

Patellar resurfacing versus nonresurfacing in total knee arthroplasty for osteoarthritis: experience at a tertiary care institution in Pakistan

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Objective: To determine the effect of patellar resurfacing in patients offered total knee arthroplasty for osteoarthritis.

Design: Randomized control study.

Place and duration of study: The Aga Khan University Hospital, Karachi, Pakistan from January 3, 2005 to January 9, 2010.

Patients and methods: Patients undergoing primary total knee arthroplasty for osteoarthritis were assigned to either the patellar resurfacing or nonresurfacing arm using systematic sampling. This consisted of patients undergoing unilateral and bilateral knee arthroplasty. Preoperatively, Knee Society Knee and Function Scores were calculated. After a minimum of 3 years postoperatively Knee Society Knee and Function Scores as well as the Clinical Anterior Knee Pain Rating were calculated and analysis done to check for differences.

Results: Seventy-five patients were recruited in each arm; 135 patients had bilateral and 15 had unilateral knee arthroplasty. The mean preoperative knee score was 40.4 for the resurfacing group and 40.60 for the nonresurfacing group ($P = 0.45$). This improved postoperatively to 93.67 and 94.23 respectively, with no difference between the two groups ($P = 0.67$). The mean preoperative function score was 45.50 for resurfaced patellae and 45.83 for nonresurfaced. This improved to 89.67 and 90.50, respectively, again with no difference ($P = 0.51$). Postoperative Clinical Anterior Knee Pain Rating was a mean of 0.1 for resurfaced and 0.13 for nonresurfaced patellas, with no difference on analysis ($P = 0.06$). However, patients who had bilateral knee arthroplasty had a slightly higher Clinical Anterior Knee Pain Rating than those who had single knee surgery ($P = 0.046$) irrespective of whether the patellar was resurfaced or not.

Conclusion: In patients undergoing primary Total Knee Arthroplasty for osteoarthritis, there is no added advantage of performing resurfacing of the patellar at 3 years of follow-up.

Keywords: patellar, patellar ligament, patellofemoral pain syndrome, arthroplasty subchondral, arthroplasty replacement knee, osteoarthritis knee, Pakistan

Introduction

The controversy about whether to resurface the patellar or to leave the native patellar unresurfaced continues to be debated by orthopedic surgeons performing total knee arthroplasties.¹ When the original total knee prostheses were designed, the patellofemoral articulation was not taken into consideration as a potential source of pain, and the results were complicated by patellofemoral symptoms despite an otherwise well-performed knee arthroplasty. Subsequent designs incorporated a femoral flange for the patellofemoral articulation and provided the option for patellar resurfacing. These early implants were not designed to accommodate the native patellar in an anatomic

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fashion during the range of motion, and resurfacing of the patellar was recommended. However, complications related to patellar resurfacing became a primary concern, and have been associated with the variable revision rates often reported after total knee arthroplasty (TKA).^{2,3}

Subsequent modifications in implant design have been made to offer the surgeon the option of leaving the patellar unresurfaced. Increased awareness of component orientation and rotation has also improved the results with regard to the patellofemoral articulation after TKA.³ Numerous clinical trials have been done to help clarify the indications for patellar resurfacing. Unfortunately, there is little consensus, and surgeon preference remains the primary variable. Despite the numerous trials, there are three basic strategies: always resurface, never resurface, or selectively resurface the patellar.

Methods

This is a randomized controlled study that involved 75 patients in each arm – patellar resurfacing and nonresurfacing – who underwent primary TKA at the Aga Khan University Hospital (Karachi, Pakistan). The study period was from January 3, 2005 to January 9, 2010.

Exclusion criteria include previous patellectomy, inflammatory arthritis, patellar fracture, patellar instability, previous extensor mechanism procedures, high tibial osteotomy, severe valgus or varus instability ($>15^\circ$), previous unicompartmental knee replacement, and a history of septic arthritis and osteomyelitis.

All patients had Kellgren and Lawrence grade 3–4 of osteoarthritis on plain radiographs.⁴

Our institution has an Ethics Committee that meets every month. It is similar to an Institutional Review Board present at other institutions. It serves as a patient's advocate and is mandated with ensuring that all clinical trials are carried out

within acceptable ethical standards. This trial was approved in its sitting on November 17, 2004.

All patients admitted to the orthopedic ward with osteoarthritis for TKA during the study period were identified and assigned to the relevant arm of the study. Those patients who had medical record numbers ending in even numbers were assigned to the resurfacing group. Those patients with medical record numbers ending in odd numbers were assigned to the nonresurfacing group.

