Abstract

Purpose: There is no difference between patellar resurfacing versus non-resurfacing in the functional outcome 6 months after total knee arthroplasty (TKA) for knee osteoarthritis. Thus, we have performed this study to compare the short-term clinical outcomes of TKA performed with and without the patella resurfaced.

Materials and Methods: A total of 50 patients with osteoarthritis (OA) of the knee were randomized to receive patellar resurfacing (n = 24; resurfaced group) or to retain their native patella (n = 26; non-resurfaced group) based on envelope selection and provided informed consent. Disease specific (Knee Society Score or KSS), Kujala Anterior Knee Pain Scale (AKPS), Western Ontario and McMaster Universities Arthritis Index (WOMAC), Short Form 36 (SF-36) and functional (patella-related activities) outcomes were measured within six months of follow-up.

Results: There was no significant difference between resurfacing and non-resurfaced group pre and post-operative regards to the in improvement of ROM (), KSKS (p=0.782, p=0.553), KSKS-F (p=0.241, p=0.293), AKPS (p=0.128, p=0.443), WOMAC (p=0.700, p=0.282), and pain scores (p=0.120, p=0.508). There was no difference in the range of of motion between resurfacing and non-resurfaced group pre (15.24 and 15.45) and post-operative (18.48 and 18.74). No side effects related to patella was observed in any of the groups, and revision was not required in any of the participants.

Conclusion: The results showed no significant difference between patellar resurfacing and non-resurfacing in TKA for all outcome measures in a short term.

Keywords: osteoarthritis, total knee arthroplasty, patellar resurfacing, non-resurfacing.

Introduction

Total knee arthroplasty (TKA) is the gold standard treatment for knee Osteoarthritis (OA), which involves removing the damaged articular surfaces and replacing them with a tibial and femoral component (1,2). However, there is controversy as to whether the patella is resurfaced or not during TKA (1). While TKA is commonly used in severe degenerative OA, surgeons are not certain about indications of patellar resurfacing (2). Some authors suggest that patellar resurfacing should be done simultaneously with TKA in order to relieve pain in the front of knee and eliminate the need for a second surgery (1, 3). However, others have observed that these two techniques are not different (3-5).

The advantages of patellar non-resurfacing include lower costs due to less dependence on equipment (6), reduced surgery time (7), decreased patello-femoral complications (3), and greater possibility to exert pressure on patello-femoral joint without the chance of prosthesis abrasion (7). Patellar resurfacing during TKA is not performed by many surgeons worldwide due to its associated complications including patellar fracture, osteonecrosis, patellar polyethylene loosening, polyethylene abrasion, instability, patellar motion difficulties and problems in extensor mechanisms (8-11). Moreover, in patients who undergo patellar resurfacing, anterior knee pain is still a common complaint, and therefore it has been suggested that patellar resurfacing should not be done routinely (12).

To date, no clinical trials (1, 13, 14) and meta-analysis studies (15-17) have not been able to end the debate and found by finding out a definitive answer. In addition, to the best of our knowledge results of patellar resurfacing or non-resurfacing in TKA has not been reported in

Iranian patients. Hence keeping in mind the existent controversy whether to resurface the patella or not, it would be the need to do a study on this contentious topic. There is no difference between patellar resurfacing versus non-resurfacing in the functional outcome 6 months after total knee arthroplasty for knee osteoarthritis. Therefore, this study was to compare the short term results between patellar resurfacing and non-resurfacing in TKA in the patients.

Materials and Methods

Patients

Between January 2012 and November 2013, a total of 50 patients with knee OA at two university-affiliated teaching hospitals were recruited to the current study, which was approved by the Tehran Medical Science University, Tehran, Iran ethics committees. In this study no power analysis was done, because this sample size was within those of other studies done on the same topics. Eligible subjects were scheduled for TKA to treat non-inflammatory arthritis after unsuccessful non-surgical treatment and those were less than 70 years old. Patients with inflammatory arthritis, a history of patellectomy, high tibial osteotomy, patellar fracture, varus/valgus deformity of greater than 20 degrees, or flexion contracture more than 25 degrees and extensive bone defect were excluded. Patients were randomized before surgery to receive patellar resurfacing (n = 24; resurfaced group) or to retain their native patella (n = 26; non-resurfaced group) based on envelope selection and provided informed consent. Evaluations were performed pre- and postoperatively by an evaluator who was blinded to group allocation, patients were not blinded to group allocation.

