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Technical Note

The Use of a Revision Femoral Stem to Manage a Distal Femoral Periprosthetic Fracture in a Well-Fixed Total Knee Arthroplasty

Richard P. Jeavons, MRCSed, Daniel Dowen, MRCSed, and Shaun O'Brien, FRCSorth

Abstract: Managing very distal femoral periprosthetic fracture above a total knee arthroplasty (TKA) is a difficult problem. When a cruciate sacrificing TKA is used, bone stock around the implant is compromised and, therefore, can limit fixation options. We present technique using the revision system femoral stem for the PFC Sigma TKA (Depuy; Leeds, England) to stabilize this particular type of fracture. **Keywords:** total knee arthroplasty, periprosthetic fracture, intramedullary canal, revision arthroplasty.

The management of periprosthetic fractures around a total knee arthroplasty (TKA) is a complex problem. Depending on the level of fracture, multiple methods of fixation have been described including open reduction and internal fixation with plate and screw constructs, fixed angle devices, and intramedullary (IM) nailing as well as conservative measures.

When fractures occur adjacent to a cruciate sacrificing (CS) replacement, fixation options become limited as the intercondylar box preparation requires resection of bone stock and the box itself can prevent distal screw placement for many constructs. Intramedullary techniques cannot be used, as passage through the box is not always possible.

Here, we present a method of IM fixation not previously described but worth considering when faced with a distal fracture of the femur close to a well-fixed femoral component of a CS TKA.

Case Report

An 84-year-old woman was admitted to the trauma and orthopedic department after a simple trip and fall. She complained of significant pain in her left total knee replacement and an inability to weight bare. It was 3 months after a left primary PFC sigma posterior cruciate substituting total knee replacement (Depuy; Leeds, England).

Radiographs revealed a transverse type fracture, with a split extending proximally, close to the femoral component of the distal femur (Fig. 1). The femoral component was well fixed to the fracture fragment. Intramedullary stabilization was the fixation method of choice, as there was insufficient bone stock for a periarticular locking plate. However, because of the intercondylar box of the CS implant, a standard retrograde nailing technique would have proven impossible. The idea to use the femoral stem from the TC3 revision system (Depuy) became apparent. The femoral stem screws into the intercondylar box attached to the CS femoral component.

Fixation using this method was undertaken. The patient made an uneventful postoperative recovery and was discharged a few days later. At 3 months, she had a well-healed scar and a range of movement from 0° to 110° flexion. Check x-rays showed her fracture was in good alignment and healing. She progressed well over the next 18 months, and on most recent follow up at 2 years, the fracture was healed; the TKA, well fixed (Fig. 2); and the patient had no discomfort. She was pleased with her outcome, walking with no aids again.

Description of Technique

Under general anesthesia and using a high thigh tourniquet at 300 mm Hg, the old midline incision was

From the Department of Trauma and Orthopaedics, Sunderland Royal Hospital, Sunderland, UK.
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Reprint requests: Richard P. Jeavons, MRCSed, 38 The Wynd, Wynyard, Cleveland, United Kingdom, TS22 5QE.

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Fig. 1. Anteroposterior and lateral radiographs showing a distal periprosthetic fracture around a well-fixed TKA (Rorabeck type 2 [6]).

reopened, and a medial parapatellar arthrotomy was performed. The periprosthetic fracture was visualized just above the level of the well-fixed femoral component. The polyethylene insert was removed, providing access to the femoral component.

To gain access to the fracture site and allow insertion of the TC3 stem (Depuy), the lateral collateral conjoint tendon insertion onto the lateral femoral epicondyle was removed with its bony attachment, using an osteotome (Fig. 3A). Loose fragments of cement and bone were removed from the intercondylar box around the implant.

At this point, the leg was moved into a varus position giving access to the femoral shaft. The IM canal was sequentially reamed to allow a 16 mm by 125 mm, 7° femoral stem to be inserted (Fig. 3A). The stem was inserted up the femoral shaft, and the component was reduced into an anatomical position using the small window in the lateral cortex (Fig. 3B). It was secured via insertion of the appropriate locking bolt from inside the intercondylar box (Fig. 3C). The small lateral cortex window allowed access to the distal part of the stem with a spanner to securely tighten it to the femoral box (Fig. 3D).

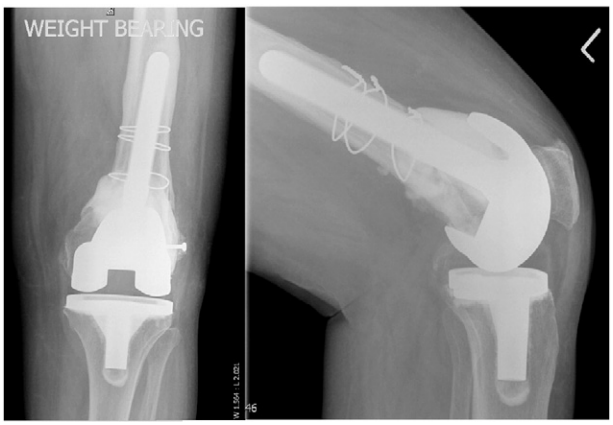

Fig. 2. Plain radiographs at 2 years postfixation demonstrating method of fixation. The fracture has healed, and the prosthesis is well aligned with no signs of loosening.

A new 10 mm, posterior-stabilized, size 2 polyethylene tibial insert was reinserted. The knee joint was reduced, and the conjoint tendon reattached to the lateral femoral cortex with a cancellous screw and washer (Fig. 3E). The defect present on the lateral femoral cortex was filled with a combination of bone graft and supplementary bone cement. Prophylactic circlage wires were placed around the distal femur for further reinforcement. A thorough washout and closure were performed, and excellent alignment and stability were achieved on the postoperative check x-rays (Fig. 2).

After the operation, mobilization was allowed in a hinged brace, protected weight bearing at 50% for 6 weeks, followed by full weight-bearing mobilization. The brace was discontinued at 8 weeks.

Discussion

Periprosthetic fractures around a TKA are uncommon, with an incidence between 0.3% and 2.5% [1]. As more TKAs are performed each year, in patients of increasing age and greater levels of postoperative activity, this figure is likely to rise. The rate of supracondylar fracture around a TKA has been reported at 1.3%, with 80% of these occurring in women [2]. In the UK in 2007, 68 654 primary TKAs were performed. The average age was 69.8 years, and 57% were in women [3].

As this trend continues, management strategies need to be tailored to the fracture personality. Some will occur in well-fixed total knee replacements, as in our case; however, many will occur in loose and occasionally infected prosthesis. The original classification system described by Neer et al [4] has undergone several revisions, most latterly by Rorabeck et al [5]. It divides the fractures into type 1, undisplaced; type 2, displaced; and type 3, displaced or undisplaced with a loose or failing prosthesis. The case that we describe falls into the type 2 category, well fixed but displaced.

Supracondylar periprosthetic fractures are those that occur within 15 cm of the knee joint line or 5 cm of the proximal end of the implant. Predisposing factors to periprosthetic fracture include female sex, older than 60 years, osteoporosis, rheumatoid arthritis, steroid use, neurologic disorders, revision surgery, stress risers such as screw holes, notching of the femur, osteolysis from wear debris, and rotationally constrained implants [6].

The aims of management are to achieve stable reduction, resulting in a painless knee with a good range of movement and acceptable alignment. Nonsurgical options include traction, full leg plaster cast, or cast brace. These strategies are not free from complications and, as such, are generally reserved for those