

Periprosthetic Patellar Fracture Fixation Using Suture Anchors

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abstract

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Treatment of type II periprosthetic patellar fractures presents difficulties in decision-making particularly when displacement is greater than 10 mm. Poor results have been reported with internal fixation, whereas conservative management has been associated with a high incidence of extensor lag. This article reports a patient with a displaced type II patellar fracture following total knee arthroplasty.

One month after undergoing total knee arthroplasty, a 72-year-old man presented to the emergency department with difficulty walking. Physical examination revealed an extensor lag with a palpable defect in the extensor mechanism. Radiographs showed a transverse, comminuted fracture through the distal third of the patella with a separation of approximately 15 mm. The patient underwent surgery, at which time the patellar component was found to be intact and well fixed to the proximal fragment. Three suture anchors were introduced into the proximal fragment through the fracture site. Tunnels were drilled in the distal fragment (through the fracture gap) corresponding to the location of the anchors; the sutures were threaded through these tunnels. Anatomical reduction was achieved with towel clips, and the sutures were tied at the distal pole. After the knots were tied, anatomical reduction was maintained, and the sutures were additionally used as cerclage around the patella. One year postoperatively, the fracture showed union, and the patient had good range of motion with no extensor lag. No patellar subluxation, avascular necrosis, or refracture occurred.



Figure: Preoperative lateral radiograph showing a periprosthetic patellar fracture. The distal fragment is comminuted and separated from the proximal fragment by approximately 15 mm. Because the polyethylene component was well fixed to the proximal fragment, the fracture was classified as type II.

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Patellar fractures after total knee arthroplasty (TKA) are uncommon.¹⁻⁴ Various treatment options have been described for these fractures based on fracture configuration.⁴⁻⁶ Displaced fractures having a separation of more than 1 cm, an extensor mechanism defect, and an intact patellar component (Ortiguera and Berry type II or Keating type 2B periprosthetic patellar fractures)^{3,4} can present difficulties in treatment decision-making. Surgery to restore the extensor mechanism has been suggested to avoid poor extension.^{3,7} However, open reduction and internal fixation (ORIF) has been reported to have a high incidence of complications and reoperations.^{4,8} Use of suture anchors has been described for the repair of patellar tendon ruptures^{9,10} and for fixation of some fractures (eg, coronoid fractures)¹¹; however, the use of suture anchors for periprosthetic patellar fracture fixation has not been described in the literature. This article reports a novel method using suture anchors for fixation of a type II periprosthetic patellar fracture. This method achieved stable anatomical fixation without interfering with the component in situ.

CASE REPORT

A 72-year-old man underwent left TKA for osteoarthritis with a posterior cruciate ligament–substituting prosthesis (Sigma PS; DePuy, Warsaw, Indiana) via a midvastus approach. Partial fat pad excision and a tibial cut first method were used. The patella was resected from an original thickness of 25.5 mm to 18 mm. A 3-lug round dome cemented component (size, 35 mm; thickness, 8 mm) was used to resurface the patella; therefore, the final thickness of the composite was 26 mm. Postoperatively, the patient's progress was uneventful, and he was discharged from the hospital on the fifth day. At his 2-week follow-up visit for stitch removal, the wound had healed primarily. No discharge occurred from the wound at any stage. He had a range of motion from 0° to 80°.

One month postoperatively, the patient presented to the emergency department with difficulty walking. He described hearing a cracking sound in the operative knee while getting up from a sitting position. The patient reported a minimal increase in preexisting pain.

Physical examination revealed a fracture of the patella, exposed through a 3-cm longitudinal gape in the middle third of the previously well-healed wound. An extensor lag of approximately 10° existed; however, the patient was able to perform active straight-leg raises without much discomfort. No knee instability existed in the anteroposterior and mediolateral planes. No clinical or serological signs of infection existed. His white blood cell count was within normal limits, and his erythrocyte sedimentation rate and C-reactive protein showed a decrease compared to immediate postoperative levels.

Anteroposterior and lateral radiographs showed a transverse, comminuted fracture through the distal third of the patella with a separation of approximately 15 mm (Figure 1). The plastic patellar component remained well fixed to the proximal fragment, and no subluxation of the patella existed. Based on clinical and radiographic criteria, the fracture was classified as an Ortiguera and Berry type II periprosthetic patellar fracture.⁴

The patient underwent surgery. The patellar polyethylene component was found to be intact and had not loosened. The fracture line was distal to the component. A tear in the medial retinaculum extended upward until the medial aspect of the quadriceps tendon. The lateral retinaculum and the patellar tendon were intact.

