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Research Article

Treating Anterior Knee Pain in the Post-Arthroplasty Patient by Isolated Patellar Resurfacing (IPR)

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Abstract *Purpose.* Patellar resurfacing during prosthetic replacement of the knee is associated with loosening and the need for secondary revision. In many cases the patella is left unreplaced during this procedure in order to decrease the revision risk. Some of these patients remain symptomatic after knee replacement. Secondary isolated resurfacing of the previously unresurfaced patella in total knee arthroplasty remains controversial. The aim of this retrospective study was to evaluate the outcome after isolated patellar resurfacing (IPR) as a second stage procedure. *Methods.* The study included 33 patients (22 females/11 males) who underwent resurfacing of the patella with a mean follow-up of 44.8 ± 12.2 months. The mean age of the patients was 70.3 ± 15 (range 39–95) years at the time of operation. The average period between total knee arthroplasty and patellar resurfacing was 23.3 ± 15.2 months. The patient's subjective satisfaction was assessed according to the Knee Society Score (KSS) questionnaire. *Results.* The mean objective KSS improved significantly from 41.6 ± 9 to 64.9 ± 11 ($P < .01$). The mean functional KSS also improved significantly from 41.6 ± 8 to 60.5 ± 9 ($P < .01$). Two patients (6%) needed further operative revision. Multivariate analysis indicates that results are better in males and in nonobese patients. *Conclusions.* Although clinical scores showed significant improvement, some patients have pain and remain dissatisfied following IPR. IPR should be considered in patients who underwent prosthetic knee bicompartmental. Patellar resurfacing should be considered if there is no evidence of prosthetic components malalignment and at least 12 months have passed since the primary implantation.

Keywords knee arthroplasty; patella replacement; osteoarthritis; anterior knee pain; knee replacement complications

1. Introduction

Total knee arthroplasty (TKA) has become the main surgical tool in the treatment of primary osteoarthritis of the knee [1]. Outcomes appear to be similar both clinically and functionally, with or without patellar resurfacing [1,2,3]. In addition, patellar resurfacing might lead to specific complications including patellar fracture and patellar component wear [4], but revision rates are slightly higher in the nonresurfaced group [3], especially revisions due to pain [5]. A malpositioned femoral component increases the patellofemoral contact pressure, thus affecting the clinical outcome and the long-term survivorship of the implant [6]. However, in patients with persistent anterior knee pain (AKP) after TKA, the source of symptoms cannot be identified [7]. A few studies demonstrating long-term outcome after IPR of the patellar component were published. While the procedure appears to be successful in many cases [8], patients with more than 3° of femoral internal rotation undergoing secondary patella resurfacing should be warned of the possibility of a poor outcome [9]. The aim of this retrospective study was to evaluate the clinical outcome after patellar resurfacing as a second stage procedure for AKP after TKA. Patients with component malalignment were excluded as this group tends not to have a good result following IPR [9].

2. Methods

At our institute, a consecutive series of 2006 TKAs performed by one of the authors from January 1st, 2000 to January 1st, 2012 was reviewed. Of this series 1,776 were primary TKAs, and in 1,523 the patella was not resurfaced. Primary patellar resurfacing was most commonly performed due to intraoperative decision by the surgeon (mostly in cases of bulky patella or due to impression of maltracking of the patella (115 cases), as well as in cases after tibial osteotomy (32 cases), following patellar fracture (21 cases), primary patella baja (7 cases), or severe patella femoral osteophytosis (78 cases)). Out of 1,523, 543 patients underwent bilateral nonsimultaneous TKA.

Out of 1,523, 33 patients had undergone IPR. Of the 33 IPRs, there were 21 Sigma Total Knee System (Depuy-Synthes, USA), five Sigma Rotating Platform Knee, two IB-II prostheses (Zimmer, Swindon, UK), and five Biomet (Warsaw, IN, USA) AGC.

IPR was performed using a single component without regard to the kind of primary arthroplasty in situ. The implant chosen for the second stage resurfacing was a round patella component (PFC Sigma Round Dome Patella 3 Peg, Depuy-Synthes, USA). A number of 31 IPR patients were

available for evaluation (one passed-away and another was lost to follow-up).

2.1. Demographics

The study included 33 patients (22 females/11 males) who underwent resurfacing of the patella with a mean follow-up of 44.8 ± 12.2 (range of 24 to 92) months. The mean age of the patients was 70.3 ± 15 (range of 39 to 95) years at the time of IPR operation. The average period between total knee arthroplasty and patellar resurfacing was 23.3 ± 15.2 (range of 15 to 64) months. Out of 33, seven patients had diabetes, 21 had hypertension, six had ischemic heart disease, two had impaired renal function (creatinine higher than 1.2 g/dl), and five had bilateral arthroplasty. None of the contralateral arthroplasties had AKP.

2.2. Inclusion/exclusion criteria

Inclusion criteria were persistent AKP after primary TKA, without improvement after conservative therapy of at least 15 months. The conservative therapy included physiotherapy according to published protocol [10] employing drop and dangle technique [11]. Patients who remained symptomatic after six weeks of rehabilitation underwent repeat courses up to 12 months post op when improvement has been shown to reach a plateau [12].

All patients were symptomatic during daily activities including getting up from chair, walking, and stair climbing. A pre- and postoperative X-ray in lateral, skyline, and anteroposterior views was performed to detect cases of lateralization of the patella and to assess the patellofemoral joint.

Exclusion criteria included patients with elevated CRP, positive gallium bone scans, radiographic signs of component malalignment or loosening.

