

Original Research Article

Outerbridge classification as a predictor for the need of patellar resurfacement in total knee arthroplasty: a prospective study

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ABSTRACT

Background: Residual anterior knee pain after total knee arthroplasty is one of the common causes of early revision surgery in form of patellar resurfacing and even resurfacing the patella in these circumstances may not relieve the symptoms. So, the decision to perform patellar resurfacing during total knee arthroplasty to prevent anterior knee pain remains controversial. The purpose of this study is to determine if the outerbridge classification can predict the need for Patellar resurfacing as part of total knee arthroplasty.

Methods: 100 patients with advanced osteoarthritis of knee fulfilling the inclusion and exclusion criteria were randomized into two groups of 50 patients each. In group A-patellar resurfacing done and in group B-patella was not resurfaced while carrying out TKR. Each patient was assessed intraoperatively and his/her patella classified as per Outerbridge classification. Patients were followed-up at 03, 06 and 12 months postoperatively and assessed by modified hospital for special surgery (HSS) knee scores.

Results: In case of Outerbridge class III group there is a statistically significant difference (p value -0.002) in HSS score at 03 months, which becomes highly significant at 06 months (p value -0.001) and 01 year (p value <0.001). Similarly, there is statistically significant difference in HSS score (p value- 0.001) in Outerbridge class IV group at 03 months, 06 months and 01 year.

Conclusions: Patellar resurfacing in patients undergoing total knee arthroplasty with patella in Outerbridge class III and IV can be safely carried out to further improve the functional outcome. There is no distinct advantage of resurfacing patella in Outerbridge class I and II in terms of functional gain. Thus, Outerbridge classification for patella can effectively guide us whether to resurface patella or not in patients undergoing total knee arthroplasty.

Keywords: Knee arthroplasty, Outerbridge classification, Patellar resurfacement

INTRODUCTION

Anterior knee pain is one of the most common causes of persistent problems following total knee arthroplasty. It is reported in 4% to 49% of patients after primary total knee arthroplasty.¹⁻³ It can occur without patellar resurfacing or even with patellar resurfacing.⁴ Residual anterior knee pain after total knee arthroplasty is one of the common causes of early revision surgery in form of patellar resurfacing and even resurfacing the patella in these

circumstances may not relieve the symptoms.^{5,6} Advocates for leaving the patella un-resurfaced cite avoidance of complications that include patella fracture, avascular necrosis, patella tendon injury, and instability. Proponents of routine patella resurfacing cite the occasional need for secondary resurfacing procedures and the increased incidence of anterior knee pain in patients with un-resurfaced patellae as a cause for concern with leaving a patella un-resurfaced during knee arthroplasty. In addition, some advocate selective patellar resurfacing

based on patient factors such as quality of the articular cartilage and patellofemoral congruence at the time of surgery. So, the decision to perform patellar resurfacing during total knee arthroplasty to prevent anterior knee pain remains controversial.⁷ The Outerbridge classification of cartilage defects in the patella is commonly used in the literature to classify degenerative changes in patella. The purpose of this study is to determine if the Outerbridge classification can predict the need for Patellar resurfacing as part of total knee arthroplasty.

METHODS

A longitudinal observational study involving 100 patients with severe primary osteoarthritis of knee between age group of 40-80 years is conducted in the tertiary care hospital between September 2014 to July 2016. Ethical clearance was obtained from the local ethical committee. Patients with isolated patellofemoral osteoarthritis, patellectomy, patellofemoral instability, history of patella fracture, unicondylar knee replacement, high tibial or distal femoral osteotomy or any operation involving the extensor mechanism are excluded from the study.

Patients meeting the criterion led down for the study were explained about the study and informed consent was taken. Patients are randomized by computer generated random number table into 02 groups of 50 each. 50 patients in group A underwent patellar resurfacing and 50 patients in group B underwent total knee arthroplasty without resurfacing the patella. All the patients included in the study underwent total knee arthroplasty using same implant design (posteriorly stabilized Depuy sigma PFC). Outerbridge class I-IV was assigned to the patella in each patient intra-operatively as given in Table 1.¹⁵

Table 1: Outerbridge classification for patellar osteoarthritis.

