The Journal of Arthroplasty 41 (2026) 2016–2021

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Primary Knee

A Complete Infrapatellar Fat Pad Resection Is Associated With New Postoperative Patella Baja and Persistent Pain, but a Lower Risk of Manipulation Under Anesthesia After Primary Total Knee Arthroplasty

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ARTICLE INFO

Article history:
Received 29 July 2025
Received in revised form
14 October 2025
Accepted 16 October 2025
Available online 23 October 2025

Keywords:
arthroplasty
fat pad
knee surgery
baja
pain
manipulation

ABSTRACT

Background: Patella baja after total knee arthroplasty (TKA) is associated with postoperative stiffness, and there is conflicting evidence regarding the patellar fat as a source of pain. We hypothesized that a complete infrapatellar fat pad resection during primary TKA does not increase the incidence of new postoperative patella baja while reducing the incidence of persistent pain and improving postoperative function. Specifically, we evaluated the odds of 1) new patella baja, 2) persistent pain, 3) knee society score, 4) range of motion, and 5) manipulation under anesthesia.

Methods: The primary outcome of this single-institution retrospective study was the incidence of new patella baja comparing preoperative and postoperative lateral knee radiographs using the Insall-Salvati ratio of patients who underwent a primary TKA with either a complete or partial infrapatellar fat pad resection from 2014 to 2025. The final cohort included 592 patients who had either a complete ($n = 351$) or partial ($n = 241$) infrapatellar fat pad resection. The secondary outcomes included KSS, persistent pain, and range of motion. Differences in outcomes between complete and partial fat pad resection were assessed via risk-adjusted multivariable binomial and linear regression models.

Results: A complete infrapatellar fat pad resection nearly tripled the odds of new patella baja compared to a partial resection [2.92 (confidence interval (CI): 1.12 to 9.15); $P = 0.041$; number needed to harm [NNH] = 26]. Complete resection also more than doubled the odds of persistent pain [2.45 (CI: 1.17 to 5.54); $P = 0.022$; NNH = 19]. The KSS were lower by 2.9 (CI: 1.2 to 4.7) points with complete resection ($P = 0.001$). After adjustment, no differences were noted in the range of motion.

Conclusions: Our study highlights that infrapatellar fat pad resection may be a potential risk factor for developing new patella baja and persistent pain after primary TKA.

Patella baja, a low-lying patella, has been associated with reduced range of motion, stiffness, and pain [1]. Due to the shortened distance between the patella and tibia in this condition, there is disruption of the functional knee extensor mechanism [2]. There are a variety of manifestations, one being patella baja following a total knee arthroplasty (TKA). The reported incidence of postoperative patella baja has varied, ranging from 10 to 34% [3–5]. The development of patella baja after TKA can be influenced by surgical technique, with one study showing that TKAs with a mini mid-vastus approach without patella eversion led to an

One or more of the authors of this paper have disclosed potential or pertinent conflicts of interest, which may include receipt of payment, either direct or indirect, institutional support, or association with an entity in the biomedical field which may be perceived to have potential conflict of interest with this work. For full disclosure statements refer to https://doi.org/10.1016/j.arth.2025.10.046.