Three suture anchors were introduced (Twifix Ti 2.8; Smith & Nephew, Andover, Massachusetts) into the proximal fragment through the fracture site. One was placed near the medial edge, the second was placed near the lateral edge, and the third was placed centrally. The medial and lateral suture anchors each had a single pair of threads. The central suture an-



Figure 1: Preoperative lateral radiograph showing a periprosthetic patellar fracture. The distal fragment is comminuted and separated from the proximal fragment by approximately 15 mm. Because the polyethylene component was well-fixed to the proximal fragment, the fracture was classified as type II.⁴

chor was selected such that it had 2 pairs of threads. K-wires were used to make 3 tunnels in the distal fragment, through the fracture site, corresponding to the position of the suture anchors in the proximal fragment. The sutures were threaded through these tunnels to exit at the distal pole of the patella through the patellar tendon (Figure 2).

With the knee in extension, anatomical reduction of the fracture was achieved and held with towel clips while the sutures were being tied at the inferior pole. Each of the 2 pairs of threads of the central anchor was tied with the corresponding medial or lateral edge pair of sutures. After tying the knots, anatomical reduction was maintained (Figure 3). The 4 pairs of sutures thus obtained were then used as cerclage around the patella for additional fixation. These cerclage sutures were tied at the superolateral pole of the patella.

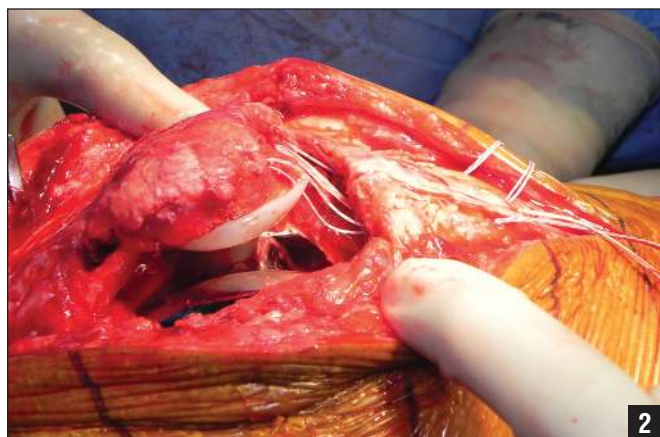


Figure 2: Intraoperative photograph shows the threads of the suture anchors in the proximal fragment passing through the tunnels in the distal fragment and exiting at the inferior pole of the patella.

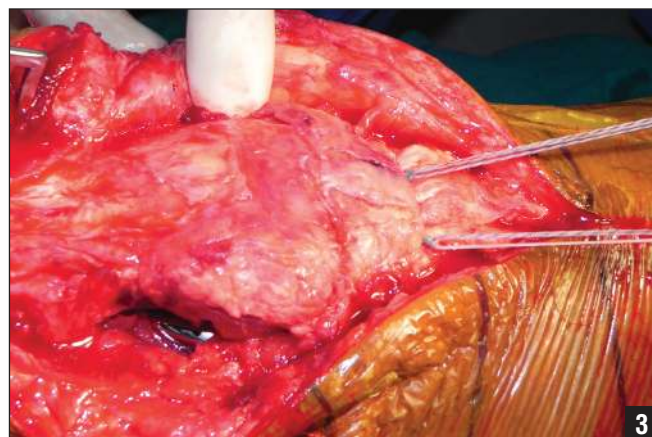


Figure 3: Intraoperative photograph shows anatomical reduction was maintained after the knots were tied at the inferior pole of the patella.

In the immediate postoperative period, a cylinder slab was applied to the limb. This was changed to a cylindrical cast on the fifth postoperative day, and partial weight bearing was started. Full weight bearing in a knee brace was started from the fourth week onward. Range-of-motion exercises were begun after 6 weeks.

The patient returned for postoperative assessment at 1, 3, and 12 months. Parameters assessed included progress of fracture union, presence of sclerosis or fragmentation (suggestive of avascular necrosis), secondary displacement of fracture fragments, refracture, heterotopic ossification, and patellar subluxation.

Three months postoperatively, the patient was able to walk with a cane. His range of motion was from 10° to 80°. The wound healed well. The lateral radiograph showed a 3- to 4-mm anteroposterior translation and a 3° to 4° angulation at the fracture site.

One year postoperatively, the patient could walk without support on level ground up to 1.5 km, and he had no discomfort while climbing stairs. Clinically, quadriceps strength and patellar tracking were normal. His range of movement was from 0° to 110°. Radiographs showed union of the fracture without avascular necrosis, subluxation, or refracture (Figure 4). The Knee Society knee score was 92

and function score was 80; corresponding scores before primary TKA had been 33 and 50, respectively.

