Novel Anterior Plating Technique for Patella Fracture Fixation

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Abstract: Patella fracture fixation remains a significant challenge for orthopedic surgeons. Although tension band fixation allows for reliable osseous union, especially in simple fracture patterns, it still presents several problems. Plate fixation of patella fractures is a method that allows for more rigid stabilization and earlier mobilization. At the authors’ level 1 trauma center, one fellowship-trained trauma surgeon has transitioned to using a novel anterior, low-profile mesh plate construct for all types of patella fractures. This construct allows for stable fixation, osseous union, and neutralization of the inferior pole for even the most comminuted of patella fractures. [Orthopedics. 2017; 40(4):e739-e743.]

Operative Technique

The patient is positioned supine on a radiolucent table, and a small bump is placed under the ipsilateral hip to orient the patella superiorly. A tourniquet is optional. A midline anterior longitudinal approach is made starting just proximal to the superior pole of the patella down to the distal extent of the tibial tubercle (Figure 1). Sharp dissection is carried down to the patella. The prepatellar bursa is often disrupted, otherwise it is incised. Full-motion must be limited to prevent loss of fracture reduction, resulting in prolonged recovery and knee stiffness.3,4 Second, tension banding is associated with a high rate of overall complications and reoperation due to failure of fixation or prominent hardware.5-8 Third, with tension banding, functional outcomes have been reported to be poor and ultimately comparable to those with partial patellectomy.5,9,10 Finally, tension banding is inadequate treatment in the setting of comminuted fractures. Plate fixation of patella fractures allows for more rigid stabilization and earlier mobilization. Biomechanical studies have shown equal or superior fixation strength with plates compared with tension banding.11,12 Recent case series reporting on the use of various plating constructs have shown promising results, with early reports of satisfactory functional outcomes and minimal complications.8,13,14 At the authors’ level 1 trauma center, one fellowship-trained trauma surgeon (P.J.W.) has transitioned to using a novel anterior, low-profile mesh plate construct for all types of patella fractures. This construct allows for stable fixation, osseous union, and neutralization of the inferior pole for even the most comminuted of patella fractures. This article describes the surgical technique in adequate detail to allow other orthopedic surgeons to replicate this procedure (Video).
thickness soft tissue flaps are elevated medially and laterally to the epicondyles.

The periosteum adjacent to the fracture lines is elevated, with the remaining periosteum left undisturbed (Figure 1). The fractures are then debrided and irrigated. Many comminuted fractures have an impacted coronal plane fracture involving the distal pole of the patella (Figure 2). It is important to disimpact a coronal plane fracture to avoid malreduction of the joint. Traumatic retinacular tears are used as access points to the joint for articular reduction (Figure 3). Smaller tears can be extended toward the epicondyle, or transverse arthrotomies can be made at the level of the axial fracture plane. Direct visualization and manipulation of the articular surfaces are done through the arthrotomies, and the fractures are held with a combination of bone reduction clamps and Kirschner wires after reduction (Figure 4). Fluoroscopy confirms the reduction. Interfragmentary compression screws are then placed, if the fracture pattern is amenable to lag screws. Screw size is predicated by fragment size and ranges from 2.0 to 3.5 mm (Figure 5).

A 2.7-mm variable angle locking compression mesh plate (Synthes, West Chester, Pennsylvania) is then cut and bent to fit the contours of the anterior patella (Figure 6). The plate covers the entire anterior surface and is contoured around the edges of the patella to act as a cerclage-type construct, effective for containing comminuted fractures. A FiberTape (Arthrex, Naples, Florida) is looped through the middle of the plate and brought distal, deep to the plate (Figure 7). The distal aspect of the plate is positioned to slightly overhang the inferior pole of the patella. This overhang allows the distal row of screws to be placed into, or just caudal to, the inferior pole. These screws serve as a buttress to prevent subsidence of the inferior pole fragment. Plate placement is confirmed using fluoroscopy.

