

## Case Report

# Use of Ilizarov External Fixation for a Periprosthetic Supracondylar Femur Fracture

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**Abstract:** Supracondylar femur fractures above a total knee replacement are rare injuries that may be challenging to treat. We present a case of an elderly woman whose supracondylar femur fracture was not deemed amenable to conventional treatment. This patient underwent fixation of her femur fracture above a total knee replacement using an Ilizarov external fixator. The fixator was removed at 10 weeks, at which time the fracture was solidly healed. At the most recent follow-up, the patient is 19 months postinjury. She is fully weight bearing without walking aids and has a knee range of motion of 0° to 110°. **Key words:** Ilizarov, external fixation, fracture, total knee arthroplasty, supracondylar.

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The patient is a 65-year-old woman who fell at home and sustained a fracture above her left total knee prosthesis. The patient had undergone a left total knee replacement in 1979. In 1982, she underwent revision surgery (using a Kinematic Total Condylar Prosthesis [Howmedica, Rutherford, NJ]) for unremitting knee pain. Subsequently the patient had a problem with a dislocating patella and in 1983 had a vastus medialis obliquus advancement performed. All of the patient's previous surgeries had been performed at other institutions. The patient had no further problems until her fall in 1996 and stated that her prosthesis had been functioning well.

The patient was seen in the emergency department and was diagnosed with a low supracondylar femur fracture (Fig. 1). The only pertinent medical history was for non-insulin-dependent diabetes mellitus. Physical examination revealed an obvious

deformity of the left distal femur, a well-healed anterior scar, and pain to palpation in the thigh. She was also noted to be neurovascularly intact distally in the left lower extremity.

A closed reduction and casting was chosen as the best option for the patient, and the patient was taken to the operating room; the procedure was performed under fluoroscopic guidance, and the patient was placed into a spica cast. Initial radiographs showed a near anatomic reduction; however, over the next week, the fracture displaced in the cast. The patient also became incontinent of urine, which soaked her cast. At this point, after discussing the treatment options with the patient, it was decided the best option would be to place the patient in a circular thin-wire external fixator.

A 4-ring Ilizarov external fixator was preconstructed using long leg radiographs as a template. The fixator was placed using a combination of thin wires (1.8-mm) and half pins (6.0-mm), under fluoroscopic guidance. The procedure was performed by the senior author (M.R.B.). The frame was constructed to span the knee joint with the joint held in full extension. The frame was placed using the usual Ilizarov techniques and reduction

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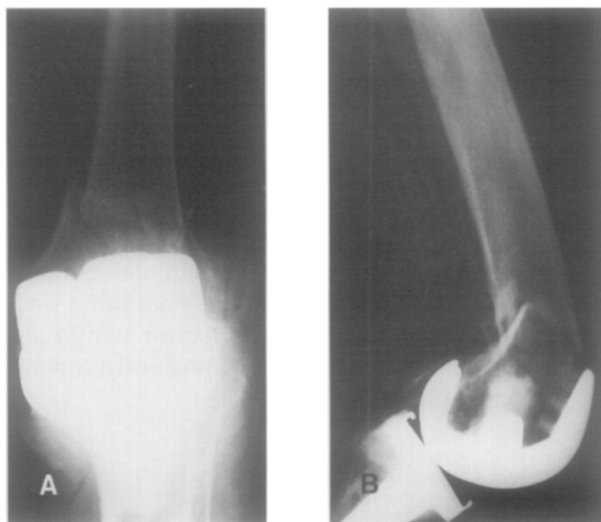
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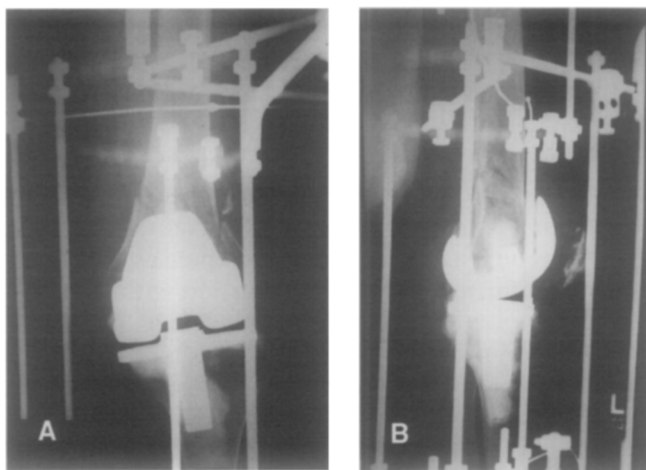
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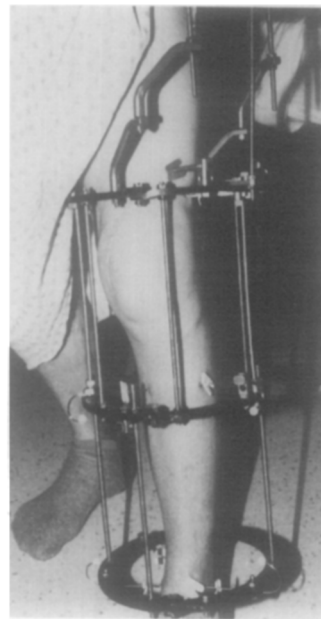
**Fig. 1.** Initial anteroposterior (A) and lateral (B) radiographs of a supracondylar femur fracture above a total knee replacement.

