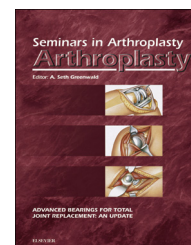


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Patellar resurfacing in total knee arthroplasty

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ABSTRACT

Routine patella resurfacing in total knee arthroplasty has been debated for decades. The early total knee designs and surgical techniques lead to a high complication rate following patellar resurfacing. This lead to many surgeons abandoning this practice and either leaving the patella unresurfaced routinely or selectively resurfacing. Modern day randomized control trials and meta-analyses of these trials reveal a higher incidence of anterior knee pain and a resultant higher reoperation rate in nonresurfaced patellae. We argue that with modern day designs and surgical techniques, there is a low complication rate to resurfacing and little downside to resurfacing.

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1. Introduction

While total knee replacement is a proven, effective treatment for osteoarthritis of the knee, patellar resurfacing remains controversial. Advocates of patellar resurfacings argue for less anterior knee pain and need for secondary resurfacing procedures. Proponents for leaving the patellar unresurfaced point toward higher complications with surgical violation of the patella.

Early total knee replacement designs ignored the patellofemoral compartment, and anterior knee pain was common post-operatively. This lead to the development of patellar resurfacing components and metal backed patellar buttons [1]. A trend of routine patellar resurfacing arose, but a surge of complications associated with resurfacing followed. Early designs and techniques were plagued with avascular necrosis, maltracking, dislocation, loosening, patella fracture, and extensor mechanism disruption [2–6]. The benefits of patellar resurfacing were questioned and some abandoned routine resurfacing.

We argue that with modern implant design and surgical techniques, complications associated with patellar resurfacing have been mitigated and routine resurfacing can prevent subsequent anterior knee pain. Many of the failures of patellar resurfacing are attributable to implant design. The early femoral component designs were boxy in design and had either a shallow or absent trochlear groove. Components were not side-specific and patellar tracking was not optimized. Further, tibial trays were symmetric in shape and did not accommodate for external rotation. Metal backed patellar components were also associated with loosening and stress shielding. Moreover, early patellar component designs utilized a large central peg, which acted as a stress riser and increased risk for fracture.

Further, surgical technique has improved. We now have better understanding of the relationship of patellar tracking and external rotation of components. Lateral releases appear to be less common with external rotation of components and newer trochlear designs. Studies have also elucidated optimal patellar thickness to avoid fractures.

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Table 1 – Prevalence of Anterior Knee Pain

Study	Implant	Resurfaced Patella	Nonresurfaced Patella
Wood et al. [13]	MG II	16%	31%
Barrack et al. [16]	MG II	19%	17%
Waters and Bentley [14]	PFC	5%	25%
Mayman et al. [8]	AMK	NA	NA
Roberts et al. [9]	PFC Sigma		
Summary		13%	24%

There are definite regional difference in opinion on this matter with some avoiding resurfacing all together, some selectively resurfacing based on degree of chondromalacia, and some routinely resurfacing. With the advent of right and left sided implants, more anatomic trochlear design, all-polyethylene patellar buttons with multiple peripheral pegs, external rotation of components and avoidance of lateral releases, we believe that routine resurfacing is safe and effective. Decision making components can be divided into five categories: Patient satisfaction/functional scores, anterior knee pain, need for revision, and complications.

2. Patient satisfaction/functional scores

Schroeder-Boersch randomized 40 patients to patelloplasty or resurfacing. Knee Society Scores (KSS) were followed out to 24 months. No lateral releases were performed. While there was no difference in patient satisfaction between the two groups, the study was not powered to investigate this. However, there was a significantly difference in both knee and function components of the KSS favoring the resurfacing group at 24 months [7].

Mayman performed a prospective RCT of 100 knees with 8–10 years follow-up. They did not report a difference in KSS. They categorized subjects into “disappointed,” “unsure,” “satisfied,” and “extremely satisfied.” No patients fell into the “disappointed” category. A total of 80% of the patellar resurfacing population reported being “extremely satisfied” versus only 48% in the nonresurfaced group. This was a statistically significant difference. However, when the “satisfied” and “extremely satisfied” groups were combined, there was no difference. This study demonstrates that overall, subjects with total knee replacements are satisfied; however, the most satisfied may be those with resurfacing [8].

In another prospective randomized control trial, Roberts studied 327 knees with mean follow-up of 7.8 years. Average satisfaction in patients with greater than 2 year follow-up was significantly higher in the resurfaced knees. In all, 114 knees reached greater than 10 year follow-up. However, there was no difference in satisfaction between the resurfaced and nonresurfaced groups at longer follow-up [9].

Although two meta-analyses of 12 and 16 randomized control trials did not show a difference in patient satisfaction [10,11], it may be difficult to distinguish patients on patient satisfaction alone as the vast majority of patients are satisfied with total knee replacement. In another meta-analysis specifically designed to investigate this point, Parvizi analyzed

1519 subjects in 14 randomized control trials. Those undergoing resurfacing were significantly more satisfied than those left unresurfaced [12].

3. Anterior knee pain

A review of 891 total knee arthroplasties investigated selective resurfacing with mean follow-up for 6.5 years. This study reported one out of 396 knees with resurfaced patellae had anterior knee pain. Conversely, 51 of 495 knees that were left unresurfaced experienced anterior knee pain [4]. Although this was a retrospective study, the statistics are striking (Table 1).

Wood reported on 220 knees randomized to resurfacing or nonresurfacing with mean follow-up of 4 years. In this study, 16% of resurfaced knees versus 31% of nonresurfaced knees had anterior knee pain, a statistically significant difference. In otherwords, unresurfaced knees were almost twice as likely to develop anterior knee pain. This study also investigated stair negotiation as a surrogate marker for anterior knee pain and function. Overall, pain with navigated stairs was not different between the two groups, presumably due to altered cadence with stairs. Overall, 33% of subjects with resurfaced patellae versus only 19% of nonresurfaced knees lead with the operative leg when descending stairs. While this difference was not statistically significant there was a strong trend ($p = 0.059$) [13].

Waters also performed a randomized trial of 514 press fit total knee replacements. There was a significant difference in anterior knee pain with only 5.3% of resurfaced patellae being painful versus 25.1% of nonresurfaced patellae. Out of 11, 10 subjects who underwent secondary resurfacing of the patella had relief of anterior knee pain. Further, this study analyzed a subgroup of patients who had one knee unresurfaced and the other resurfaced. Amongst those patients, there was greater satisfaction with the resurfaced knee [14].

When combining data across many randomized trials, several meta-analyses have found similar results. Parvizi et al. [12] reported anterior knee pain in 23.8% of nonresurfaced versus only 11.9% in resurfaced. Pakos reported a meta-analysis of 10 trials and 1223 knees. Absolute risk of anterior knee pain was reduced by 13.8% with resurfacing. The number needed to resurface to prevent one knee with anterior knee pain was 7. Another meta-analysis of 12 trials reported anterior knee pain in 7.6% of resurfaced knees and 22.3% of nonresurfaced knees. Relative risk of anterior knee pain was 0.39 in favor of resurfacing. Similarly, relative risk for pain with

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