Grade	Pathology
Grade I	cartilage with softening and swelling
Grade II	a partial-thickness defect with fissures on the surface that do not reach subchondral bone or exceed 1.5 cm in diameter
Grade III	fissuring to the level of subchondral bone in an area with a diameter more than 1.5 cm
Grade IV	exposed subchondral bone

Postoperatively all the patients are subjected to same rehabilitation protocol. Baseline antero-posterior, lateral and skyline view radiograph of the knee were taken. At 03 monthss, 06 months and 01 year postoperative follow up; modified hospital for special surgery (HSS) knee score was calculated. Antero-posterior, lateral and skyline view radiograph of the operated knee were also assessed for any evidence of complication including infection, component loosening, patella fracture/patellar osteolysis.

All the collected data was entered in an Excel master sheet. The master sheet contained no identifiable records. Each patient had given a unique identifiable number by which they could be traced if necessary.

Statistical analysis

Data analysis was conducted on an intention to treat basis. Statistical analysis was done using SPSS windows software. Distributions of the gender, age, side of knee were assessed using SPSS windows software. Modified hospital for special surgery (HSS) knee score was assessed using paired t-test for each Outerbridge class in patient who underwent patella resurfacing and those who did not. Statistical significance was set at P value of 0.05 or less.

RESULTS

Out of the 100 patients who underwent total knee arthroplasty, 50 patients had their patella re-surfaced (PR= group A) and 50 were managed without patellar resurfacement (PNR= group B). Out of 56 males; 31 underwent TKR with patella re-surfaced and 25 without re-surfaced. Out of 44 female patients; 19 had patella re-surfaced and 25 had without their patella resurfaced. The difference between mean age of the patients among the Outerbridge classes and both the groups (A and B) is not statistically significant (p value >0.1) and hence comparable as shown in Table 2.

Results of this study showed that statistically there is no advantage of resurfacing patella in patients with patella in Outerbridge class I group. Mean HSS scores at 03 months, 06 months and at 01 year are comparable. (p values determined by independent T test at 3 months and 6 months are 0.064 and 0.22 respectively). P value at 1 year (**) in class I group cannot be calculated because the standard deviations of both groups are 0 as given in Table 3.

Similarly, statistically there is no advantage of resurfacing patella in patients with patella in Outerbridge class II group. Mean HSS scores at 03 months, 06 months and at 01 year are comparable. (P values determined by independent T test at 3 months and 06 months are 0.946 and 0.207 respectively). P value at 01 year in Outerbridge class II group cannot be calculated because the standard deviations of both groups are 0 as given in Table no 4.

In case of Outerbridge class III group there is a statistically significant difference (p value -0.002) in HSS score at 03 months, which becomes highly significant at 06 months (p value -0.001) and 01 year (p value <0.001) as shown in Table 5.

Similarly, there is statistically significant difference in HSS score (p value- 0.001) in Outerbridge class IV group at 03 months, 06 months and 01 year as given in Table 6.

Table 2: Demographic data of the patients in both the groups.

Outerbridge class	Number of patients	Mean age (Years)		Male		Female		PR A	PNR B
		A	B	A	B	A	B		
I	13	61.00±8.38	66.800±8.26	5	2	3	3	8	5
II	25	66.364±6.42	67.571±11.18	6	4	5	10	11	14
III	31	63.143±8.83	64.118±9.40	9	9	5	8	14	17
IV	31	64.471±9.34	64.000±7.25	11	10	6	4	17	14
Total	100			31	25	19	25	50	50

PR=group A=Patellar resurfacement group; PNR=group B=Patellar non resurfacement group.

Table 3: Distribution of HSS in Outerbridge class I group

Groups	Number of Patients	Mean at 03 months	Mean at 6 months	Mean at 01 year
Patella resurfaced -A	5	80.000	90.00	100.00
Patella not resurfaced -B	8	82.500	100.00	100.00
P value		0.064	0.22	**

HSS-Modified hospital for special surgery score.

Table 4: Distribution of HSS in outerbridge class II group

Groups	Number of Patients	Mean at 03 months	Mean at 6 months	Mean at 01 year
Patella resurfaced-A	14	81.071	99.286	100.00
Patella not resurfaced-B	17	77.647	91.176	96.471
P value		0.002	<0.001	<0.001

HSS-Modified hospital for special surgery score.

Table 5: Distribution of HSS in Outerbridge class III group

Groups	Number of Patients	Mean at 03 months	Mean at 6 months	Mean at 01 year
Patella resurfaced-A	14	81.071	99.286	100.00
Patella not resurfaced-B	17	77.647	91.176	96.471
P value		0.002	<0.001	<0.001

HSS-Modified hospital for special surgery score.

