Patellar Resurfacing Versus Circumferential Denervation of the Patella in Total Knee Arthroplasty

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Abstract: This study compared the rates of anterior knee pain and functional outcomes between resurfaced patellae and non-resurfaced patellae with a circumpatellar denervation. One hundred ten patients who underwent patellar resurfacing or a circumpatellar denervation were evaluated for knee pain and functional outcomes at a minimum of 2 years after total knee arthroplasty. There were no significant differences between the 2 groups regarding Knee Society Scores, anterior knee pain scores, or visual analog scale scores. The groups had similar incidences of anterior knee pain. Most patients reported no to mild effect of anterior knee pain on daily living. Patients in each group reported increased pain with kneeling, squatting, and departing an automobile. Similar proportions of patients were disappointed with their overall outcomes in each group. Circumpatellar denervation and patellar resurfacing during total knee arthroplasty lead to similar incidences of anterior knee pain. [Orthopedics. 2016; 39(5):e1019-e1023.]
Two surgeons during a 2-year period. Prior to commencing the study, institutional review board approval was obtained. Patients undergoing a primary TKA for the diagnosis of primary osteoarthritis were included in the study. Patients with a history of trauma, previous operations, or reoperations since the index procedure were excluded from the study.

Two cohorts of patients were retrospectively reviewed. Group A had a patellar resurfacing during the index procedure by one surgeon (M.A.M.). Group B had a circumpatellar denervation without resurfacing by another surgeon. In all patients, for both surgeons, a tourniquet was inflated to 350 mm Hg and a midline incision with a medial parapatellar arthroscopy was used. Intraoperative cuts were made in the traditional manner with intra-medullary femoral and extra-medullary tibial guides, and 1 of 2 cemented prostheses was used (Triathlon Total Knee Replacement System, Stryker Orthopedics, Mahwah, New Jersey; Zimmer NexGen, Zimmer, Warsaw, Indiana). In Group A, the patella was resurfaced using a standard cemented polyethylene patellar button. In Group B, the patella was not resurfaced. Instead, a monopolar bovie electrocautery was used on coagulation at 40 to 60 W and run around the periphery of the patella at approximately 50% of its depth for 20 to 30 seconds. In both groups, a drain was then placed and the arthroscopy and subcutaneous layers were closed in the standard manner. Postoperative protocols were similar between the 2 groups.

Data were collected with the use of a clinical survey at a minimum of 2 years postoperatively. The survey was mailed to the patient to be completed at home and included the functional Knee Society Score, a clinical knee rating system, a visual analog scale, a patient satisfaction survey, and an effect on daily living questionnaire. The Knee Society Score was a functional assessment evaluating walking and standing, standard activities, advanced activities, and discretionary activities. Using the clinical knee rating system, patients were asked to rate their level of knee pain during certain activities. A score of 1 indicated no pain and a score of 5 indicated severe pain. The visual analog scale was used to rate patients’ knee pain during certain activities. A score of 0 indicated no pain and a score of 10 indicated severe pain. The effect on daily living questionnaire asked patients how anterior or knee pain affected their daily life. Patients were not required to include their names on surveys.

Eighty-six patients were included in Group A (patellar resurfacing) and 83 patients were included in Group B (circumpatellar denervation). Fifty-five patients (64%) responded to the survey in Group A and 65 patients (78%) responded in Group B. Four surveys were excluded from Group A and 6 were excluded from Group B because they were incomplete. A total of 51 patients, with a mean age of 65 years (range, 49-85 years), were included in Group A. A total of 59 patients, with a mean age of 62 years (range, 45-87 years), were included in Group B.

**RESULTS**

**Knee Society Score**

There was no significant difference in mean functional Knee Society Scores between Group A (80±23 points) and Group B (84±18 points) (P=.3043). Scores were noted to be similar regarding pain with walking and pain with stair climbing (Table 1).

**Clinical Knee Rating System**

There was no significant difference in scores on the clinical knee rating system between Group A (16.3±9.5 points) and Group B (15.4±9.3 points). In addition, pain with kneeling (2.7±1.6 points vs 2.6±1.3 points) and pain departing an automobile (1.5±0.8 vs 1.4±0.9 points) were also similar between the 2 groups (P>.05) (Table 2).

**Visual Analog Scale**

There was no significant difference in scores on the visual analog scale between Group A (13.1±17.3 points) and Group B (12.7±14.1 points). Pain with kneeling (4.1±4.0 points vs 4.9±3.7 points) and pain with squatting (3.1±3.7 points vs 3.3±3.7 points) were also similar between the 2 groups (P>.05) (Table 3).

**Effect on Daily Living**

Between Group A and Group B, there were no significant differences in the proportions of patients who reported no anterior knee pain (55% [n=27] vs 49% [n=29]), mild anterior knee pain (37% [n=18] vs 36% [n=21]), moderate anterior knee pain (12% [n=6] vs 10% [n=6]), or severe anterior knee pain (2% [n=1] vs 3% [n=2]).

**Patient Satisfaction**

Regarding the outcomes of surgery, there were significant differences in patients who were enthusiastic (35% vs 58%), patients who were satisfied (53% vs 29%), and patients who were noncomittal (8% vs 0%) between Group A and Group B. However, there was no significant

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**Table 1** Differences in Knee Society Scores Between the Cohorts

<table>
<thead>
<tr>
<th>Parameter Measured</th>
<th>Knee Society Score, points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Patellar Resurfacing</td>
</tr>
<tr>
<td>Distance, mean±SD</td>
<td>40.4±13.6</td>
</tr>
<tr>
<td>Stair climbing, mean±SD</td>
<td>40.2±10.9</td>
</tr>
<tr>
<td>Deductions</td>
<td>-1.3</td>
</tr>
<tr>
<td>Functional score, mean±SD</td>
<td>79.9±22.8</td>
</tr>
</tbody>
</table>
difference regarding patients who were disappointed with their outcome (10% vs 12%). Four patients (8%) in Group A and 8 patients (13%) in Group B said they would not have the surgery again.