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https://doi.org/10.1016/j.arth.2025.10.046
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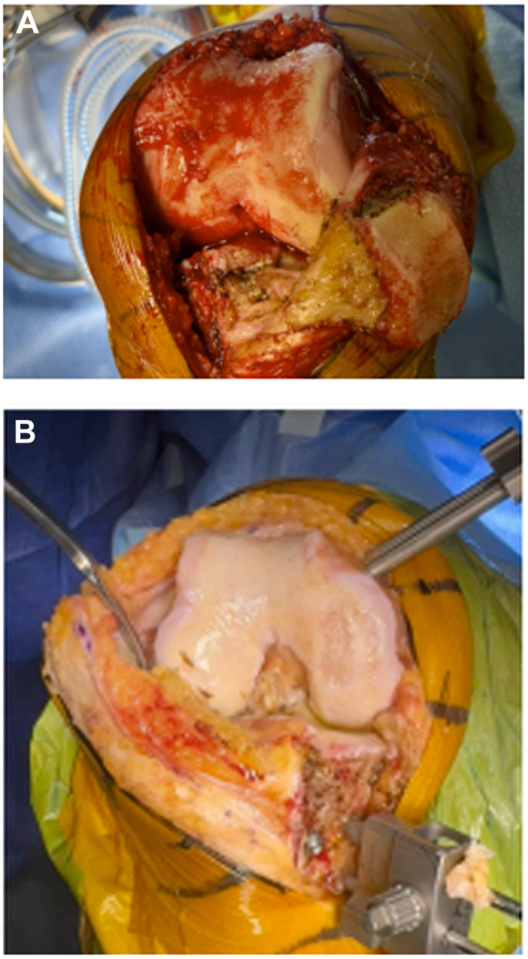

Figure 1. (A) Complete or (B) partial of the infrapatellar fat pad excision during total knee arthroplasty.

Figure 2. Preoperative (left) and postoperative (right) Insall-Salvati measurements for (A) complete and (B) partial fat pad resection.

incidence of 12% compared to 37% in TKAs with a standard medial parapatellar approach with patella eversion [6].

Infrapatellar fat pad resection is a surgical technique with conflicting evidence regarding the risk of postoperative patella baja. The infrapatellar fat pad is present beneath the patellar ligament, which has traditionally been resected during a TKA, with one study estimating rates of up to 88% [7]. Resection of the infrapatellar fat pad enhances visualization of the lateral tibial plateau and has been reported to prevent residual knee pain [8–10]. There remains a lack of conclusive evidence regarding comparative outcomes of preservation or resection of the infrapatellar fat pad [11]. In particular, the effect of infrapatellar fat pad resection on the risk of patella baja remains unclear. Complete fat pad resection is associated with patellar tendon shortening, as well as greater pain and worse functional outcomes after a TKA, compared to patients who underwent infrapatellar fat pad preservation [12,13]. However, other studies have shown no difference in patella tendon length between infrapatellar fat pad resection and preservation and even improved postoperative knee mobility with resection [8,14,15]. These findings highlight a critical gap in understanding how surgical technique during a TKA may influence postoperative outcomes. Therefore, there exists an opportunity to evaluate how infrapatellar fat pad resection may influence knee outcomes following a TKA and ultimately inform guidelines regarding safe practices to optimize patient function and quality of life. Thus, there are three research questions: 1) Is complete patellar fat pad resection associated with the incidence of patella baja after total knee arthroplasty? 2) Does complete patellar fat pad resection reduce the prevalence of persistent anterior pain? and 3) Is complete patellar fat pad resection associated with an increase in postoperative patient-reported function as measured by knee society score, range of motion, and the incidence of manipulation under anesthesia?

Methods

This is a single-institutional retrospective review of patients who underwent primary TKA from 2014 to 2025 by two academic surgeons (WJM and DFA, Figure 1). The inclusion criteria were all patients who had a primary TKA, patients who had complete postoperative follow-up records, and patients who had undergone a complete or partial fat pad resection during surgery. The degree of fat pad resection for each TKA was classified based on the surgeon, with one performing a complete infrapatellar fat pad resection and the other performing a partial resection. The complete infrapatellar fat pad resection involved exposing the undersurface of the patellar tendon (Figure 1A), whereas the partial fat pad resection did not expose the undersurface of the patellar tendon (Figure 1B). Radiographic images were reviewed for each patient preoperatively and at their last postoperative follow-up to assess patella baja according to the Insall-Salvati method (Figure 2). Patients who had incomplete radiographic data or preoperative patella baja were excluded (Figure 3). The final cohort included 592 patients: 351 (59.3%) underwent a complete

