure 3 Anteroposterior radiograph of the knee after initial fixation of the hip. The tip of the nail is very close to this prosthesis.

Figure 4 Anteroposterior radiograph of the pelvis 18 months after initial fixation showing that the fracture has failed to unite.

showed that the fracture was distracted (figure 2) but she was able to fully weight bear without any difficulty and was discharged home the following week with no immediate postoperative complications. At this time an anteroposterior (AP) radiograph of the knee (figure 3) showed that the tip of the nail was very close to the knee replacement but that there was normal alignment.

She represented 18 months later to an arthroplasty outpatient clinic with increasing disability because of pain and swelling in the knee associated with a progressive valgus deformity of the right knee. She had a burning sensation over the anterolateral aspect of the knee and had pain more proximally at the fracture site and around the site of insertion of the γ nail.

Her right knee was swollen. She had valgus alignment on weight bearing with associated pain and a range of movement between 5 and 90 degrees only. There was considerable pain on stressing the knee. Examination of the left knee showed no specific abnormalities.

Figure 4 shows the radiograph of the pelvis demonstrating that the hip fracture had failed to unite. An AP of the right knee (figure 5) demonstrated that there was a fracture of the distal locking screw and the leg had subsequently shortened by at least 2 cms, which had led to the nail pushing the medial femoral condyle causing the femoral component to become displaced leading to a relative valgus alignment and deformity of the knee. It also revealed gross porosis of the femur.

TREATMENT

Revision of the knee was not practical in the presence of a long nail because the bulk of a revision component would have hit the long γ nail and there would have been no room for a femoral stem.

In the presence of the non-union two separate procedures were performed – a revision of the nail to a shorter cephalomedullary nail (figure 6) before inserting a Triathlon Total Stabilising knee replacement (figure 7).

DISCUSSION

Cephalomedullary nails are designed to allow and control collapse of fractures of the femoral neck. When used to treat fractures of the femoral shaft the surgeon should anticipate that the insertion of the nail may result in distraction at the fracture site and also that collapse may occur at the fracture site as fracture healing proceeds. Distraction at the fracture site can occur as a consequence of traction on the limb, when advancing a nail that fits tightly into the medullary canal of the distal fragment or when the nail enters the compact cancellous bone of the metaphysis of a young patient. The bone should be reamed to allow the nail to advance without resistance and traction must always be released before locking screws are inserted. When using intramedullary nails without a signal arm in the femoral neck it is good practice to close a simple fracture by placing the distal locking screws first and knocking the nail back before inserting the proximal screws. This technique is inappropriate when using cephalomedullary nails because of the accuracy with which the proximal screw must be sited along the femoral neck. The alternative method of closing the fracture site by percussing the knee or foot

Figure 5 Anteroposterior radiograph of the right knee 18 months after initial hip fracture fixation. The distal locking screw has fractured and has displaced the femoral component of the knee replacement into valgus.

Figure 6 Radiograph of the right hip demonstrating the shorter cephalomedullary implant.

Figure 7 Revised total knee replacement demonstrating the stemmed implants and restoration of anatomical alignment.

before inserting the distal locking screws is inadvisable in a rheumatoid patient with knee replacements.

The problem which developed in this case was because the surgeon had not allowed for the two predictable events of shortening of the fracture and failure of bone union. In older patients we recommend the use of an intramedullary nail short enough to allow the largest amount of collapse that is anticipated and omitting the distal locking at the initial operation. Collapse at the fracture site is encouraged with early weight bearing and if discomfort at the fracture site continues for more than 3 weeks distal locking screws are inserted at a separate procedure after first checking the fracture site by radiographs. Although we recommend the use of two screws distally we recognise that the simple addition of a second distal locking screw to this construct would simply have delayed the ultimate mechanical failure in the presence of established non-union of the subtrochanteric fracture.

Learning points

- ▶ Adjust surgical technique to encourage successful fracture healing.
- ▶ When treating a subtrochanteric fracture of the femur in a patient with ipsilateral knee replacement ensure you use a shorter nail so that if the fracture collapses there is no chance that the nail can impact on the femoral component of the knee replacement.

Competing interests None.

Patient consent Obtained.

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