Table 6: Distribution of HSS in Outerbridge class IV group.

Groups	Number Of Patients	Mean at 03 months	Mean at 6 months	Mean at 01 year
Patella resurfaced- A	17	80.588	97.941	97.941
Patella not Resurfaced- B	14	72.143	85.714	85.714
P value		0.001	0.001	0.001

HSS-Modified hospital for special surgery score.

DISCUSSION

The management of the patella in total knee arthroplasty (TKA) traditionally has been one of three options: always resurface, never resurface, or selectively resurface the patella. The presence of anterior knee pain following primary total knee replacement is negatively correlated with patient satisfaction and quality of life. Literature lacks the firm evidence that the patellar resurfacing will have definitive advantage in prevention and management of anterior knee pain.⁸ Increased understanding of patellofemoral anatomy, biomechanics, implant design, and surgical technique has led to an improvement in the previously reported high rate of patellofemoral

complications associated with TKA.⁹⁻¹² Traditional indications for patellar resurfacing, including age, weight, gender, patellar anatomy, quality of articular cartilage, radiographic findings, and the presence of rheumatoid arthritis deformity and preoperative anterior knee pain continue to be debated.

Carlos Rodríguez-Merchán et al conducted a study a prospective randomized study of 500 TKAs between 1995 and 2000 to determine if the Outerbridge classification can predict the need for patellar resurfacing as part of total knee arthroplasty.¹³ They carried out patellar resurfacing depending on the Outerbridge classification of the patella at the time of surgery. Patients

with Outerbridge Grades I, II, and III formed Group A, whereas patients with Grade IV formed Group B. Within each group, resurfacing was completed on half of the patients. Group A had 328 patients (164 with PR, 164 without PR). In Group B, there were 172 patients (86 with PR, 86 without PR). An identical prosthetic design was used for both groups. The minimum follow-up was 5 years (average, 7.8 years) for both Group A and Group B. At the end of follow-up, number of patients in each group that required secondary resurfacing as a result of patellofemoral pain was assessed. Patients in Group A required fewer revisions for PF pain. In Group A, only one patient required a secondary PR (0.6% rate), whereas in Group B, 10 patients needed PR (11.6% rate). In Group B, the risk of need of a patellar resurfacing was 21.5 times greater than in Group A. On the basis of these findings, they recommended PR in Outerbridge Grade IV patellae, but not in Grades I, II, and III.

In 2004, Burnett et al evaluated the results of resurfacing and not resurfacing the patella.⁷ Intraoperative cartilage quality was not found to be a predictor of outcome. Also in 2004, a meta-analysis of national joint replacement registry data of bilateral TKA studies, selective resurfacing reports, and randomized clinical trials was done by Bourne and Burnett. The authors concluded that although the evidence seems to support patellar resurfacing, this issue remains inconclusive because of problems generalizing from one implant to another and the short-term nature of available studies. Based on existing data, patellar resurfacing seems reasonable in most TKAs. Not resurfacing the patella might be considered in selected younger patients (younger than 60 years) with mild or no patellar arthritis, a well-tracking extensor mechanism, and particularly if a patella-friendly femoral component is used.

Waters and Bentley in their prospective, randomized study on patellar resurfacing in total knee arthroplasty evaluated 514 consecutive primary press-fit condylar total knee replacements.¹ The patients were randomized to either resurfacing or retention of the patella. They were also randomized to either a cruciate-substituting or a cruciate-retaining prosthesis as part of a separate trial. The mean duration of follow-up was 5.3 years (range, two to 8.5 years), and the patients were assessed with use of the knee society rating, a clinical anterior knee pain score, and the British orthopaedic association patient-satisfaction score. The assessment was performed without the examiner knowing whether the patella had been resurfaced. At the time of follow-up, there were 474 knees. Thirty-five patients who had a bilateral knee replacement underwent resurfacing on one side only. Overall prevalence of anterior knee pain was 25.1% (fifty-eight of 231 knees) in the non-resurfacing group, compared with 5.3% (thirteen of 243 knees) in the resurfacing group ($p < 0.0001$). There was one case of component loosening. Ten of eleven patients who underwent secondary resurfacing had complete relief of anterior knee pain. The overall postoperative knee scores

were lower in the non-resurfacing group, and the difference was significant among patients with osteoarthritis ($p < 0.01$). There was no significant difference between the resurfacing and non-resurfacing groups with regard to the postoperative function score. Patients who had a bilateral knee replacement were more likely to prefer the resurfaced side.