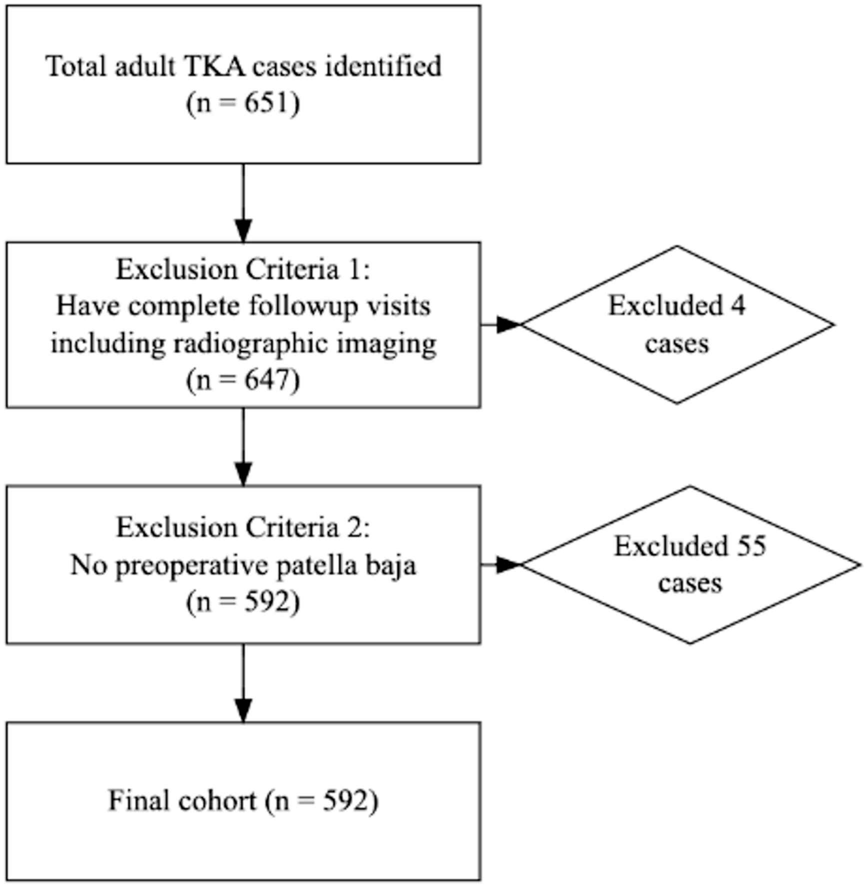

Figure 3. Patient inclusion and exclusion flow chart. TKA, total knee arthroplasty.

infrapatellar fat pad resection and 241 (40.7%) underwent partial resection. Of the total cohort, the mean age was 66 years (range, 37 to 96), and 379 patients (64.0%) were women. Patients having complete resection were around two years younger ($P = 0.014$) and had a median follow-up duration that was one year shorter ($P < 0.001$, Table 1). Preoperative patellar height categorizations were not different between the groups ($P = 0.567$).

Our primary outcome was the incidence of new postoperative patella baja. This was defined as an Insall-Salvati ratio of less than 0.8 [1,16]. Insall-Salvati ratios were collected preoperatively and from the patients' last postoperative follow-up. Radiographic measurements were also performed on each patient's preoperative and postoperative radiographs to normalize measurements based on the knee positioning of patients in their radiographs, including knee flexion and limb varus. Postoperative distal femoral valgus, proximal tibial varus, and femoral component flexion were also measured. We also evaluated whether a patient had a prior osteotomy. Our secondary outcomes included postoperative Knee Society Score (KSS), presence of patient-reported constant pain, total knee range of motion, and the incidence of postoperative manipulation under anesthesia.

