Intra-operative fracture in posterior-stabilised total knee arthroplasty

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ABSTRACT

Purpose. To review records of 17 patients who sustained a tibial or femoral intra-operative fracture during primary cemented total knee arthroplasty (TKA)

Methods. Records of 1346 primary cemented TKAs using the NexGen LPS fluted tibial component performed by a single surgeon were reviewed. 12 tibial and 5 femoral intra-operative fractures occurred in 5 men and 12 women aged 54 to 83 (mean, 71.6) years. No patient had any condition that may predispose to osteoporosis.

Results. All 12 tibial fractures occurred during hammering down of the final tibial component. They were vertical crack fractures of the anterior cortex of the medial tibial plateau with minimal displacement and did not extend beyond the tip of the tibial stem. Four of the 5 femoral fractures were avulsion fractures in the coronal plane of the medial femoral condyles and occurred during removal of the intercondylar notch. The remaining femoral fracture involved the medial cortex of the medial femoral condyle and occurred during removal of a large medial femoral condyle osteophyte. All fractures were immediately fixed with 3.5-mm partially threaded AO cancellous screws. All patients achieved bone union and good function.

Conclusion. Intra-operative tibial fractures are more common than femoral fractures; fixation with multiple AO screws achieves good outcome.

Key words: arthroplasty, replacement, knee; intraoperative complications

INTRODUCTION

The prevalence of intra-operative fracture during total knee arthroplasty (TKA) without computer navigation is 0.39% to 2.2%.1,2 Surgical options for this complication include internal fixation with screws, tension band wiring, plate fixation, the use of a longer stem to bypass the fracture, and the use of a constrained prosthesis, whereas conservative options include protected weight bearing and bracing.1,5 This
study reviewed records of 17 patients who sustained a tibial \( (n=12) \) or femoral \( (n=5) \) intra-operative fracture during primary cemented TKA.

**MATERIALS AND METHODS**

This study was approved by the medical advisory committee and the board of the hospital. Records of a consecutive series of 1346 primary cemented TKAs using the NexGen LPS fluted tibial component performed by a single surgeon between January 2000 and December 2011 were reviewed. The TKA was performed through the anterior medial parapatellar approach without computer navigation. An intramedullary jig was used for femoral preparation, and an extramedullary jig for tibial preparation. The patella was routinely resurfaced. Cement was applied to the tibial base plate, tibial plateau, and proximal tibial canal. The final tibial component was inserted about half way into the tibial cavity by hand to confirm correct orientation before being hammered down.

12 tibial and 5 femoral intra-operative fractures occurred in 5 men and 12 women aged 54 to 83 (mean, 71.6) years, giving a prevalence of 0.9% and 0.4%, respectively. No patient had any condition that may predispose to osteoporosis. Two patients had undergone arthroscopic debridement of their knees. One patient had undergone open reconstruction of her ruptured anterior cruciate ligament 20 years earlier.

Intra-operative fractures were immediately reduced with bone clips without removal of the prostheses or cement and then fixed with multiple 3.5-mm partially threaded AO cancellous screws while the cement was still in the doughy state (Fig.). Patients were allowed full range of knee motion and full weight bearing with a walking frame on day 1. The walking frame was replaced by 2 crutches as patient mobility progressed. At 4 weeks, mobilisation with one crutch or a single walking stick was allowed. Two weeks later, walking without any aid was allowed.

Patients were assessed using the Knee Society Clinical Rating System\(^6\) and the Knee Society Total Knee Arthroplasty Roentgenographic Evaluation and Scoring System.\(^7\)

**RESULTS**

All 12 tibial fractures occurred during hammering down of the final tibial component. They were vertical crack fractures of the anterior cortex of the medial tibial plateau with minimal displacement and did not extend beyond the tip of the tibial stem. Four of the 5 femoral fractures were avulsion fractures in the coronal plane of the medial femoral condyles and occurred during removal of the intercondylar notch, because of an incomplete sagittal cut between the intercondylar notch and medial femoral condyle (Fig.). The remaining femoral fracture involved the medial cortex of the medial femoral condyle and

Figure Radiographs showing multiple screw fixation for (a) the medial tibial plateau fracture and (b) the medial femoral condylar fracture.
occurred during removal of a large medial femoral condyle osteophyte. All patients achieved bone union and good function. One patient developed haematogenous infection secondary to an infected ingrown toenail and underwent revision TKA 9 months later.

After a mean of 84.4 months, 2 men and 9 women (with 7 tibial and 4 femoral fractures) were available for follow-up (the remaining had died from unrelated causes or lost to follow-up). Their mean Knee Society knee score and function score were 89.7 and 73.2, respectively (Table), which was comparable with other studies that reported respective scores of 96 and 83 after a mean of 4 years,8 94.7 and 83.7 after a mean of 5 years,9 and 73.3 and 75.3 after a mean of 10.3 years.10 Six of the patients (with 4 tibial and 2 femoral fractures) had developed debilitating medical problems that markedly impaired their mobility and function scores.

**DISCUSSION**

Intra-operative femoral fractures are preventable and commonly due to technical errors. Should difficulty be encountered during removal of the intercondylar notch, we suggest excluding a possible connection between the intercondylar notch and the femoral condyles from an incomplete box cut to avoid an avulsion fracture.

Intra-operative ‘tibial plateau’ fractures are usually a crack fracture with minimal displacement. Predisposing factors include a relatively large tibial stem in a small tibia or concomitant tibial tuberosity osteotomy.2 Multiple AO screw fixation enables early knee mobilisation and protected weight bearing, as does tension band wiring.2 As the trial and final tibial components are of the same size, and the prepared proximal tibial cavity is a closed cavity, we suspect that excessive bone cement into the proximal tibial cavity during insertion of the final tibial component may have contributed to the fracture.

Intra-operative fracture in primary TKA is associated with a higher revision rate (owing to instability, loosening, and infection).1 21% of patients underwent revision TKA after a mean follow-up of 2.8 years; this may have been due to 64% of the patients having previous knee surgery or severe bone deformity.1

One limitation of this study was the absence of controls for comparison. Nonetheless, comparative study is difficult because of the low prevalence of intra-operative fracture. The dropout rate was high owing to deterioration of health or natural death.

**CONCLUSION**

Intra-operative tibial fractures are more common than femoral fractures; fixation with multiple AO screws achieves good outcome.

**DISCLOSURE**

No conflicts of interest were declared by the authors.

**REFERENCES**