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Early Healing With Locked Condylar Plating of Periprosthetic Fractures Around the Knee

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Abstract: Management of periprosthetic fractures around the knee is often difficult because of poor bone quality, comminution, and constraints imposed by the existing prosthesis. Locked condylar plates may provide more reliable fixation for these fractures than traditional methods of fixation. Eleven patients with periprosthetic fractures around the knee were treated with open reduction and internal fixation using a locked condylar plate. All 9 acute fractures and 1 of 2 periprosthetic nonunions healed at an average of 21 weeks, and no patient required additional surgery. Nine fractures healed in anatomical alignment, whereas 1 healed in 5° valgus. The remaining periprosthetic nonunion developed a persistent nonunion with subsequent hardware failure. The average range of motion was 4° to 92°. Locked plating systems are highly effective for the management of complex periprosthetic fractures around the knee. They result in reliable fracture healing and permit early motion in complex fractures. **Key words:** knee, arthroplasty, fracture, fixation, ORIF.

Periprosthetic fractures around the knee are relatively uncommon, occurring in approximately 0.3% to 2.5% of patients with a total knee arthroplasty (TKA) [1]. Most of these fractures occur around the distal femur, with only rare fractures occurring around the proximal tibia [2]. As the average age of the population in the United States increases over the next 30 to 40 years, more total knee arthroplasties will be performed and thus more periprosthetic fractures will certainly occur. Fixation of these fractures has been problematic because of generally poor bone quality, fracture comminution, the constraints imposed by the existing prosthesis, and the often small distal fragment with limited options for fixation. Numerous techniques have evolved to provide stable fixation including intramedullary nails, blade plates, condylar screw and side plates, and condylar buttress plates. The complication rates using these techniques have been as high as 25% to 75% [1]. New techniques that provide more reliable fracture fixation, are adaptable to a wide variety of fracture and prosthesis types, and provide stable fixation in the osteopenic bone are needed. Locked condylar plates would seem to provide a means of achieving these goals. They provide improved fixation in the osteopenic bone, are relatively easy to apply, and provide many options for screw fixation around prosthetic components even in the presence of an intramedullary stem [3,4]. We report the results of the use of locked condylar plates for treatment of complex periprosthetic fractures around the distal femur and proximal tibia.

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Methods

Patient Characteristics

All patients who had a periprosthetic fracture around the distal femur or proximal tibia treated with a locked condylar plate between November 2002 and December 2003 were included in the study. All patients presented to the emergency department or to the orthopedic clinic of the Milton S. Hershey Medical Center (Pennsylvania State University College of Medicine). There were 11 patients included in the study. Ten patients had periprosthetic fractures of the distal femur and one patient had a periprosthetic fracture of the proximal tibia. Nine patients presented with an acute fracture and 2 patients presented with a nonunion of a distal femoral periprosthetic fracture with failed fixation. The average age of the patients at the time of injury was 65 years, and their average weight was 93 kg (range, 64-165 kg). The diagnosis for the index TKA was osteoarthritis in 8 patients, rheumatoid arthritis in 1 patient, and posttraumatic osteoarthritis in 2 patients. Two patients had had a revision before the fracture. Four patients had a cruciate-retaining TKA, 6 patients had a cruciate-substituting TKA, and 1 patient had a hinged prosthesis. Two patients had a femoral component with an intramedullary stem. Three of the index arthroplasties were performed at the authors' institution.

The mechanism of injury was a fall in 6 patients, a twisting injury in 1 patient, motor vehicle accident in 2 patients, a stress fracture in 1 patient, and a severe femoral notch in 1 patient. All patients had only mild pain or no pain in the knee before the fracture. The average time from the original TKA until the fracture was 77 weeks (range, 2.5-254 weeks).

Fracture Evaluation

Anteroposterior and lateral x-rays were obtained on admission and reviewed to confirm the fracture pattern and the stability of the component. All 11 patients had Lewis type 2 distal femur fractures with a well-fixed prosthesis [5]. One patient had a severe notch of the distal femur, but none of the other components were malaligned.

Treatment

All periprosthetic fractures around the knee were treated with open reduction and internal fixation (ORIF) with a locked condylar plate during this period by 1 of 3 surgeons. No fracture was treated nonoperatively and no knee was treated with immediate revision TKA for periprosthetic fracture. The choice of fixation was at the discretion of the surgeon; however, no periprosthetic fractures around the knee were treated with alternative fixation techniques during this time. Of the 10 patients with a distal femoral fracture, 9 had a standard lateral approach to the femur whereas 1 had an anterior approach through a previous incision. Nine fractures were stabilized with a 4.5-mm locked compression plate condylar plate (Synthes), one was stabilized with a less invasive surgical system (LISS) plate (Synthes) using a limited incision, and another (proximal tibia) was stabilized with a 4.5-mm locked compression plate T plate. The length of the plate and the number of locking screws were determined by the fracture characteristics and the bone quality. An average of 5 locking screws was used in the periarticular segment and 4 locking screws were used in the shaft fragment. Unicortical screws were used for fixation of the plate to the femoral shaft in the patient who was treated with an LISS plate with a limited incision and in one patient treated with a distal femoral condylar locking plate in the most proximal hole. Unicortical locking screws were placed in the distal fragment of distal femoral fractures when dictated by the constraints of the implant. Eight fractures were supplemented with nonstructural allograft bone. Fracture fixation was not supplemented with polymethylmethacrylate in any of the fractures.

Postoperatively, 10 patients were advised to limit weight bearing on the affected extremity until the fracture was healed and 1 patient remained non–weight bearing for 8 weeks. Seven patients were treated with a brace postoperatively, and all but one patient began immediate range of motion.

Outcome Assessment

The function of the knee arthroplasty before the fracture was assessed based on each patient's recall because most of these arthroplasties were not followed up at our institution before the fracture. This information was limited. Postoperative data were collected in a prospective manner as part of the normal medical care of our patients. The initial postoperative x-rays and serial follow-up radiographs were reviewed for fracture healing, loss of alignment, hardware failure, and loosening of the prosthesis.

All patients were followed up until the fracture had healed except for one patient who developed a