**DISCUSSION**

Resurfacing the patella remains a controversial issue in orthopedics. Complications related to the patella, such as postoperative anterior knee pain, following total knee replacement can occur at rates as high as 50%. Some authors have reported that patellar resurfacing decreases the amount of anterior knee pain and increases patient satisfaction; however, others have stated that patellar denervation is more beneficial for postoperative anterior knee pain and function. However, patients without a resurfaced patella are more likely to be offered an operation than patients with a resurfaced patella, even if their knee pain is similar. For this reason, the current authors chose to use the incidence of anterior knee pain, rather than reoperation rates, as the end point in this study.

The authors found little difference in the incidence of anterior knee pain when using circumpatellar denervation, which is the standard technique to denervate the patella, compared with patellar resurfacing. In addition, functional Knee Society Scores, clinical knee rating system scores, and visual analog scale scores were similar between the 2 groups, indicating similar overall functional outcome. Furthermore, a higher percentage of patients in the circumpatellar denervation group (58%), than in the resurfacing group (35%), were enthusiastic about their outcome. However, the reverse was true for patients satisfied with their outcome.

There is constant striving to reduce postoperative knee pain following TKA. Arthroscopic denervation of the patella for patellofemoral pain, with promising results, has been described by Vega et al. Some surgeons have applied the same principle to managing the patella during arthroplasty by removing osteophytes and using electrocautery to circumferentially denervate the patella. This technique, theoretically, would decrease the amount of postoperative anterior knee pain that is believed to be attributed to patellofemoral arthritis and provide a reasonable alternative to patellar resurfacing. A study investigating the anatomic dissection of 30 cadaver knees showed that the medial and lateral patellar nerves supply the innervation of the patella. In a right knee, the lateral nerve enters the patella from the vastus lateralis at the 11-o’clock position and the medial nerve enters the patella from the vastus medialis at the 2-o’clock position. Further studies have shown a wide range of anomalies in the innervations of the patella, including contribution from infrapatellar branches. Peptides, such as substance P, are responsible for transmission of nociceptive stimuli and have been isolated in the retinaculum, fat pad, periosseous, and subchondral plate of a patella with degenerative arthritis. Interruption of this complex pathway with adequate denervation of the patellar nerves should decrease pain perception around the patella. Unfortunately, there are no reports of the correct technique to adequately denervate the patella with an electrocautery. Thus, the time, wattage, and location of cautery to irreversibly denervate the patella remain unknown.

Several studies have reported improved results with patellar denervation. In a recent randomized controlled trial, Pulavarti et al attempted to determine if patellar denervation would improve function.
after TKA. In this study, 126 consecutive patients were randomized to undergo or not to undergo patellar denervation after the patella was left unresected. The participants were assessed at 3, 12, and 24 months after surgery for pain scores and other outcome measures. This study found that patients with patellar denervation had better pain scores at 3 months and higher satisfaction at 2 years. In a meta-analysis that included 5 randomized controlled trials with 572 patients and 657 knees, Li et al9 found that patellar denervation was associated with less anterior knee pain, lower visual analog scale score, and better knee function compared with no patellar denervation without patellar resurfacing. This meta-analysis also suggested that patellar denervation offered improved outcomes without increased complications compared with non-denervated patellae. However, limitations of this study included the lack of a control group without denervation or resurfacing and the use of a different surgeon for each cohort. Nevertheless, the surgeons used similar preoperative, operative, and postoperative protocols.

Conversely, reports have indicated no differences in outcomes between patellar denervation and resurfacing. A meta-analysis conducted by Arirachakaran et al10 identified 18 studies to indirectly investigate the outcomes of patellar resurfacing vs patellar denervation. Of these 18 studies, 15 compared patellar resurfacing with either non-resurfacing (n=14) or patellar reshaping (n=1) and 3 compared patellar denervation with patellar non-resurfacing. After making indirect comparisons between the patellar denervation and the patellar resurfacing cohorts, Arirachakaran et al concluded that there was no improvement in postoperative anterior knee pain with patellar denervation vs patellar resurfacing and that, therefore, either could be selected for the patellofemoral component in TKA. These findings correlate with the current authors’ clinically obtained results. However, a meta-analysis by Chen et al22 found that patellar resurfacing can reduce the need for reoperation, despite no distinct improvement in postoperative knee function or satisfaction having been seen when compared with TKA without patellar resurfacing.

The concept of patellar denervation is intriguing, but the proper technique remains poorly understood. Although the authors’ current technique of patellar denervation has not resulted in a decrease in anterior knee pain when compared with patellar resurfacing, an adequate irreversible denervation could eliminate the need to resurface the patella in TKA. Nevertheless, if the incidence of anterior knee pain is similar between resurfaced and denervated patellae, then using the circumpatellar denervation could avoid the potential complications associated with the patellar button. This study has shown that there is no clinical difference in postoperative anterior knee pain when comparing patellar resurfacing with circumpatellar denervation without resurfacing during TKA. However, currently, the authors believe that larger, prospective randomized, controlled trials are needed to better evaluate and confirm their conclusion.

REFERENCES

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