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Research Article

Comparison of Clinical Outcomes between Patella Resurfacing Versus Non-Resurfacing in Primary Total Knee Arthroplasty-A Prospective Study of 360 Cases

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Abstract

Background/Aim: To compare clinical outcomes between patellar resurfacing and nonresurfacing in total knee arthroplasty (TKA).

Materials and Methods: Data from osteoarthritis patients who underwent TKA and were followed up for ≥ 4.5 years were analysed retrospectively. Patients were divided into two groups: patellar nonresurfacing group and patellar resurfacing group. In the Nonresurfacing group, the partial lateral facet of the patella was removed, the patella was reshaped to match the trochlea of the femoral prosthesis and circumpatellar denervation was performed. In the resurfacing group, the patella was resurfaced with a cemented component. Clinical outcomes included incidence of anterior knee pain, Knee Society Score, patient satisfaction, revision rate and radiographic findings. Fisher's exact test was used to assess nominal data including the incidence of AKP, patient satisfaction score, and revision rate. P values < 0.05 were considered to be statistically significant.

Results: Totally 360 patients were evaluated including 198 cases assigned to the nonresurfacing group and 162 to the resurfacing group. Mean age of two groups had statistically significant difference but BMI showed not to be statistically significant different between two groups. There was significant difference between two groups for measured clinical outcomes such as Oxford Knee Score (OKS). Clinical outcomes for patellar nonresurfacing, including patelloplasty and circumpatellar denervation, showed to be different to those for patellar resurfacing, in TKA.

Conclusion: Patellar nonresurfacing (including removal of patellar osteophytes, patellar partial lateral facetectomy and circumpatellar denervation) can obtain satisfactory outcomes in TKA. In addition, patellar nonresurfacing can easily be converted to patellar replacement, if AKP cases.

Keywords: *Patellar Resurfacing; Nonresurfacing; Total Knee Arthroplasty*

Introduction

There are several ideas about patellar resurfacing during total knee arthroplasty (TKA) [1-4]. Although it can decrease the rate of anterior knee pain (AKP) and patellofemoral problems [3-6], several complications such as osteonecrosis, patellar clunk syndrome patellar component failure and tendon rupture are reported consequence by patellar resurfacing [6-8] therefore, patellar non-resurfacing is

mostly preferred [9,10]. Recently, postoperative AKP has been reduced by using well-designed prostheses that reduce contact stress, and interact like normal patellofemoral joints [2,3,5,11]. The outcomes of TKA with patellar resurfacing and non-resurfacing procedures, have been assessed in many controlled clinical trial studies with special attentions to revision rate and AKP [12-18]. On the other hand, circumpatellar denervation and patellar partial lateral facetectomy have been reported to achieve better therapeutic effects including better Western Ontario McMaster Osteoarthritis Index Score, Knee Society Score and patellofemoral symptoms, and slower progression of patellofemoral osteoarthritis), and consequently reduced postoperative AKP in patients with isolated patellofemoral osteoarthritis [19-24].

Aim of the Study

The aim of this study was to compare the incidence of AKP, revision rate and knee function between the patellar resurfacing and non-resurfacing procedures during Total Knee Arthroplasty (TKA).

Materials and Methods

In this study, data from patients with osteoarthritis who underwent unilateral TKA at Mirhosseini Hospital, Shiraz University of Medical Sciences, Shiraz, Iran, were analyzed. TKA has been performed by the indication of severe degenerative osteoarthritis that was unresponsive to non-operative therapy. Patients with history of septic arthritis of the knee or osteomyelitis, high tibial or distal femoral osteotomy, patellar fracture, patellectomy, any surgery involving the extensor mechanism; severe deformity of the knee (Varus angulation, valgus angulation or flexion contracture of > 15°); severe medical disability that limited the patient's ability to walk were excluded from the study. Patients with follow up data of ≥ 4.5 years were enrolled. Those undergoing surgery with patellar resurfacing, whereas those undergoing surgery underwent patellar non-resurfacing. The study was ethically approved by the Shiraz University of Medical Sciences, Shiraz, Iran and all study participants signed informed consent.