Operative technique

One of three experienced surgeons or their trainees under supervision performed surgery. Patients after tibial and femoral cut were allocated to the PR and NPR groups. Standard surgical technique including a midline incision and medial parapatellar exposure was utilized in all patients. All surgeries were done under tourniquet pressure. The Profix™ Total Knee System, a posterior cruciate sacrificing, fixed bearing prosthesis manufactured by Zimmer, Inc. was utilized in all subjects with cemented components. In cases where both knees needed surgery, each knee was randomized independently. PR was performed using all-polyethylene prosthesis, and PNR was achieved with osteophyte removal, electro-cauterization in the 5mm edge of the patella, and fibrillated cartilage smoothing. A standardized clinical pathway was followed ensuring all subjects received similar preoperative, perioperative and postoperative care; early mobilization was encouraged starting the first postoperative day.

Evaluations

The following clinical, functional and radiologic scores were assessed preoperative and 6 months after surgery: Knee range of motion, Knee Society Knee score (KSKS), Knee Society Function score (KSKS-F), Western Ontario and McMaster Universities Arthritis Index (WOMAC), 36-Item Short Form Health Survey (SF-36), Kujala Anterior Knee Pain Scale (AKPS) and Visual Analogue Scale (VAS) score for pain. Alignment was evaluated using knee society radiographic evaluation system in which α and β are defined as angles of femoral and tibial components in coronal section and γ and δ are defined as angles of femoral and tibial components in the sagittal section. In addition, the patients' radiographic imaging was scored based on the six

commonly used systems the Kellgren-Lawrence in both PR and NPR groups. Patients' comorbidities, post-surgical complications, need for a second surgery, and the surgery to release lateral retinaculum were carefully documented. Other parameters such as age, gender, height, weight, and patella thickness were assessed as independent factors.

Statistical Analysis

Statistical analysis was performed using the SPSS software, version 18.0 (Statistical Product and Service Solutions, SPSS Inc. Chicago, IL, USA). The data are presented as the mean ± standard deviation. The test for normality was performed using the Kolmogorov- Smirnov test. The Wilcoxon and Mann-Whitney U tests were used to compare the continuous variables. The paired t-test was used to compare the quantitative variables before and after the surgery. A P value of < 0.05 was considered statistically significant.

Results

A total of 50 subjects were enrolled with 24 randomly allocated to the Resurfaced and 26 to the Non-resurfaced group. Overall, 42 cases were men and 8 were women, with an average age of 64.8 ± 7.8. There were 11 cases of right side osteoarthritis in PR, and 13 in NPR groups; and in the left knee the number was 13 in both groups.

Both PR and PNR groups resulted in improved ROM and other functional tests after surgery (Table 1, Fig.1, $P \leq 0.001$). Statistical analysis showed no significant difference between resurfacing and non-resurfaced group pre and post-operative regards to the in improvement of in improvement of ROM (), KSKS (p=0.782, p=0.553), KSKS-F (p=0.241, p=0.293), AKPS (p=0.128, p=0.443), WOMAC (p=0.700, p=0.282), and pain scores (p=0.120, p=0.508) (Table 1). Moreover,

mean degrees of angles evaluated by knee society radiographic evaluation system did not show any significant difference between groups (Table 1, T-test, P>0.05).

In this study there were no significant differences between resurfacing and non-resurfaced regards to the baseline characteristics including age (p = 0.92), gender (p = 1.00), BMI (p = 0.57) and patella thickness (p = 0.46) with the exception of SF-36 score, where the PNR group reported lower preoperative.

Surgical complications were not observed during the 6-month follow-up. Neither PR nor PNR group cases needed a revision surgery or lateral retinaculum release. Co-morbidities differences were not statistically significant between groups.