A total of 150 patients were recruited; with 75 patients in each group. No power analysis was done, but this sample size is within those of other studies done on this topic.^{5–10}

A thorough history and physical examination was carried out by the first author (AF). All those patients fitting the exclusion criteria were withdrawn from the study. The study was explained to each patient and informed consent obtained. The preoperative Knee Society Knee and Function Scores were calculated.

Postoperative rehabilitation protocol for all patients included institution of a regimen of continuous passive motion (CPM) on the first postoperative day with a gradually progressive range of motion. Patients were also ambulated from the first postoperative day with the help of a walker. All patients were taught a quadriceps strengthening regimen in the form of straight leg raising exercises which were started in the hospital and continued for 6 weeks postoperatively. We did not use a knee brace in any of our patients.

At a minimum of 3 years postoperatively, patients were called to a free clinic and a proforma was filled out by the first author (AF) detailing post-operative Knee Society Knee and Function scores. Patients also were assessed for Clinical Anterior Knee Pain Rating as used by Waters (Figure 1).¹⁰ For bilateral knee arthroplasty patients a single data sheet was filled encompassing the patients feelings about both knees.

Clinical Anterior Knee Pain Rating	
Rating	Description
0	No pain
I	Mild pain that does not intrude on daily activities
II	Moderate pain that is a nuisance; patient not considering further surgery
III	Severe pain; patient considering further surgery

Figure 1 Clinical anterior knee pain rating.

The surgical approach was similar in all cases using a medial parapatellar approach. The implant used in all cases was NexGen Legacy (Zimmer, Warsaw, IN).

The Intramedullar Femoral Anterior-Posterior Sizing Guide was used to aid in setting 3° of external rotation of the femoral component in relation to the nondeformed posterior condyles. The femoral and tibial components were cemented into position as per standard procedure.

Patellar nonresurfacing technique

Sharp dissection through the pre-patellar bursa to expose the anterior surface of the patellar was done. All osteophytes and synovial insertions from around the patellar were removed. Care was taken not to damage tendon insertions onto the bone.

Patellar resurfacing technique

The Universal Patellar Saw Guide was applied in line with the patellar tendon, and the patellar pushed up between its jaws. The patellar was leveled within the saw guide jaws. The amount to be resected across the top of the saw guide jaws was the same on all sides. The patellar was cut flat so that a smooth surface remained.

After centering the appropriate Patellar Drill Guide over the patellar, peg holes were then drilled into the native patellar and the artificial patellar button cemented into place.

Statistics

Data collected on the proforma was entered into SPSS (v11; IBM, New York, NY). This data was used to calculate mean and standard deviation for gender, age, height, weight, Knee Society Knee and Function Scores (pre- and postoperatively) and Clinical Anterior Knee Pain Rating (postoperative) for patellar resurfacing and nonresurfacing.

Student's *t*-test was used to detect any relationship between any two variables. A *P*-value of <0.05 was considered significant.

Results

Demographics

We studied a total of 150 patients, 75 in the resurfacing group and 75 in the nonresurfacing group. Analysis indicated that the groups were similar for age, duration of follow-up, gender, height, and weight (Table 1).

Knee scores and function scores

The pre-operative and post-operative knee and function score was calculated for both groups – resurfacing and nonresurfacing (Table 2). No difference was found in the two groups.

Table 1 Demographic results

	Resurfacing group	Nonresurfacing group	P-value
Age	62.33 years	62.07 years	0.59
Duration of follow-up	3 years 6 months	4 years 1 month	0.309
Gender	52 female, 23 male	61 female, 16 male	0.55
Height	153 cm	153.8 cm	0.48
Weight	71.2 kg	70.8 kg	0.76

Clinical anterior knee pain rating

Sixty-eight of the 75 patients in the resurfaced group and 70 of the 75 in the nonresurfaced group had a Clinical Anterior Knee Pain Rating postoperatively of 0, signifying no pain at all. The remaining patients had a score of 1 suggesting presence of mild pain that does not interfere with daily living.

The mean Clinical Anterior Knee Pain Rating for the resurfaced group was 0.10 and the nonresurfaced group was 0.13, but this again was not clinically significant (*P* = 0.06). Though this is close to our significant threshold of 0.05, as the difference was only two cases we did not treat it as significant.

Unilateral versus bilateral

Sixty-five of the 75, or 86.6%, of cases in the resurfacing group were bilateral total knee replacement whereas 13.4% were unilateral (Table 3). Seventy of the 75, or 93.33% of cases, in the nonresurfacing group were bilateral.