Helmy et al have developed a decision model based solely on the data of randomized, controlled trials.¹⁴ The authors' model showed patellar resurfacing is the best management strategy for the patella at the time of primary TKA.

Our study emphasizes the fact that we can improve the functional outcome in TKR if we resurface the patella primarily in Outerbridge class III and IV. We feel that our study contributes important evidence that the degree of patellar involvement can be used to assist in the decision to perform patellar resurfacing during TKA as shown by the study carried by Carlos et al.¹³ Prospective nature of study and randomization strengthens the study; however it has some limitations like smaller sample size and shorter follow up period. Also, this study does not include other possible confounding variables responsible for patellofemoral problems in TKR.

CONCLUSION

Patellar resurfacing in patients undergoing total knee arthroplasty with patella in Outerbridge class III and IV can be safely carried out to further improve the functional outcome. There is no distinct advantage of resurfacing patella in Outerbridge class I and II in terms of functional gain. Thus, Outerbridge classification for patella can effectively guide us whether to resurface patella or not in patients undergoing total knee arthroplasty.

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REFERENCES

1. Waters TS, Bentley G. Patellar resurfacing in total knee arthroplasty. A prospective, randomized study. *J Bone Joint Surg Am*. 2003;85:212-7.
2. Popovic N, Lemaire R. Anterior knee pain with a posteriorstabilized mobile-bearing knee prosthesis: the effect of femoral component design. *J Arthroplasty*. 2003;18:396-400.
3. Sensi L, Buzzi R, Giron F, De Luca L, Aglietti P. Patellofemoral function after total knee arthroplasty: gender-related differences. *J Arthroplasty*. 2011;26(8):1475-80.
4. Muoneke HE, Khan AM, Giannikas KA, Hagglund E, Dunningham TH. Secondary resurfacing of the patella for persistent anterior knee pain after

- primary knee arthroplasty. *J Bone Joint Surg Br*. 2003;85:675-8.
5. Campbell DG, Mintz AD, Stevenson TM. Early patellofemoral revision following total knee arthroplasty. *J Arthroplasty*. 1995;10:287-91.
 6. Patel K, Raut V. Patella in total knee arthroplasty: to resurface or not to – a cohort study of staged bilateral total knee arthroplasty. *Int Orthop*. 2011;35:349–53.
 7. Burnett RS, Haydon CM, Rorabeck CH, Bourne RB. Patella resurfacing versus nonresurfacing in total knee arthroplasty: results of a randomized controlled clinical trial at a minimum of 10 years' followup. *Clin Orthop Relat Res*. 2004;428:12-25.
 8. Fu Y, Wang G, Fu Q. Patellar resurfacing in total knee arthroplasty for osteoarthritis: a meta-analysis. *Knee Surg Sports Traumatol Arthrosc*. 2011;19(9):1460-6.
 9. van Jonbergen HP, Reuver JM, Mutsaerts EL, Poolman RW (2012) Determinants of anterior knee pain following total knee replacement: a systematic review. *Knee Surg Sports Traumatol Arthrosc*. 2014;22(3):478-99.
 10. Verlinden C, Uvin P, Labey L, Luyckx JP, Bellemans J, Vandenuecker H. The influence of malrotation of the femoral component in total knee replacement on the mechanics of patellofemoral contact during gait: an in vitro biomechanical study. *J Bone Joint Surg Br*. 2010;92:737–42.
 11. Burnett RS, Bourne RB. Indications for patellar resurfacing in total knee arthroplasty. *J Bone Joint Surg Am*. 2003;85:728–45.
 12. Wood DJ, Smith AJ, Collopy D, White B, Brankov B, Bulsara M. Patellar resurfacing in total knee arthroplasty: a prospective, randomized trial. *J Bone Joint Surg Am*. 2002;84:187–93.
 13. Carlos Rodríguez-Merchán E, Gómez-Cardero P. The Outerbridge Classification Predicts the Need for Patellar Resurfacing in TKA. *Clin Orthop Relat Res*. 2010;468(5):1254–7.
 14. Helmy N, Anglin C, Greidanus NV, Masri BA. To resurface or not resurface the patella in total knee arthroplasty. *Clin Orthop Relat Res*. 2008;466:2775–83.
 15. Outerbridge RE. The etiology of chondromalacia patellae. *J Bone Joint Surg Br*. 1961;43:752–7.

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