Discussion

This study showed that TKA in both PR and PNR groups improved KSKS and KSKS-F, however, there is no difference between these two methods in the level of improvement, which is in agreement with the studies of Pavlou et al. (18), Burnett et al. (13) and others (3, 14, 19-21). Nevertheless, in the studies of Schoroed et al. (22) and Waters et al. (11), KSKS was better in PR than PNR group, while the KSKS-F was equal. Nizard et al. (23) and Parvizi et al. (24) reported significantly higher scores in both KSKS and KSKS-F in the PR group compared to PNR. We could not reject the null hypothesis to show any difference between PR and NPR'. Reasons for inability to reject the null hypothesis are small sample size, and bias in sample selection

Our study showed that the minimum range of motion improved to about 5-8 degrees in both groups, though not significantly different between them. In addition, after surgery, the maximum range of motion improved to 15-18 degrees in both groups, again with no significant

difference in intergroup analysis. Meftah et al. (25) and Burnett et al (13) also reported similar results.

In this study, we have found lower mean functional score in resurfaced group than non-resurfaced, but this was not significant. In a meta-analysis of 7 studies, Arirachakaran et al. showed lower but not significant functional score in patellar resurfacing (609 patients) compared with non-resurfacing (660 patients) (26). However, in the meta-analysis of the 7 studies reporting on the KSS function score there was a high and significant heterogeneity between studies, therefore no conclusion can be drawn easily from those data (26). In a retrospective study on functional aspects on 53 patients, van Hemert et al. (2009) reported that patients who underwent resurfacing in TKR had a functional advantage over those who were not resurfaced (27). According to the finding, it seems non-resurfaced groups showed a borderline improvement in Knee Society Function Score compared to the patellar resurfacing groups.

The Kujala score is an appropriate evaluation method in the patellofemoral position. In the present study this score was improved in both groups equally postoperatively. One of the limitations of this scoring is that in higher scores the patient may feel no pain, as for example 74.6, in the study by Vahurmets (28); and thus its inference should be done deliberately.

The WOMAC score is inversely related to the patient's conditions. Knee arthroplasty in both groups reduced WOMAC, with no difference between PR and PNR. This finding is comparable to studies of Campell et al. (14) and Lauren et al. (29). Additionally, we have found an increased SF-36 score and a reduced pain score after surgery in both groups similar to Lauren et al. (29), both changes was not different between the two groups.

Although not statistically significant, patients of PR group reported more pain when going up the stairs. It has been previously explained that cauterization around the patella results in reduction of anterior knee pain and better patient satisfaction after surgery (21). We also applied cauterization around the patella in patellar non-resurfacing cases, which might have contributed to relieve pain. In studies of Campell et al. (14) and Parry et al. (20), the outcomes of pain reduction was not different between the groups, similar to our study. In most studies, anterior knee pain has been assessed after knee arthroplasty; but in this study it was evaluated as a whole. The results of anterior knee pain score are confusing in the literature. Some studies did not report any difference between the PR and PNR groups (13, 14, 18, 30), while others show lower pain in either PR (1, 11, 22, 31) or PNR approach (32).

In radiographic evaluation, the measured angles of α, β, γ and δ in PR and PNR groups are in accordance with other studies including reports by Bae et al (33) and Bach et al (34), where the angles were not statistically different between groups.

In this study, patella-related complications was not observed, neither in PR, nor in PNR group which is in accordance with the study conducted by Meftah et al. (25). In none of the groups of our study, revision was performed; in contrast, Lauren et al. (29) and Campell et al. (14) performed two revisions in PNR and one in PR groups in the 10-year follow-up.

It appears that a number of patients with PNR approach suffered from anterior knee pain; and the revision is implemented not because of the patellofemoral complications, but to control anterior knee pain. The meta-analysis by Stephan et al (13) showed that occurrence of revision surgery is equal in PR and PNR groups but some other reports suggest less need for revision

surgery in PR groups (18). In our study, an accurate judgment could not be made due to short follow-up period.

Our study had some limitations. First of all, the number of patients was low and this brings the concern of type B error, which indicates that the non-significant difference between two groups may be the consequence of low number of patients. Second, our follow up period is relatively short; considering the fact that complications sometimes occur years after the surgery. Hence, we are going to continue to follow the patients for another four years.

However, we do not think that these limitations undermine the main finding of this study. This prospective randomized study showed that TKA is effective procedure with considerable improvement in patients' pain and function. However, patellar resurfacing or non-resurfacing has no significant effect on pain and function.

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Figure legend

Fig. 1. Mean ROM-Low (A) and ROM-high (B) *before* and *after* surgery. The results suggest that both resurfacing and non-resurfacing improve ROM-Low and ROM-high, but the difference between them is not significant. *** P<0.001.