Treatment of the patella during primary arthroplasty. All cases of TKA were performed via a medial parapatellar arthrotomy incision. The patella was everted and osteophytes resected. Patellar denervation with electrocautery was performed in all cases of nonresurfaced patellae to reduce AKP [13].

2.3. Operative technique

All surgical procedures were performed by one of the authors via the previous incision and a standard medial parapatellar arthrotomy. Postoperatively, full weight-bearing was allowed in all cases and the drain was retained for 24 h. The KSS [14] was filled out preoperatively and at the time of follow-up. The patients' satisfaction was also evaluated by a custom-made questionnaire which included three grades from satisfied to partially satisfied and not satisfied [6].

2.4. Statistical analysis

Results are reported as mean ± standard deviation for parametric data and median for nonparametric data. Statistical analysis was performed using the Analyse-it version 2.3 program, Excel 12+ (Analyse-it Software Ltd. 2015), and the Student's t-test for dependent samples after using the Kolmogorov-Smirnov test to check for normal distribution and the Levene test to determine the equality of variances.

2.5. Defining component alignment

Component malalignment was determined according to computerized tomography as previously described [15]. In short, rotational alignment with respect to anatomic landmarks was measured for the femoral component relative to the surgical trans-epicondylar axis and for the tibial component relative to the medial third of the tibial tuberosity and then the images are transposed to measure relative rotational mismatch between the femoral and tibial components. Malalignment degrees of ± 3 in either direction were considered to be acceptable according to previously published data [16].

3. Results

The mean KSS improved significantly from 41.6 ± 9 to 64.9 ± 11 ($P < .01$). The mean functional score also improved significantly from 41.6 ± 8 to 60.5 ± 9 ($P < .01$). Two patients (6%) needed further operative revision. Results are better in males ($n = 11$, mean improvement 31 ± 6 points) than in females ($n = 22$, 19.4 ± 10, t-test $P < .05$) and in nonobese patients (defined as BMI less than 30) ($n = 15$, mean improvement 38 ± 8) than in obese patients with a mean improvement of 11.0 ± 5 points, t-test, $P < .05$.

Furthermore, according to a five-grade Lickert scale custom-made questionnaire designed to detect patients' satisfaction with the surgical procedure, the results were as follows: one patient satisfied, two quite satisfied, three no change, four quite unsatisfied, five unsatisfied. The median value was 1 ± 1.6, IQR 2. Nineteen patients (61.2%) indicated they were satisfied/highly satisfied with the procedure and only six (19.3%) were dissatisfied/highly dissatisfied and reported persistent AKP (the rest (eight patients) had a noncommital response indicating that the revision did not change much in their pain condition). In total, two patients (6%) from the same cohort of the dissatisfied patients ($n = 6$) were revised due to AKP, and underwent complete total knee arthroplasty exchange using a revision system (M.B.T. Revision Tray, DepuySynthes). Both patients remained with AKP after the full revision was performed. No clear cut explanation of the persistent AKP was available in those two cases. The other four patients were treated conservatively with physiotherapy and analgesics, and remained symptomatic.

4. Discussion

AKP is difficult to manage in TKA patients. It appears to have a similar incidence in patella-resurfaced TKA than in nonresurfaced knees [17]. Though more revisions

are performed in the nonresurfaced group, as long as the replacement patellar component is not metal backed, overall results are similar in both types of surgery [18]. The current series suggests that only a small minority of patients with unresurfaced patellae require revision due to AKP (33/1523, 2.1%) confirming results of previous studies indicating that clinical results are not affected by patellar resurfacing during total knee arthroplasty [3,5]. Most revised patients are either satisfied or partially satisfied by the revision procedure. Repeat revision with full component replacement is seldom indicated and does not seem to allow improvement in residual AKP IPR. These findings are in line with the currently available literature. Clements et al. have found that rates of early revision of primary total knees were higher when the patella was not resurfaced, due to surgeons being inclined to resurface later if there is patellofemoral pain [19]. The success rate in this series is higher than the approximate 50 success rate reported by Correia et al. [20]. This might be due to our routine use of bone scan and CRP levels in order to rule out infections and the use of computerized tomography-scans to rule out component malalignment. Even 3° of femoral internal rotation in patients undergoing secondary patella resurfacing leads to the possibility of a poor outcome [9]. Additional routine evaluation should be for patellar instability using the Laurin view [21], as patellar instability is quite common in patients with AKP after bicondylar replacement [22].

Resurfacing of the patella appears to have no clinical effect on pain and function after TKA [23], though for medical insurers a strategy of replacing all patellae might prove to be cheaper [24].

The strengths of this study is the relatively large series of successive arthroplasties done at one institute according to the same protocol. In addition, only two of 33 patients were unavailable for follow-up examination. The size of the cohort (1,523) arthroplasties allows the determination of the frequency of AKP in unresurfaced knee arthroplasties. The limitations of the study include the use of several different prosthesis designs for knee arthroplasty.

The need for routine patellar resurfacing during primary knee arthroplasty is somewhat controversial [25,26,27]. It appears that the current trend is toward resurfacing of the patella in all patients [1] as it seems to be cheaper in the long run [24]. Based on our experience, it seems that patellar resurfacing is optional during primary TKAs. Some patients are likely to suffer from AKP after knee arthroplasty. In persistent AKP, IPR should be performed provided there are no component malalignment per computerized tomography, no evidence of infection and preferably in a nonobese patient. When these limitations are adhered to, the majority of patients can be relieved of AKP by IPR. A minimum waiting period prior to IPR seems to be around a year, as some cases improve eventually with conservative measures.

Conflict of interest The authors declare that they have no conflict of interest.

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