Surgical procedures

The surgical procedures were same for all cases, and the same group of three surgeons performed all surgeries. In addition, the same type of cemented posterior cruciate sacrifice prosthesis (press-fit condylar [PFC; DePuy Orthopaedics, Warsaw, IN, USA]) was used for all patients. An anterior midline skin incision was done for the midvastus approach. Soft-tissue balancing and bone cuts were performed in the same sequence. In the nonresurfacing group, patellar osteophytes were removed, following by partial (1 cm) lateral facetectomy of the patella, and reshaping the patella to be matched with the trochlea of the femoral prosthesis. Finally, circumpatellar denervation was performed by cauterization of the soft tissue around the patella with an electro-scalpel. In the resurfacing group, a cemented inset PFC Sigma® oval dome component (DePuy Orthopaedics) was applied for patellar resurfacing. Soft-tissue balancing helped surgeon for optimal patellar tracking. The lateral release was performed ≥≈2.5 cm from the lateral patellar border to correct the subluxation of the patella. All patients received same standardized perioperative regimen. After surgery, the affected limb was elevated higher than the heart and ice bags were placed around the affected knee. The continuous passive motion was not used postoperatively. Active isometric quadriceps, initiative straight-leg raising and extending–flexing motion was encouraged in the immediate postoperative period. Walking with partial weight bearing was permitted 24h postoperatively under the supervision of a physical therapist.

Study assessments

A preoperative evaluation was performed using the Knee Society Pain Score, Knee Society Function Score and Total Knee Society Score.31 Postoperative follow-up assessments were performed at 3 months and at 1, 2, 3, 5, 7 and 9 years. Data collected at 4.5 years postoperatively were analyzed in the present study. Clinical outcomes were evaluated using the three components of the Knee Society Score mentioned above,31 the British Orthopaedic Association patient-satisfaction score,32 X-ray examination findings, the incidence of AKP

and the revision rate. Pre and postoperative clinical evaluations were performed by surgeons (mainly M.H. and J.W.) who were unaware as to whether patients had received patellar resurfacing or nonresurfacing.

Statistical analyses

All data were analyzed using the SPSS® software package, version 19.0 (SPSS Inc., Chicago, IL, USA) for Windows®. Unpaired Student's t-test was applied to compare pre- and postoperative Knee Society Scores between the two groups. Fisher's exact test was used to assess nominal data including the incidence of AKP, patient satisfaction score, and revision rate. P values < 0.05 were considered to be statistically significant.

Results

Totally, 360 patients were involved in this study including 162 cases of patellar resurfacing and 198 cases of non-resurfacing procedure, and they were followed up for < 4.5 years.

		Resurfacing Group	Non-Resurfacing Group
Gender	Male	74 (45.7%)	120 (60.60%)
	Female	88 (54.3%)	78 (39.40%)
Knee	Right	73 (45.1%)	87 (43.9%)
	Left	89 (54.9%)	111 (56.1%)

Table 1: *Gender and knee side distribution in resurfacing group and non-resurfacing group undergoing total knee arthroplasty.*

There were statistically significant between-group differences regarding age, but not for gender, body mass index. The mean ± SD duration of surgery was 72.7 ± 32.6 minutes in the nonresurfacing group and 76.7 ± 29.5 minutes in the resurfacing group which was not statistically significant. Lateral retinacular release was performed in six patients in the nonresurfacing group and in three patients in the resurfacing group, with no significant between-group differences.

Variables	Resurfacing Group (N = 162)	Non-Resurfacing Group (N = 198)	P-value
Age	59.83 ± 0.89	58.7 ± 0.7	0.003
BMI[a]	24.84 ± 0.33	24.51 ± 0.35	0.184
Surgery Duration	76.7 ± 29.5	72.7 ± 32.6	0.072
OKS[b]	39.56 ± 0.36	37.21 ± 0.31	0.000
OKSA[c]	22.89 ± 0.59	21.02 ± 0.31	0.000
OKSF[d]	17.09 ± 0.18	16.19 ± 0.19	0.000

Table 2: *Gender and knee side distribution in resurfacing group and non-resurfacing group undergoing total knee arthroplasty ([a]Body Mass Index, [b]Oxford knee scores, [c] Oxford knee scores activity, [d] Oxford knee scores function).*

The findings of postoperative clinical evaluations are summarized in table 2. At 4 years postoperatively follow up, there were significant differences between groups in terms of Oxford Knee Score. According to the guidelines of the British Orthopaedic Association patient satisfaction score, 32 patient satisfaction was assessed before any secondary operation was performed. There was no significant difference between the two groups in the proportion of patients who were satisfied with their treatment or the proportion experiencing postoperative anterior knee pain.

