Complications Associated with Fixation Constructs of Operatively Treated Patella Fractures: A Retrospective Study

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INTRODUCTION:

Patella fractures are uncommon injuries, typically caused by direct trauma or eccentric quadriceps contraction. Minimally displaced fractures with an intact extensor mechanism are often treated nonoperatively, while displaced, open, or extensor mechanism–disrupting fractures generally require open reduction and internal fixation (ORIF). Fixation techniques include tension band wiring (TBW) with K-wires or cannulated screws, mesh or mini-fragment plates, and circumferential cerclage for added stability. In patients with poor bone quality or severe comminution, partial or total patellectomy may be necessary.

Although union rates exceed 95% and infection rates remain low, complications such as symptomatic hardware removal (up to 50%) and loss of reduction (5–22%) are common. Biomechanical studies suggest plate fixation may reduce complications and hardware removal compared to TBW, though data remain mixed. This retrospective study aims to assess outcomes by construct type, hypothesizing that plate fixation is associated with a lower revision rate.

METHODS:

Following institutional review board approval, patients with operatively managed patella fractures at a single level I trauma center from 2012-2022 were retrospectively identified with Current Procedure Terminology code 27524. Patients under 17 or with less than 90 days follow-up were excluded. Patient presentation characteristics including demographics, comorbidities, and injury characteristics were collected.

Treatment and perioperative parameters including operative technique, fixation constructs, and weightbearing recommendations were recorded. Outcomes such as follow-up and complications were recorded. A diagnosis of osteoporosis was defined by medical record diagnosis or active treatment of osteoporosis. Polytrauma was defined as injury severity score (ISS) of > 15. FiberWire (Arthrex, Naples, FL) was used for TBW with suture. Implant failure was defined as hardware loosening or breakage necessitating reoperation after initial definitive fixation.

Fractures were grouped by definitive fixation construct and data were summarized and compared between groups with chi-square tests, Fisher exact tests, independent T-tests, and ANOVA in SPSS (version 29.0.2.0). Subgroups of fractures with less than and greater than four fragments were compared. Two sided tests were used, and variances were tested for equivalence as necessary. P-values less than .05 were considered significant.

RESULTS:

Two hundred forty-eight patients with 253 fractures were reviewed. Mean age was 46 (17-89) years. 58% of patients were male and 41.9% female. Average body mass index (BMI) was 27 (17-53) kg/m². 29.6% (75/253) of patella fractures were open. Mean follow-up was 304 (92-2185) days (Table 1).

47.4% (120/253) of fractures were treated with TBW, 22.1% (56/253) tendon advancement, 7.1% (18/253) plates, and 23.3% (59/253) other constructs (Table 2). 9.1% (23/253) required soft tissue coverage.

The overall reoperation rate was 21.7% (55/253). Failure of fixation requiring revision occurred at an overall rate of 15.0% (38/253) and at a mean of 11 (2-103) weeks after initial definitive fixation. The rate of revision for failure of fixation was 5.6% (1/18) after plate fixation, 20.8% (25/120) after TBW, and 10.7% (6/56) after tendon advancement (P=.196) (Table 3). The revision rate for TBW was higher when compared to all other constructs (20.8% [25/120] vs. 9.8% [13/133]; P=.014), but not when compared to plate fixation (P=.332).

The overall rate of sHWR was 8.3% (21/253). Plates required more sHWR (27.8%, 5/18) than TBW (10.0%, 12/120, P=.041) and all other constructs (6.8%,16/235, P=.008).

DISCUSSION AND CONCLUSION:

Management of patella fractures with plates was associated with high rates of sHWR. Plates trended toward lower rates of revision, with only one of 18 failing; however, this did not reach statistical significance. TBW was associated with higher rates of revision compared to all other constructs but not when compared directly to plate fixation.

Table 1. Demographic and clinical characteristics of the study cohort (n=248 patients, n=253 fractures).

Variable	n (%) or mean (range)
Age, mean (range)	46 (17-89)
Sex, n (%)	
Male	144 (58.0)
Female	104 (41.9)
Follow-up period (days), mean (range)	394 (92-2185)
BMI (kg/m^2), mean (range)	27 (17-53)
ASA score, n (%)	
I	10 (4.0)
II	91 (36.7)
III	127 (51.2)
IV	24 (9.7)
VI	1 (0.4)
Tobacco use, n (%)	89 (35.9)
Osteoporosis, n (%)	35 (14.1)
Open fracture, n (%)	75 (29.6)
4+ fragments, n (%)	134 (54.0)
Impaction, n (%)	131 (52.0)

BMI = body mass index, kg/m^2 = kilograms per meter squared, ASA = American Society of Anesthesiologists.

Table 2. Distribution of fixation constructs used for operative management of 253 patella fractures.

Fixation construct	n (%)
Tension band wiring (TBW)	120 (47.4)
Plates	18 (7.1)
Tendon advancement (TA)	66 (22.1)
Other constructs	
Screws only	40 (15.8)
Screws + TA	9 (3.5)
Plates + TBW	3 (1.2)
K-wires + cerclage	1 (0.4)
Cerclage only	1 (0.4)
I&D +/- Patellectomy	5 (2.0)

I&D = irrigation and debridement.

Table 3. Postoperative outcomes and complications.

Outcome	n (%)
Reoperation	55/253 (21.7)
Revision	
Tension band wiring (TBW)	25/120 (20.8)
Plates	1/18 (5.6)
Tendon advancement (TA)	6/56 (10.7)
Symptomatic hardware removal	
TBW	12/120 (10.0)
Plates	5/18 (27.8)
Other constructs	16/235 (6.8)
Infection	21/253 (8.3)