Data Analyses

Differences in baseline characteristics and outcomes between complete versus infrapatellar partial fat pad resection were first assessed univariately using *t*-tests for continuous variables and *Chi*-square or Fisher's exact tests for categorical variables. Data distributions were visually assessed using histograms and quantile-quantile plots. Multivariable binomial regressions were then used to investigate the relationship between the amount of infrapatellar fat pad resection and the risk of developing new postoperative patella baja while adjusting for age, sex, body mass index, knee flexion, limb varus, postoperative distal femoral valgus, postoperative proximal tibial varus, postoperative femoral component flexion, and prior osteotomy. A similar model was used to evaluate the relationship with patient-reported constant pain after surgery. The results are presented as odds ratios (ORs) or mean change with 95% confidence intervals (CIs). The number needed to harm (NNH) was calculated, that is, the number of patients one would have to treat to encounter one adverse event. Generalized linear models with similar risk adjustment were used to assess relationships with KSS score and range of motion. All analyses were conducted with R version 4.4.1 (R Foundation for Statistical Computing, Vienna, Austria) with a two-sided level of significance of $\alpha = 0.05$.

Results

In univariate analyses, new postoperative patella baja occurred in 20 patients (5.7%) who had a complete infrapatellar fat pad resection and five patients who had partial resection (2.0%, $P = 0.037$) (Table 2). Complete infrapatellar fat pad resection was associated with a higher proportion of patients reporting constant postoperative pain compared to a partial resection (9.7 versus 4.1%, $P = 0.018$). Complete infrapatellar fat pad resection was also associated with a statistically lower postoperative KSS [median (interquartile range (IQR)): 95 (90 to 100) points for complete

Table 1
Demographics and Clinical Measurements Overall and by Group.

Patient Characteristics	Overall (N = 592)	Complete Resection (N = 351)	Partial Resection (N = 241)	*P*-Value
Demographics				
Age	66 (37.0, 96.0)	66 (37.0, 96.0)	67 (42.0, 92.0)	0.014[a]
Women (%)	379 (64.0)	228 (65.0)	151 (62.7)	0.627
Body mass index	31.4 ± 6.6	31.8 ± 6.3	30.9 ± 6.9	0.091
Follow-up, years	1.3 [0.3, 3.1]	1.0 [0.3, 2.6]	2.0 [1.0, 4.0]	<0.001[a]
Preoperative patella class (%): normal	431 (72.8)	252 (71.8)	179 (74.3)	0.567
Patella alta	161 (27.2)	99 (28.2)	62 (25.7)	
Prior osteotomy (%)	251 (42.4)	154 (43.9)	97 (40.2)	0.428
Clinical measurements				
Preoperative knee flexion	131.5 ± 13.3	130.8 ± 13.8	132.4 ± 12.4	0.151
Postoperative knee flexion	134.8 ± 13.8	135.0 ± 14.6	134.6 ± 12.7	0.722
Preoperative limb varus	173.2 ± 5.8	172.7 ± 5.9	173.9 ± 5.7	0.015[a]
Postoperative limb varus	176.1 ± 3.1	175.7 ± 3.4	176.8 ± 2.6	<0.001[a]
Postoperative distal femoral valgus	91.2 ± 4.6	91.0 ± 4.9	91.4 ± 4.0	0.348
Postoperative proximal tibial varus	89.5 ± 2.7	89.5 ± 2.7	89.4 ± 2.6	0.485
Postoperative femoral component flexion	86.9 ± 8.0	85.9 ± 8.8	88.2 ± 6.3	<0.001[a]

Descriptive statistics are presented as means ± standard deviations for normally distributed continuous variables and medians [interquartile ranges] for non-normally distributed continuous variables. Descriptive statistics for categorical variables are presented as n (%).
[a] $P < 0.05$.

resection versus 98 (94 to 99) for partial resection; ($P = 0.002$)] and less postoperative range of motion [median (IQR): 115° (105 to 122.5) for complete resection versus 120° (110 to 125) for partial resection; $P = 0.018$]. Manipulation under anesthesia was performed for 13 patients (3.7%) in the complete resection cohort and 27 patients (11.2%) in the partial resection cohort ($P < 0.001$).

