

Surgical Management of Patellar Fractures



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KEYWORDS

- Patella fracture • Extensor mechanism • Tension band • Partial patellectomy
- Surgical management

KEY POINTS

- The patella is a crucial component of the extensor mechanism.
- Modern surgical techniques provide good results with proper indications.
- Management of patella fractures depends on the fracture morphology.
- Symptomatic implants often lead to additional surgery.
- New techniques aim to reduce implant complications.

INTRODUCTION: NATURE OF THE PROBLEM

The patella plays a crucial role in the extensor mechanism to increase the mechanical advantage of the quadriceps. Forces up to 5 times the body weight have been recorded from the extensor mechanism; the patella displaces the quadriceps tendon-patellar tendon link away from the axis of knee rotation, effectively increasing the moment arm of the quadriceps.^{1,2}

Every year, roughly 1 in every 100 fractures will involve the patella.³ Fractures can be classified based on displacement, comminution, and fracture pattern and often involve concurrent injury to the proximal tibia, distal femur, or knee ligaments. Although conservative treatment remains an option, open reduction and internal fixation (ORIF) and/or partial patellectomy have emerged as the preferred treatment options.⁴ Numerous biomechanical and long-term studies highlighted the importance of the patella and tempered enthusiasm for total patellectomy as the treatment of choice for all patella fracture.^{5–8} In the 1950s, the Arbeitsgemeinschaft für Osteosynthesefragen

(AO) introduced and promoted the use of anterior tension band principles for patella fracture fixation.⁹ Subsequent studies validated its stability.^{10–12} Modern treatment options include internal fixation using tension bands with Kirschner (K) wires or cannulated screws, lag screw fixation, and partial patellectomy, all with reasonably good clinical results.

INDICATIONS/CONTRAINDICATIONS

Indications for treatment of patellar fractures are largely determined by the type of fracture encountered. However, the goals of treatment remain the same: (1) restoration of the extensor mechanism and (2) maintenance of a congruous articular surface. Thus, the literature often has focused on treatment type rather than fracture type.

Conservative Management

Nondisplaced, closed patellar fractures, including stellate, transverse, and vertical, or fractures with less than 2-mm articular steps can be treated conservatively.³ Stellate, transverse, and vertical

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fractures of the patella often spare the medial and lateral retinaculum, maintaining knee extension.^{10,13} Transverse fractures can present with significant displacement, such as 4 to 5 mm. However, if patients are able to extend their leg actively, the retinaculum is likely intact and can be managed conservatively.¹⁰ Because the distal portion of the patella is extra-articular, fractures of the inferior pole can also be managed conservatively.

Conservative management usually includes weight-bearing-as-tolerated (WBAT) ambulation with the knee in fixed extension supported by a splint, knee immobilizer, or hinged knee brace. At 2 to 3 weeks, patients begin passive range of motion (PROM) from 0° to 30°, increasing the arc of motion by 15° per week. At approximately 8 weeks, patients should have nearly a full PROM of the knee and can begin advancing WBAT without immobilization.

SURGICAL TECHNIQUE/PROCEDURE

Surgical Indications

Indications for surgery include open fracture, articular step of 2 mm or greater, and loss of knee extension (Fig. 1). Comminuted stellate fractures typically present with intact retinaculum; however, because of the articular incongruity, surgical intervention may be recommended (Fig. 2). Highly comminuted and displaced fractures can present as transverse fractures with massive comminution or stellate fractures with massive diastasis. These injuries are often open.

Preoperative Planning

Standard radiographic views for the patella fractures include anteroposterior and lateral

radiographs. The patella position and height are readily assessed with this view. A lateral radiograph will often provide an excellent survey of the fracture as well as an opportunity to determine patellar height (Fig. 3A, B). Most reliably, this is accomplished using the Insall technique.^{14,15} A computed tomography scan can provide more detailed information regarding fracture character and articular step, though it is not routinely obtained (see Fig. 3C–E).

Prep and Patient Positioning

In addition to the implants necessary for fixation, a small-fragment instrument and implant set and pointed bone reduction forceps can be useful. Additionally, wire instruments, such as tensioners, wire forceps, and crimpers, can be helpful (Fig. 4). Angiocatheters can provide a convenient conduit for passing suprapatellar and infrapatellar wires. Patients are placed supine on the operating table with an optional tourniquet placed on the proximal thigh. Care should be taken to ensure that the tourniquet is placed as high as possible and inflated during knee flexion to avoid quadriceps trapping.

Surgical Approach

A midline longitudinal or lateral para-patellar incision is most frequently used. This approach facilitates reduction and is safe for future arthroplasty. In addition, this approach avoids the saphenous branch of the femoral nerve, which safely lies medial to the incision. Several case series promote arthroscopically assisted reduction and fixation of minimally displaced patellar fractures.^{16–18} However, this technique may not be

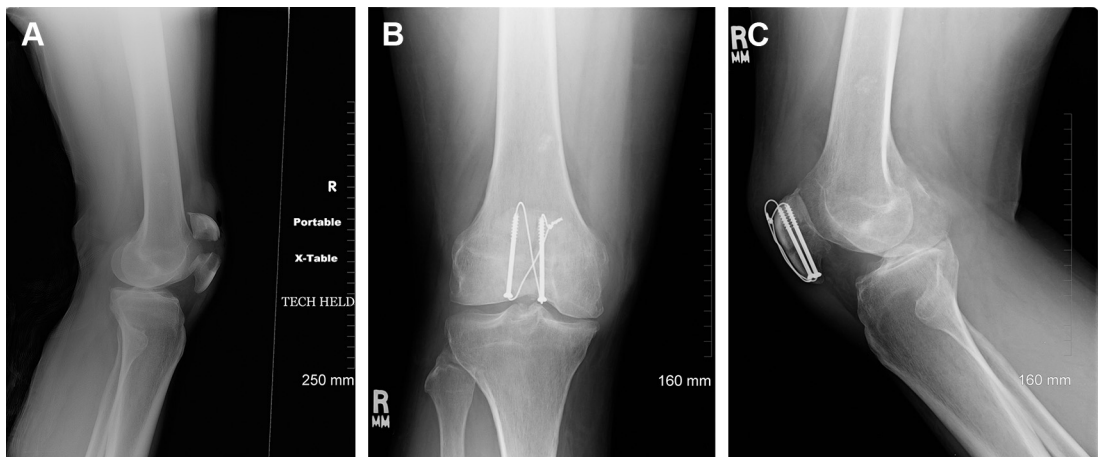


Fig. 1. (A) Lateral radiograph of open transverse fracture of the patella with significant displacement. (B, C) Anteroposterior and lateral radiographs following fixation with 4.0-mm cannulated lag screws and tension band.

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