Once the plate is appropriately sized, contoured, and positioned, it is compressed into the patella with several cortical screws (Figure 8). A well-contoured plate compressed into the patella should permit invagination of the periosteum, tendon, and retinaculum through the open spaces; this allows the plate to recess into the soft tissues. Fractures are then neutralized through the plate using multiple unicortical 2.7-mm locking screws. Screw holes are predrilled to, but not through, the subchondral bone to prevent intra-articular screw penetration. The cortical screws are then removed and replaced with lower-profile locking screws. The number of screws used varies depending on the fracture pattern and comminution, with screws in plate holes directly overlying fracture lines being avoided (Figure 9).

Once the plate is fixed, the distal pole is neutralized using the FiberTape that was previously passed through the plate. The suture is passed deep and...
A drill hole for a 4.75-mm SwiveLock anchor (Arthrex) is made in the tibial tubercle, with position confirmed using fluoroscopy. A tap is used to cut threads into the hole (Figure 7). The patellar tendon is tensioned by cephalad trans locating the patella until the “crinkle” is removed from the tendon, and the anchor is then used to attach the distal suture into the tibial tubercle.

The knee is taken through full range of motion to evaluate stability of the construct (Figure 10). The articular surface is visualized and palpated through the retinaculum windows to confirm reduction and to check that no screws have penetrated the intra-articular surface. Reduction and positioning of hardware are assessed with fluoroscopy. The retinaculum is repaired, and the wound is closed in usual layered fashion.

**POSTOPERATIVE PROTOCOL**

Postoperative surgical dressings vary according to surgeon preference. The authors typically use a thin layer of soft cotton and a gentle compressive wrap. Patients are mobilized weight bearing as tolerated, in a hinged knee brace locked in extension, beginning immediately postoperatively. After 2 weeks, or when the incision has healed, patients can begin progressive, unrestricted range-of-motion exercise with outpatient physical therapy. The knee brace locked in full extension...
is used during ambulation for the first postoperative month. At 6 weeks postoperatively, strengthening exercises are begun. Patients are evaluated for osseous union and functional outcome with routine physical and radiographic examinations up to 6 to 12 months postoperatively.

**DISCUSSION**

Comminuted fractures of the patella are difficult to treat effectively, and traditional methods of fixation are complicated with tenuous fixation, protracted postoperative immobilization, fixation failure, fibrous unions, and prominent hardware. The authors find the use of a locking mesh plate, as compared with conventional tension banding or partial patellectomy, particularly for comminuted fractures, to be an effective method for treating patella fractures. The mesh plate has many points of locking fixation that allow for a bone-preserving, anatomic reconstruction. Furthermore, the low-profile, open lattice design, when properly contoured and compressed into the bone, allows the plate to recess into the soft tissues, potentially minimizing wound problems and hardware complications.

Although this plating technique is indicated for any displaced patella fracture, it is especially useful for those with coronal splits, comminution, or small distal pole fragments. Contraindications to the use of the plate and screw construct are active local infection, anterior knee soft tissue defects, or patients medically not cleared for operative intervention. Key advantages to the anterior mesh plate, as compared with other techniques, include elimination of the need for patellectomies, earlier range of motion, rigid fixation leading to more reliable bony union, and an effective means to address inferior pole comminution. The primary disadvantage, compared with other techniques, is a higher hardware cost. Additionally, if the hardware is improperly compressed and contoured to the patella, this could lead to symptomatic hardware and hardware removal. Indications for hardware removal would include symptomatic hardware, infection, or planned total knee arthroplasty. In the setting of a total knee arthroplasty, the authors recommend removing just those screws needed to place the patellar button. If hardware removal were required, the screw holes within the patella would create areas of stress risers with an associated risk for fracture. Other potential pitfalls include overtensioning the patella tendon or inadvertent intra-articular hardware.

Pearls to this technique include adequate contouring of the plate, initial use of cortical screws to compress the plate to the bone, and preservation and neutralization of the distal pole. By matching the contours of the patella, the use of cortical screws allows adequate compression of the plate into the periosteum. In theory, a large amount of metal in a subcutaneous location in the anterior knee would be problematic. In the authors’ experience, this construct has been well tolerated without the need for reoperation for symptomatic hardware, which can be attributed to this critical part of the technique.

**CONCLUSION**

Anterior plating for patella fractures can effectively treat all operative patella fractures, even highly comminuted fractures with separate inferior pole fragments. This technique allows for osseous union with effective neutralization of the inferior pole with a rigid locked construct.

**REFERENCES**