Following risk adjustment in the multivariate regression, complete infrapatellar fat pad resection nearly tripled the odds of new patella baja when compared to a partial resection [OR: 2.92, CI: 1.12 to 9.15; $P = 0.041$] (Table 3, Supplemental Tables 1 to 5). This resulted in a case of new patella baja for every 26 patients who received a complete infrapatellar fat pad resection instead of a partial resection. The infrapatellar complete fat pad resection group also had 2.45-fold (1.17 to 5.54) increased odds for persistent pain ($P = 0.022$). This resulted in a primary TKA with persistent pain for every 19 TKAs that received a complete infrapatellar fat pad resection instead of a partial resection. Complete infrapatellar fat pad resection was associated with 2.9 (CI: 1.2 to 4.7) points lower KSS score ($P = 0.001$). Infrapatellar fat pad resection was no longer associated with postoperative range of motion following risk adjustment ($P = 0.123$). A complete fat pad resection was associated with nearly 3.7 times lower odds of a postoperative manipulation under anesthesia when compared to a partial resection (CI: 1.75 to 8.33, $P < 0.001$). Partial fat pad resection resulted in a manipulation under anesthesia for every 13 patients who were not treated with complete resection.

Discussion

Complete infrapatellar fat pad resection was associated with a nearly three-fold increase in the odds for new postoperative patella baja following TKA and an almost 2.5-fold increase in the odds of persistent pain. While the functional differences in KSS between groups were statistically significant, the difference of three points following risk adjustment was small relative to the established minimally important difference of this instrument [17]. Differences in knee motion between groups were not significant following adjustment for demographic and radiographic factors. These results are counterbalanced by the observation that a complete fat pad resection was also associated with a nearly four-fold decrease in the odds of a postoperative manipulation under anesthesia.

Our findings add to the current conflicting literature on infrapatellar fat pad resection and associated outcomes by providing one of the largest single-institution analyses to date, comparing mechanical and functional outcomes between complete and partial infrapatellar fat pad resection in primary TKA. For example, one meta-analysis of 2,734 patients undergoing a primary TKA found a trend toward shortening of the patellar tendon associated with fat pad resection [18]. Our findings similarly show that there may be a difference between complete fat pad resection and partial fat pad resection for the risk of new patella baja. Regarding other postoperative outcomes, prior studies have reported an association between infrapatellar fat pad resection and adverse outcomes, including increased postoperative pain, though reproducible findings have been inconsistent and confounded [8,14]. Our study demonstrates that complete infrapatellar fat pad resection increased postoperative pain and worsened KSS scores, with no difference in range of motion after adjusting for demographic and radiographic factors. Our functional outcome results are supported by a study evaluating infrapatellar fat pad resection (complete versus partial versus none), where Oxford

Table 2
Patient's Postoperative Outcome by Group.

Outcome	Overall (N = 592)	Complete Resection (N = 351)	Partial Resection (N = 241)	*P*-Value
Postoperative patella baja (%)	25 (4.2)	20 (5.7)	5 (2.1)	0.037[a]
Range of motion	115.5 [110.0, 125.0]	115.0 [105.0, 122.5]	120.0 [110.0, 125.0]	0.018[a]
Persistent pain (%)	44 (7.4)	34 (9.7)	10 (4.1)	0.018[a]
Knee Society Score	97.0 [92.0, 100.0]	95.0 [90.0, 100.0]	98.0 [94.0, 99.0]	0.002[a]
Manipulation (%)	40 (6.8)	13 (3.7)	27 (11.2)	<0.001[a]

Descriptive statistics are presented as medians [interquartile ranges] for continuous variables and n (%) for categorical variables.
[a] $P < 0.05$.

Table 3
Results From Risk-Adjusted Multivariable Regression Relating Complete Versus Partial Fat Pat Resection to Postoperative Outcomes.

