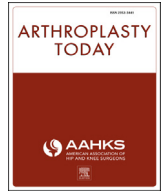




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A classification-based approach to the patella in revision total knee arthroplasty

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ABSTRACT

Background: There is a paucity of data to guide management of the patella in revision total knee arthroplasty (RTKA). The purpose of this study was to review our experience with patellar management in RTKA.

Methods: We retrospectively reviewed 422 consecutive RTKAs at a minimum of 2 years (mean, 42 months). Patellar management was guided by a classification that considered stability, size, and position of the implanted patellar component, thickness/quality of remaining bone stock, and extensor mechanism competence.

Results: Management in 304 aseptic revisions included retention of a well-fixed component in 212 (69.7%) and revision using an all-polyethylene component in 46 (15.1%). Patella-related complications included 5 extensor mechanism ruptures (1.6%), 3 cases of patellar maltracking (1.0%), and 2 periprosthetic patellar fractures (0.7%). Of 118 2-stage revisions for infection, an all-polyethylene component was used in 88 (74.6%), patelloplasty in 20 (16.9%), and patellectomy in 7 (5.9%). Patella-related complications included 4 cases of patellar maltracking (3.4%), 3 extensor mechanism ruptures (2.5%), and 1 periprosthetic patellar fracture (0.8%).

Conclusions: Septic revisions required concomitant lateral releases more frequently (38.1% vs 10.9%; $P < .02$) but had a similar rate of patellar complications (6.8% vs 3.3%; $P = .40$). No cases required rerevision specifically for failure of the patellar component. Patients who had a patelloplasty had worse post-operative Knee Society functional scores than those with a retained or revised patellar component. In most aseptic RTKAs, a well-fixed patellar component can be retained. If revision is required, a standard polyethylene component is sufficient in most septic and aseptic revisions. Rerevisions related to the patellar component are infrequent.

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Introduction

Managing the patellar component in revision total knee arthroplasty (RTKA) is challenging, given the small size and thickness of the patella, which limits reconstructive options [1–5].

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A fracture or other failure of the patellar component can lead to disruption of the extensor mechanism, which is among the most serious complications of TKA with the potential for long-lasting disability and the need for salvage procedures, such as an extensor mechanism allograft or knee arthrodesis. Management of the patella is further complicated by the array of reconstructive options available to the surgeon, which include the following: (1) retention of a well-fixed component; (2) revision using a standard or biconvex all-polyethylene component; (3) revision using a porous metal component [6–8]; (4) impaction bone grafting [9]; (5) gull-wing osteotomy [10,11]; (6) patelloplasty (shaping the patellar remnant but leaving it unresurfaced); and (7) patellectomy.

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Despite the growing number of RTKAs, there is sparse literature to guide selection among treatment options for management of the patella. The senior authors of this article apply a classification-based approach to the patella in the revision setting. Through review of a large series of RTKAs, we sought to describe how the patella was managed and to examine associated outcomes using this systematic approach. Specifically, we assessed the following: (1) For aseptic RTKAs and 2-stage RTKAs for infection, how frequently did the patellar component need to be revised, which techniques were required, and what was the rate of patella-related complications postoperatively? (2) What were clinical outcome scores at a minimum of 2 years? (3) How did demographics, management, and outcomes differ between aseptic and septic RTKAs?

Material and methods

Following institutional review board approval, we retrospectively reviewed the records of 557 consecutive patients who underwent RTKAs by the 2 senior authors between November 2002 and May 2010. Exclusion criteria included patients who had undergone a previous patellectomy (6) or extensor mechanism allograft (16) (given the absence of a patella), and those who underwent an isolated bearing surface exchange (52), revision of a partial knee arthroplasty to a TKA (39), arthrodesis (4), or amputation (1) at the index revision (given the general lack of a treatment dilemma regarding the patella in these scenarios). This left 439 RTKAs in 439 patients eligible for inclusion. Of these, 17 (3.9%) were lost to follow-up before 2 years, leaving 422 patients with 422 RTKAs. These 161 males (38.2%) and 261 females (61.8%) had a mean age at the time of surgery of 65.6 years (range, 35–92 years). These patients were evaluated at a mean of 42 months (range, 24–144 months).