Table 2 Results of clinical scores

	Resurfacing group	Nonresurfacing group	P-value
Preoperative Knee Society knee score results			
Pain	12.00	12.33	0.58
Stability	22.67	22.83	0.46
Range of motion	15.10	15.13	0.40
Total Knee Society score	40.40	40.60	0.33
Postoperative Knee Society knee score results			
Pain	47.83	48.33	0.57
Range of motion	21.53	21.63	0.26
Stability	24.0	24.50	0.27
Total Knee Society score	93.67	94.23	0.64
Knee Society function score results			
Pre-op Knee Society Function score	45.50	45.83	0.38
Post-op Knee Society Function score	89.67	90.50	0.51

There was no difference between the groups when it came to preoperative and postoperative Knee Society Knee and Function score. However the difference between the Clinical Anterior Knee Pain Rating was significant at 0.046.

All twelve patients who reported anterior knee pain were in the bilateral group and none had unilateral knee replacements. However, as noted earlier, there was no difference between resurfaced and nonresurfaced patellas when it came to anterior knee pain.

Complications

Minor complications included deep venous thrombosis confirmed on ultrasound exams in two patients and superficial wound infection in one patient. One patient went into post-operative ileus which settled with conservative measures.

Major complications included pulmonary embolism in three patients (one of whom expired) and non-ST-elevation myocardial infarction in two patients, both of whom recovered. Out of the patients with major complications four out of five had bilateral knee surgery.

No complications related to resurfacing the patellar were encountered at the 3-year follow-up.

Discussion

Our study of 150 patients comparing patellar resurfacing versus nonresurfacing in TKA is the first study of its kind in Pakistan. As far as our demographic data was concerned, the patients were similar for age, height, weight, and gender.

The preoperative Knee Society Knee and Function Scores in the two groups were also identical, suggesting equal burden of disease in the two groups.

All patients showed tremendous improvement in Knee Society Knee and Function Scores postoperatively. It is well proved that TKA is very effective in alleviating pain and improving function in primary knee osteoarthritis.

However, there was no difference in the improvement of the scores or the absolute postoperative knee scores in the two groups. This challenges the traditional belief that patello-femoral arthritis plays a very important part in the symptomatology of tri-compartmental osteoarthritis.

Similarly, no significant differences were found in anterior knee pain between the two groups when it came to the Clinical Anterior Knee Pain Rating. One would expect that if the patellar played a significant role in symptoms of osteoarthritis, anterior knee pain should have been significantly higher in the nonresurfaced group.

However, those patients who had bilateral TKA had a slightly higher incidence of anterior knee pain irrespective of whether the patellar was replaced or not. This may be related to them generally having a more aggressive and severe form of osteoarthritis than those with unilateral pathology.

We know of five randomized, controlled, blinded clinical trials that were performed to better answer the question of whether to resurface or to not resurface^{3,5-8} (Table 4). These five studies included a total of 471 knees treated with either patellar resurfacing or nonresurfacing. These randomized studies were well designed, with randomization of patients and blinding of both the examiners and the patients to the type of patellar management.

However, despite this rigorous attention to detail, the results are again variable.

Burnett et al reported a prospective, randomized, double-blind study comparing resurfacing with nonresurfacing in 1995.¹¹ Outcome measures included the Knee Society clinical rating,¹² radiographic analysis, a 30 second stair-climbing test, and measurements of quadriceps and hamstring torque.¹³ The authors concluded that there was no benefit to resurfacing the patellar in knees with osteoarthritis and no serious deformity, and they did not recommend routine resurfacing of the patellar in primary TKA for osteoarthritis.

Schroeder-Boersch et al⁸ performed a randomized trial of 40 knees, treated with or without resurfacing, followed for a minimum of 2 years. When the patients who had a revision were excluded from the analysis of the Knee Society scores, the two groups were similar with regard to those scores for function and stair-climbing ability, although not for pain.