Outcome	OR (95%) CI Complete Versus Partial Resection	*P*-Value
Postoperative patella baja	2.92 (1.12, 9.15)	0.041[a]
Constant pain postoperative	2.45 (1.17, 5.54)	0.022[a]
Manipulation under anesthesia	0.27 (0.12, 0.57)	<0.001[a]
Outcome	**Mean Difference (95% CI) Complete Versus. Partial Resection**	***P*-Value**
Knee Society Score	−2.9 (−4.7, −1.2)	0.001[a]
Range of motion	−1.5 (−3.5, 0.4)	0.123

Data are displayed as odds ratios (ORs) with 95% confidence intervals (CIs) for binary outcomes and mean differences with 95% CIs for continuous outcomes. Complete models showing all covariates are included in the Supplemental Material.
CI, confidence interval.
[a] $P < 0.05$.

knee scores were negatively associated with increasing infrapatellar fat pad resection [12]. Similar to our results, one systematic review found moderate evidence supporting a trend toward increased pain with infrapatellar fat pad resection and no trend regarding range of motion [19]. While previous literature has not investigated the link between fat pad resection and postoperative manipulation under anesthesia rates, we found increased rates of manipulation under anesthesia among patients undergoing partial fat pad resection compared to complete resection. Notably, the change in KSS scores in our study was clinically less relevant, suggesting that differences in infrapatellar fat pad resection technique may not result in meaningful differences in functional knee recovery or performance. Overall, there remains inconclusive evidence in the literature regarding the relationship between infrapatellar fat pad resection and TKA outcomes. Our study offers valuable insights to inform surgical decision-making regarding fat pad management in primary TKA, namely that fat pad resection increases the risk of new postoperative patella baja, increased postoperative pain, and potentially poorer postoperative functional improvements.

There are multiple potential mechanisms for our study's findings. Complete excision of the patellar fat pad may shorten the patellar tendon, which is likely to cause patella baja [13]. The patellar fat pad also contains a network of arteries, which anastomose to help perfuse the patellar bone [20,21]. Compromising this vascular supply may lead to impaired regeneration, thereby delaying knee recovery. However, this remains unclear, as inflammation of the infrapatellar fat pad increases anterior knee pain, suggesting that preserving the infrapatellar fat pad may also lead to increased residual pain [22]. As a result, the decreased function and range of motion following infrapatellar fat pad resection may be due to increased fibrosis. In the space created by removing the infrapatellar fat pad, pathologic collagen deposition may lead to a fibrotic scar that causes patellar tendon contraction [23]. However, while prior studies have proposed that the fibrosis induced by fat pad resection may be associated with stiffness following a TKA [24,25], our study found that patients who received a partial resection had greater rates of manipulation under anesthesia, which is commonly indicated for stiffness [26]. Taken together with our finding that postoperative range of motion was not associated with the amount of fat pad resection, this suggests that the indications for a manipulation under anesthesia are likely multifactorial, with stiffness being only one consideration. Given the current lack of consensus on whether infrapatellar fat pad resection is recommended during primary TKA, further research is warranted to validate our study's findings and better characterize the effect of infrapatellar fat pad resection on postoperative TKA outcomes.

Our study is not without potential limitations. Generalizability may be limited by the single institution, as patient selection, surgical technique, and postoperative care may differ across institutions and surgeons. Conversely, the single institution had the benefit of standardized postoperative rehabilitation and recovery protocols. Additionally, our cohort was derived from two surgeons, with each only contributing to one group based on technique. While this limited within-group variation and a multivariable regression were used to control for measured confounders, there may be differences in unmeasured factors such as operative protocols (e.g., tourniquet use, intra-articular injection cocktail, or closure), choice of implant design, or use of patellar resurfacing. Furthermore, the differences in manipulation under anesthesia rates seen in our study may be more related to surgeon preference than the differing motion and pain between the patient cohorts. More robust research examining the impact of these factors on the risk of postoperative patella baja development is warranted to better understand the findings of this pilot study. In addition, the degree of infrapatellar fat pad resection was inferred based on the surgeon rather than directly quantified via intraoperative documentation, which may introduce misclassification bias despite the surgeons' reporting consistent surgical practice. Other differences in surgical techniques, including tourniquet use, local anesthetic choice, amount of fat pad resection, choice and frequency of patellar eversion, decision to resurface the patella, and external pin utilization for navigation, were not directly assessed in this study. Prior research has shown that patellar eversion during a TKA is not associated with patellar tendon shortening [27], and there is limited research on the impact of navigation pins on postoperative patella baja [28]. Our observations are associative, and each of these limitations will need further exploration in nonpilot confirmatory studies to tease out causality. Lastly, while there are multiple techniques for measuring patella baja, the Insall-Salvati ratio was selected to define patella baja, as it has the greatest reliability for measuring patellar height compared to alternative techniques [29]. When compared with other measurement techniques in our study (data not shown), the Insall-Salvati ratio was the most sensitive for new patella baja.