The most common reasons for revision were aseptic component loosening in 155 cases (36.7%), deep infection [12] in 118 (27.9%), and instability in 52 (12.3%; Table 1). All 118 infected cases were treated with a 2-stage exchange protocol with interval antibiotic spacer placement. The 304 aseptic revisions included 280 revisions of the tibial and femoral components (92.1%), 15 isolated tibial revisions (4.9%), 6 isolated femoral revisions (2.0%), and 3 isolated patellar component revisions (1.0%). The mean time from primary arthroplasty to index revision was 76.2 months (range, 2–330 months). Mean American Society of Anesthesiologists Physical Status Classification score was 2.5 (range, 1–4) for aseptic cases and 2.6 (range, 1–4) for 2-stage revisions. Among aseptic revisions, initial diagnoses for primary TKA included osteoarthritis in 269 patients (88.4%), rheumatoid arthritis in 20 patients (6.6%), and post-traumatic arthritis in 15 patients (4.9%). Among infected revisions, initial diagnoses included osteoarthritis in 101 patients (85.6%), inflammatory arthritis in 15 patients (12.7%), and post-traumatic arthritis in 2 patients (1.7%).

In all revisions, the patella was managed using a classification that considered the stability, size, and position of the implanted

Table 2
Classification of the patella in revision total knee arthroplasty.

Type	Description	Management
1	Component well fixed, appropriately sized and positioned	Retention
2	Component loose or requires revision for malpositioning/sizing or deep infection	Revision
2A	>10 mm patellar remnant and adequate cancellous bone to achieve stability with standard 3-peg component	Standard, cemented 3-peg component
2B	<10 mm patellar remnant and/or deficient cancellous bone precluding the use of a standard 3-peg component	Specialized technique to reconstruct; impaction grafting, porous metal patella, or patellar osteotomy
3	Fragmentation of the patella that precludes reconstruction	Tubularization/centralization of the extensor mechanism
4	Incompetent extensor mechanism	Reconstruction of the extensor mechanism

patellar component; thickness and quality of the remaining host bone stock; and competence of the extensor mechanism (Table 2).

Each patient was evaluated preoperatively and postoperatively at 3 weeks, 6 weeks, 3 months, and annually thereafter for examination and radiographic follow-up. At each visit, standard evaluation measures included Knee Society Score (KSS) for knee and function [13] and plain radiographs (anteroposterior, merchant, and lateral views of the affected knee). Radiographs were independently reviewed preoperatively and postoperatively by 3 clinicians to determine if the patellar component was loose; the patellar component was considered loose if at least 2 of 3 agreed there was evidence of migration on serial radiographs.

For all patients, KSS preoperatively and at final follow-up were compared using paired *t* tests. Demographics, patellar management, and clinical outcome scores were compared between aseptic and septic revisions using *t* tests for continuous variables and chi-squared tests for binary variables. Values were considered significant if $P < .05$. Recorded complications included patellar maltracking (defined as subjective complaints of instability and >50% lateral overhang of patella on patellar view), extensor mechanism disruption, patellar fracture, and the need for reoperation or repeat revision of the patellar component.

Results

Management of the 304 aseptic revisions included retention of a well-fixed component in 212 (69.7%), revision using a standard all-polyethylene component in 46 (15.1%), resurfacing of a previously unresurfaced patella in 24 (7.9%), patelloplasty in 10 (3.4%), impaction grafting in 1 (0.3%), and extensor mechanism allograft in 11 (3.6%). Of the 46 patients who had a revision of the patellar component, the most common indications were a patellar-composite felt to be too thick (18; 39.1%), severe wear of an all-polyethylene patella (8; 17.4%), aseptic loosening of the patellar component (7; 15.2%), revision of a metal-backed patellar component with wear (5; 10.8%), and malpositioning of the patellar component (3; 6.5%). A lateral retinacular release was performed in 33 knees (10.9%).

Postoperative complications related to the patella occurred in 10 patients (3.3%). This included 3 patients with patellar maltracking (1.0%; 2 of which were associated with rupture of the medial arthroscopy requiring surgical repair); 5 patellar tendon ruptures (1.6%) including 2 related to trauma (3 of which were treated with an extensor mechanism allograft and 2 with primary repair

Table 1
Indications for revision surgery.

Indication	Number (n = 422), n (%)
Aseptic loosening	155 (36.7)
Periprosthetic joint infection	118 (27.9)
Instability	52 (12.3)
Stiffness	43 (10.2)
Extensor mechanism complication	24 (5.7)
Polyethylene wear	17 (4.0)
Periprosthetic fracture	7 (1.7)
Component malrotation	6 (1.4)

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