In 1997, Barrack et al¹⁴ reported the results of a prospective, randomized, double-blind study of 118 knees followed for a minimum of 2 years. All patients had been treated with a Miller-Galante II cruciate-retaining knee prosthesis (Zimmer, Warsaw, IN) with a femoral component featuring a nonanatomic patellofemoral groove. No difference in the overall Knee Society score or the subscore for pain or

Table 3 Unilateral and bilateral knee replacement outcomes compared

	Unilateral (n = 15)	Bilateral (n = 135)	P-value
Total preoperative Knee Society knee score	42.17	40.31	0.99
Total preoperative Knee Society function score	42.50	46.02	0.42
Total postoperative Knee Society knee score	93.83	93.96	0.54
Total postoperative Knee Society function score	91.66	89.90	0.29
Mean postoperative clinical anterior knee pain rating	0	0.13	0.046

Table 4 Results of five randomized trials comparing patella resurfacing with nonresurfacing

Author	Date of publication	Knee implant	Minimum duration of follow-up (years)	Knees (n)	Revisions in nonresurfaced group		Revisions in resurfaced group	
					For any reason	For patellofemoral problem	For any reason	For patellofemoral problem
Bourne et al ⁶		Anatomical modular knee (AMK)	6.3	100	6	2	2	1
Feller et al ⁵	1996	Porous coated anatomic modular	3	40	0	0	2	0
Schroeder-Boersch et al ⁸	1998	Unspecified	2	40	2	2	1	1
Barrack et al ⁷	2001	MG II CR	5	93	7	7	0	0
Wood et al ³	2002	MG II CR	2	198	15	15	9	9
Totals				471	30 (13%)	26 (11%)	14 (6%)	11 (5%)

function was noted between the knees that had had patellar resurfacing and those that did not.

In 1996, Feller et al⁵ reported a prospective randomized trial of 40 patients without severe deformity of the patellar who underwent TKA (described as a technically uncomplicated TKA) for the treatment of osteoarthritis by a single surgeon in Australia. The authors concluded that the prevalence of anterior knee pain after TKA was not influenced by whether the patellar had been resurfaced.

In another report on 93 knees, Barrack et al⁷ again found no significant difference in the Knee Society pain, function, and total scores following patellar resurfacing and those following nonresurfacing. Similarly, the factors that are commonly considered for selective patellar resurfacing (obesity, degree of patellar chondromalacia, and preoperative anterior knee pain) did not predict either a lower postoperative knee score or postoperative knee pain at this later follow-up evaluation.

The largest randomized, controlled, clinical trial of which we are aware was recently performed in Australia,³ and the results differed from those of Barrack et al. The Australian study included 198 osteoarthritic knees treated with TKA with use of a Miller-Galante II implant. At a minimum of 3 years postoperatively, no difference in the Knee Society clinical rating, range of motion, or functional score was noted between the resurfaced and nonresurfaced knees. However, 31% of the nonresurfaced knees had anterior pain postoperatively compared with 16% of the resurfaced knees. The authors concluded that the results for anterior knee pain and stair descent favor the use of resurfacing and that revision rates for patellofemoral symptoms may be similar for the two techniques.

As we finish our study, it is logical for us to concur with the findings of Bennet, Barrack, and Feller. Our analysis has clearly indicated that patients with osteoarthritis who underwent TKA did equally well irrespective of whether the patellar was resurfaced or not. Though there were no added complications with resurfacing the patellar in our study, numerous other studies have reported serious complications such as patellar fracture, disruption of the extensor mechanism, osteonecrosis, aseptic loosening, instability and dislocation, “overstuffing” of the patellofemoral joint, catastrophic failure, patellar polyethylene wear, and patellar clunk syndrome.¹⁵

We recognize that the present study was of medium duration (minimum 3-year follow-up) and that accelerated failure may occur in either group with longer follow-up. The results of the present study may be specific to the type

of prosthesis used, and different results may be reported for different designs.

Also, randomization was done using medical record numbers, which has the benefit of being easy and inexpensive. However, more accurate and sophisticated methods exist that could further reduce bias. Radiological analysis in addition to clinical data would have given further guidance on interpreting outcome.

The shortcomings of this study notwithstanding, the medium term data show no benefit in resurfacing the patellar in patients undergoing TKA for uncomplicated knee osteoarthritis.

Conclusion

At 3 years follow-up

- There is no difference in improvement of Knee Society Knee Scores or Function Scores of patients undergoing patellar resurfacing versus nonresurfacing in TKA.
- There is no difference in postoperative clinical anterior knee rating of patients undergoing patellar resurfacing versus nonresurfacing in TKA.
- Patients who underwent bilateral total knee replacement had higher incidence of anterior knee pain irrespective of whether the patellar was resurfaced or not.
- In our experience we do not think that patellar resurfacing is required in TKA procedures for osteoarthritis.
- Our indications for patellar resurfacing are inflammatory arthropathy, previous patellar fracture or dislocation, severe patellar maltracking, previous unicompartmental knee arthroplasty or high tibial osteotomy, and non-anatomic toehlear groove on femoral component.

Disclosure

The authors report no conflicts of interest in this work.

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