Overall, our study demonstrates that complete infrapatellar fat pad resection is associated with an increased risk of new postoperative patella baja and persistent postoperative pain. These results suggest that minimizing fat pad resection, when feasible, may reduce the risk of adverse outcomes and enhance TKA recovery.

CRediT authorship contribution statement

Bill Young: Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation. **Anna G. McGovern:** Writing – review & editing, Investigation, Formal analysis, Data curation. **Puthi Tantikosol:** Writing – review & editing, Formal analysis, Data curation, Conceptualization. **Nipun Sodhi:** Writing – review & editing, Validation, Software, Data curation, Conceptualization. **Jayme C.B. Koltsov:** Writing – review & editing, Supervision, Software, Resources, Methodology, Formal analysis, Data curation. **Henry J. Wong:** Writing – review & editing, Software, Methodology, Formal analysis, Data curation. **William J. Maloney:** Writing – review & editing, Validation, Supervision, Methodology, Conceptualization. **Derek F. Amanatullah:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

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Appendix

Supplemental Table 1
Complete Results From Multivariable Logistic Regression for New Cases of Insall-Salvati Baja Patella.

Characteristic	Odds Ratio	95% CI	*P*-Value
Complete versus partial resection	2.92	(1.12, 9.15)	0.041[a]
Preoperative knee flexion (+10°)	1	(0.74, 1.35)	0.991
Postoperative knee flexion (+10°)	1.35	(1.01, 1.80)	0.042[a]
Preoperative limb varus (+10°)	0.99	(0.51, 2.13)	0.988
Postoperative limb varus (+10°)	1.3	(0.35, 6.22)	0.73
Postoperative distal femoral valgus (+10°)	0.74	(0.31, 1.80)	0.495
Postoperative proximal tibial varus (+10°)	0.24	(0.06, 1.06)	0.058
Postoperative femoral component flexion (+10°)	0.99	(0.69, 1.48)	0.974
Prior osteotomy	0.92	(0.38, 2.15)	0.849
Age (+10 years)	1.26	(0.82, 2.00)	0.304
Women	0.99	(0.42, 2.44)	0.976
Body mass index	0.85	(0.58, 1.20)	0.368
Follow-up (+1 year)	0.93	(0.72, 1.16)	0.553

CI, confidence interval.
[a] $P < 0.05$.

Supplemental Table 2
Complete Results From Multivariable Logistic Regression for Constant Pain.

Characteristic	Odds Ratio	95% CI	*P*-Value
Complete versus partial resection	2.45	(1.17, 5.54)	0.022[a]
Preoperative knee flexion (+10°)	0.93	(0.73, 1.17)	0.519
Postoperative knee flexion (+10°)	0.93	(0.74, 1.17)	0.554
Preoperative limb varus (+10°)	0.97	(0.58, 1.70)	0.920
Postoperative limb varus (+10°)	0.80	(0.34, 2.16)	0.634
Postoperative distal femoral valgus (+10°)	1.35	(0.70, 2.69)	0.385
Postoperative proximal tibial varus (+10°)	0.75	(0.24, 2.48)	0.633
Postoperative femoral component flexion (+10°)	0.82	(0.59, 1.17)	0.266
Prior osteotomy	0.92	(0.47, 1.74)	0.790
Age (+10 years)	0.90	(0.66, 1.25)	0.536
Women	1.50	(0.76, 3.14)	0.255
Body mass index	1.05	(0.82, 1.34)	0.671
Follow-up (+1 year)	1.10	(0.94, 1.27)	0.234

CI, confidence interval.
[a] $P < 0.05$.