maneuvers [1]. Care was taken to stay away from the total knee components with the bone fixation implants. No implants were placed directly into the distal femoral fracture fragments themselves in an attempt to minimize the possibility of seeding the prosthesis. Postoperative radiographs showed anatomic reduction of the fracture (Fig. 2). The patient began full weight bearing on postoperative day 1 (Fig. 3).

During the 10 weeks in the fixator, the patient had problems with pin tract infections despite daily pin care. Our protocol for pin care includes daily use of a chlorhexidine gluconate (Hibistat) solution (Zeneca Pharmaceuticals, Wilmington, DE); each



**Fig. 2.** Postoperative anteroposterior (A) and lateral (B) radiographs after placement of the Ilizarov external fixator.



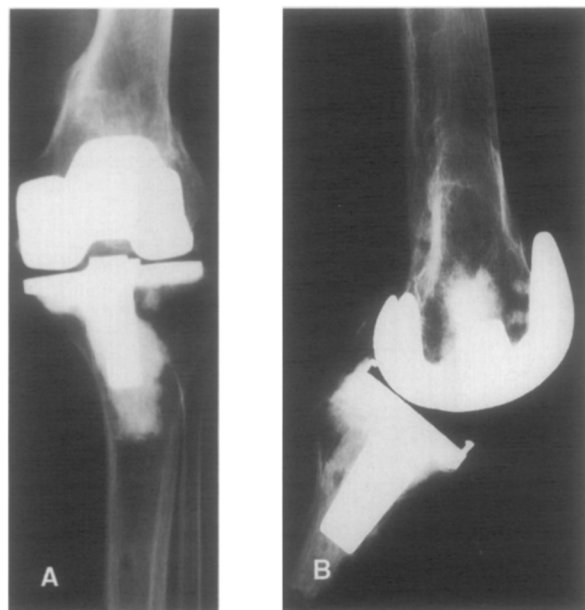
**Fig. 3.** The patient in her Ilizarov frame is shown ambulating on postoperative day 1.

pin is cleaned individually with a separate sterile applicator, then a clean Ilizarov sponge is placed. The patient's pin tract infections were treated with aggressive pin care (cleaning 3 times/day) and antibiotics. The patient never showed any signs of a deep infection or evidence of infection to her total knee prosthesis.

The fixator was removed 10 weeks after injury, at which time radiographs showed callus formation (Fig. 4); the patient began immediate full weight bearing as tolerated. At the patient's 1-month follow-up after fixator removal, she was ambulating independently and her knee motion was 0° to 85°. All of her pin and wire sites were healed without signs of infection. At her latest follow-up, 19 months postinjury, the patient had 0° to 110° of active knee motion; she was ambulating well and had no complaints.