Superficial redness around the wound occurred in 9 patients in the nonresurfacing group and in 7 patients in the resurfacing group. After a 1-week administration of oral antibiotics, superficial redness disappeared, with no evidence of infection. No case of knee anchyloses was observed in the each group. In the nonresurfacing group, 5 patients underwent revision and patellar resurfacing due to postoperative AKP, its frequency in the resurfacing group was 2 cases; all of the achieved desirable outcomes. No radiologic loosening or wearing down of prosthetic components was observed in X-ray examinations of both groups.

Discussion

Recently, TKA has been found to achieve a high rate of clinical success, and an important issue in TKA is whether the procedure should include patellar resurfacing. The present study compared the clinical outcomes of two treatment regimens: patellar resurfacing and patellar nonresurfacing. Significant differences were found in relation to OKS, revision rate and knee function between the two methods. The incidence of AKP in published trials is so variable that it becomes difficult to collect and analyze AKP data, in order to identify optimal treatment of the patella during TKA [25,26]. The variation in outcomes may be attributed to differences in patient demographics, weight, and body Mass index, design of the total knee prostheses, operating technique and data examiners [27]. In this study, the lateral patellar facet was excised in the nonresurfacing group as an effective method for treating patellofemoral osteoarthritis [28,29]. Partial lateral facetectomy is suggested to be an effective treatment of isolated patellofemoral osteoarthritis, to relieve AKP [30]. In our study, circumpatellar electrocautery was performed in all patients. Immunohistochemical research on the innervation of peripatellar soft tissues has shown the presence of substance-P nociceptive afferent fibers [31], which are destroyed by electrocautery, to reduce postoperative AKP. In one study, two groups of patients undergoing patellar nonresurfacing in TKA were compared with or without circumpatellar electrocautery, and it was found that the incidence of AKP was significantly lower in the group receiving circumpatellar electrocautery than in the other group [32]. The marked differences in AKP may also be due to the differences in the total knee prostheses used [33]. Revision due to patellofemoral problems is another common feature to consider when selecting optimal treatment of the patella in TKA [34]. The current study did not reveal any significant differences in revision rates between the resurfacing or nonresurfacing techniques. The main cause of revision in patients undergoing patellar nonresurfacing is AKP [35]. In patients undergoing patellar resurfacing, multiple factors can cause revision (including component loosening, patellar instability, patellar necrosis, patellar fracture and AKP) [35]. Some studies reported that the revision rate was significantly lower in the patellar resurfacing groups than in the nonresurfacing groups, while AKP rates were similar between both groups [4,36]. Patients undergoing patellar nonresurfacing TKA have an opportunity to undertake revisions to resurface the patella when AKP recurs. Not all patients with patellofemoral problems after patellar nonresurfacing TKA benefit from secondary patellar resurfacing. The main strength of the present study were that it was randomization, controlled trial, and the prospective data collection. Our study included a large number of patients treated during a similar time period, whose demographic features were matched between the two groups. Patients were divided into the two groups based two measures: on the time of the operation, and on whether patellar resurfacing or nonresurfacing was performed. One of the limitations of this study was that the degree of diseased articular patellar cartilage was not graded. This may not influence the accuracy of the study results and conclusion as it is mentioned by several other reports [37,38]. In conclusion, in the present study we found that OKS in resurfacing group compared with patellar nonresurfacing TKA, are significantly different and has advantages in terms of relieving pain, lowering revision rate and improving knee function during 4.5 years follow up.

Conclusion

Patellar nonresurfacing (including removal of patellar osteophytes, patellar partial lateral facetectomy and circumpatellar denervation) can obtain satisfactory outcomes in TKA. In addition, patellar nonresurfacing can easily be converted to patellar replacement, if AKP cases.

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Conflicts of Interest

The authors had no conflicts of interest to declare in relation to this article.

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