Supplemental Table 3
Complete Results From Multivariable Logistic Regression for Knee Society Score.

Characteristic	Parameter Estimate	95% CI	*P*-Value
(Intercept)	39.7	(−24.8, 104.2)	0.227
Complete versus partial resection	−2.9	(−4.7, −1.2)	0.001[a]
Preoperative knee flexion (+10°)	0.0	(−0.6, 0.6)	0.965
Postoperative knee flexion (+10°)	0.4	(−0.2, 1.0)	0.237
Preoperative limb varus (+10°)	0.5	(−1.0, 1.9)	0.529
Postoperative limb varus (+10°)	1.3	(−1.4, 4.0)	0.337
Postoperative distal femoral valgus (+10°)	−0.2	(−2.0, 1.6)	0.823
Postoperative proximal tibial varus (+10°)	1.2	(−1.9, 4.2)	0.459
Postoperative femoral component flexion (+10°)	0.9	(−0.1, 1.9)	0.087
Prior osteotomy	−0.5	(-2.1, 1.2)	0.593
Age (+10 years)	0.9	(0.0, 1.7)	0.054
Women	−1.1	(−2.8, 0.6)	0.222
Body mass index	−0.4	(−1.1, 0.2)	0.188
Follow-up (+1 year)	0.2	(−0.2, 0.6)	0.361

CI, confidence interval.
[a] $P < 0.05$.

Supplemental Table 4
Complete Results From Multivariable Logistic Regression for Range of Motion.

Characteristic	Parameter Estimate	95% CI	*P*-Value
(Intercept)	106.4	(34.1, 178.7)	0.004[a]
Complete versus partial resection	−1.5	(−3.5, 0.4)	0.123
Preop knee flexion (+10°)	−0.6	(−1.3, 0.1)	0.121
Postop knee flexion (+10°)	0.0	(−0.6, 0.7)	0.941
Preop limb varus (+10°)	0.8	(−0.8, 2.4)	0.332
Postop limb varus (+10°)	0.9	(−2.1, 3.9)	0.543
Postop distal femoral valgus (+10°)	0.0	(−2.1, 2.0)	0.991
Postop proximal tibial varus (+10°)	−0.8	(−4.2, 2.6)	0.649
Postop femoral component flexion (+10°)	0.3	(−0.8, 1.5)	0.577
Prior osteotomy	0.3	(−1.6, 2.2)	0.782
Age (+10 years)	0.1	(−0.9, 1.1)	0.859
Women	−1.5	(−3.5, 0.4)	0.117
Bosy mass index	−1.7	(−2.4, −1.0)	<0.001[a]
Follow-up (+1 year)	0.3	(−0.2, 0.7)	0.226

CI, confidence interval.
[a] $P < 0.05$.

Supplemental Table 5
Complete Results From Multivariable Logistic Regression for Manipulation Under Anesthesia.

Characteristic	Odds Ratio	95% CI	*P*-Value
Complete versus partial resection	0.27	(0.12, 0.57)	<0.001[a]
Preop knee flexion (+10°)	1.24	(0.95, 1.64)	0.121
Postop knee flexion (+10°)	1.25	(0.97, 1.61)	0.079
Preop limb varus (+10°)	1.13	(0.63, 2.16)	0.694
Postop limb varus (+10°)	0.93	(0.31, 3.4)	0.909
Postop distal femoral valgus (+10°)	0.67	(0.32, 1.43)	0.287
Postop proximal tibial varus (+10°)	1.67	(0.5, 5.81)	0.412
Postop femoral component flexion (+10°)	1.17	(0.73, 1.84)	0.521
Prior osteotomy	0.92	(0.45, 1.85)	0.826
Age (+10 years)	0.51	(0.35, 0.75)	<0.001[a]
Women	1.06	(0.54, 2.17)	0.860
Body mass index	0.84	(0.64, 1.08)	0.184
Follow-up (+1 year)	1.10	(0.94, 1.28)	0.208

CI, confidence interval; BMI, body mass index.
[a] $P < 0.05$.