## Discussion

Periprosthetic femur fracture above a total knee replacement was first described by Hirsch et al. [2]. These fractures usually occur within 15 cm of the joint line or within 5 cm of the tip of an intramedullary femoral device [3,4]. They occur in 0.3% to 2.5% of patients with total knee arthroplasties [3,5–7]. The predisposing risk factors include rheumatoid arthritis, prolonged steroid use, anterior notching of the femur during femoral component preparation, osteoporosis, neurological dysfunction, female sex, age in the 60s, and presence of



**Fig. 4.** Anteroposterior (A) and lateral (B) radiographs showing good callus formation and anatomic alignment of the fracture at 10 weeks.

a revision [3,5,6,8,9]. Treatment options for periprosthetic femur fractures include using a knee immobilizer, traction, casting, open reduction and internal fixation with a plate-and-screw construct, revision arthroplasty, retrograde intramedullary nailing, external fixation, and amputation [6,8,10].

The Ilizarov external fixator has been used to treat fractures for approximately 40 years. To the best of our knowledge, the use of an Ilizarov external fixator to treat supracondylar femur fractures above a total knee replacement has not been previously reported. In our case, this multiplanar fixator was used with successful results.

When the clinician is faced with a complicated fracture such as this, there are many variables that must be considered, including age, underlying medical problems, ambulatory status, and bone stock [11]. The clinician must also consider whether the prosthetic components are well fixed or loose. If retrograde nailing is a consideration, the clinician must identify the type of prosthesis and know if a notch is present to permit passage of a nail.

In our case, the patient initially had closed reduction with cast treatment. This treatment failed as the fracture displaced, and a retrograde intramedullary device was considered. The prosthesis did not have a femoral notch to allow entrance of a retrograde nail.

We also considered open reduction and internal fixation with a plate-and-screw construct but de-

cided against this because we were concerned about purchase in the relatively small osteopenic distal fragment. A revision total knee arthroplasty was considered but was not performed because of concerns related to blood loss, risk of infection, and need for extensive removal of bone. The patient also had had no problems with her prosthesis before her injury. In our case, we believed that the best alternative for the patient was a circular external fixator. The reason for this was her poor bone stock and distal fracture pattern. This fixator would also give the best bony stability for healing and allow her to ambulate immediately.

## Conclusion

There is little literature on the use of external fixation for periprosthetic femur fractures above a total knee replacement. Merkel and Johnson [9] reviewed these fractures, and 3 of the 34 fractures treated with a monolateral external fixator had good or excellent results with no complications. Figgie et al. [10] reviewed results of 24 supracondylar fractures above total knee replacements; one of these was treated with a monolateral fixator. In the course of treatment, the patient developed a deep infection from a pin site, which subsequently necessitated removal of the total knee prosthesis and an arthrodesis. Complications that can occur with the use of a circular external fixator include pin tract infection, joint infection, stiffness of adjacent joints, angulation, pain, ring sequestrum, implant breakage, and further surgical procedures [12].

When treating fractures above a total knee prosthesis with an external fixator, meticulous pin care and immediate treatment with antibiotics are necessary at any sign of infection. A stable frame and rapid healing can restore the patient's functional status, ambulation, and range of motion and prevent further complication.

Indications are limited for the use of an Ilizarov external fixator for a periprosthetic femur fracture. The preferred method of treatment for a displaced fracture may be a retrograde intramedullary nail if the total knee prosthesis has a femoral notch. If there is no femoral notch, the accepted alternative is open reduction and internal fixation with a condylar plate, a buttress plate, or a blade plate. We believe an Ilizarov external fixator is indicated in an elderly patient with a distal periprosthetic fracture with extremely osteopenic bone and a total knee prosthesis with no femoral notch. Early mobilization and weight bearing promotes rapid bony healing and decreases the risk of medical complications.

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