DISCUSSION

Treatment of displaced periprosthetic patellar fractures with an intact patellar component has been reported to yield poor results.^{3,4,8} In the largest reported series of periprosthetic patellar fractures by Keating et al,³ 14 of 17 patients with a type IIB fracture were treated nonoperatively. Of these, 3 patients developed an extensor lag and 2 patients had a lack of extension. Of the 3 patients who were treated with ORIF, nonunion occurred in 2 patients.

In a study by Ortiguera and Berry,⁴ 5 of 6 patients with a type II fracture were treated with ORIF; union occurred in only 1 patient. The only patient who was treated nonoperatively developed an extensor lag.

After a systematic review of the literature, Chalidis et al¹² concluded that for type II fractures, ORIF failed in 92% cases, had high complication rates, and yielded poor final results. In these cases, in the presence of a well-fixed patellar component (which must be retained), ORIF with tension-band wiring has proven to be difficult.^{13,14} The thin remaining patellar bone hinders the placement of wires for fracture fixation. Hence, to




Figure 4: Lateral radiograph at 1 year postoperatively showing fracture union.

accommodate internal fixation, removal of the patellar component has been suggested.⁴

In the current case, the type II periprosthetic fracture was accompanied by a 3-cm gap along the length of the previously well-healed wound. After the index TKA, the wound had healed primarily, and no evidence of infection existed at any stage. Following the fracture, precautions

were taken to avoid any seeding of the joint, and surgery was performed within 12 hours. The polyethylene patellar component remained well-fixed to the proximal fragment, and the distal fragment was comminuted. Because the suture anchors are tiny, they did not need a large bone stock for adequate hold and were easily placed between the pegs of the 3-lug component in the patient. For designs with a large central peg, the suture anchors can easily be placed on either side of the peg. Hence, removal of the intact patellar component is not required. In the current case, the sutures, when tied, held the anatomical reduction, and were additionally used as cerclage around the patella. At 3 months postoperatively, the patient had a flexion deformity of 10°; this had resolved at 1 year postoperatively.

The current case highlights the novel use of suture anchors for fixing periprosthetic patellar fractures. The technique achieves good fixation without necessitat-

ing removal of the well-fixed component. The absence of any metal implant for patella fixation ensures unhindered wound healing and obviates the need for implant removal. This method also avoids the difficulties associated with tension-band wiring. The procedure is simple and quick, and the patient can be mobilized early. 

REFERENCES

- Berry DJ, Rand JA. Isolated patellar component revision of total knee arthroplasty. *Clin Orthop Relat Res.* 1993; (286):110-115.
- Grace JN, Sim FH. Fracture of the patella after total knee arthroplasty. *Clin Orthop Relat Res.* 1988; (230):168-175.
- Keating EM, Haas G, Meding JB. Patella fracture after post total knee replacements. *Clin Orthop Relat Res.* 2003; (416):93-97.
- Ortiguera CJ, Berry DJ. Patellar fracture after total knee arthroplasty. *J Bone Joint Surg Am.* 2002; 84(4):532-540.
- Sheth NP, Pedowitz DI, Lonner JH. Periprosthetic patellar fractures. *J Bone Joint Surg Am.* 2007; 89(10):2285-2296.
- Rorabeck CH, Taylor JW. Classification of periprosthetic fractures complicating total knee arthroplasty. *Orthop Clin North Am.* 1999; 30(2):209-214.
- Tharani R, Nakasone C, Vince KG. Periprosthetic fractures after total knee arthroplasty. *J Arthroplasty.* 2005; 20(4)(suppl 2):27-32.
- Hozack WJ, Goll SR, Lotke PA, Rothman RH, Booth RE Jr. The treatment of patellar fractures after total knee arthroplasty. *Clin Orthop Relat Res.* 1988; (236):123-127.
- Bushnell BD, Tennant JN, Rubright JH, Creighton RA. Repair of patellar tendon rupture using suture anchors. *J Knee Surg.* 2008; 21(2):122-129.
- Capiola D, Re L. Repair of patellar tendon rupture with suture anchors. *Arthroscopy.* 2007; 23(8):906.e1-4.
- Clark SE, Lee SY, Raphael JR. Coronoid fixation using suture anchors. *Hand (NY).* 2009; 4(2):156-160.
- Chalidis BE, Tsiridis E, Tragas AA, Stavrou Z, Giannoudis PV. Management of periprosthetic patellar fractures: a systematic review of literature. *Injury.* 2007; 38(6):714-724.
- Engh GA, Ammeen DJ. Periprosthetic fractures adjacent to total knee implants: treatment and clinical results. *Instr Course Lect.* 1998; 47:437-448.
- Bourne RB. Fractures of the patella after total knee replacement. *Orthop Clin North Am.* 1999; 30(2):287-291.