Long-term results of patellofemoral arthroplasty

A REPORT OF 56 ARTHROPLASTIES WITH 17 YEARS OF FOLLOW-UP

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We studied retrospectively the outcome of patellofemoral arthroplasty (PFA) using the Richards prosthesis in 51 patients (56 knees). Their mean age was 50 years (30 to 77). In 43 patients (45 knees), the American Knee Society score and the patients’ subjective judgement were assessed. Excellent or good results were obtained in 86% of cases at a mean follow-up of 17 years (15 to 21).

Because of ongoing tibiofemoral osteoarthritis, two patients required a high tibial osteotomy and ten PFAs were converted to a total knee arthroplasty after a mean of 15.6 years (10 to 21). The PFAs were stable during follow-up with a loosening rate of only 2%.

We conclude that a patellofemoral prosthesis is a good treatment option with successful long-term results in middle-aged patients with radiologically documented, isolated, patellofemoral osteoarthritis.

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Patellofemoral pain is a common symptom in general orthopaedic practice. Most patients can be treated conservatively by modification of activities, isometric quadriceps strengthening, and/or the administration of non-steroidal anti-inflammatory drugs. Surgical treatment may be necessary in patients with chronic patellar subluxation, osteochondritis dissecans of the patella, excessive lateral pressure syndrome, or patellofemoral osteoarthritis (PFOA).1 In patients with PFOA, anterior advancement of the tibial tubercle, debridement of osteophytes and chondrectomy combined with drilling of the subchondral bone, facetectomy, patellar reconstruction with periosteal grafts, patellectomy, or surface replacement of the patella alone have been suggested as surgical options.2-12 All these procedures have shown variable and often unpredictable results.

McKeever,10 in 1955, was the first to describe good results following patellar resurfacing using a metal prosthesis fixed with a screw. Subsequently, other authors reported variable results using this technique.11,12 In 1979, Blazina et al13 were the first to describe resurfacing both sides of the patellofemoral joint. The published success rates for patellofemoral arthroplasty (PFA) vary from 44% to 90%.13-20 Overall, patellofemoral replacement has better results than patellar resurfacing alone.10-20 Nevertheless, there are few studies on patellofemoral arthroplasty and, in most, only limited numbers of patients with a relatively short follow-up.6,13-19 One study on the short-term results was presented by one of us in 1982.19 We now report the long-term results of patients with PFOA who have been treated with a PFP and this series includes the long-term data for the previously reported series of patients.

Patients and Methods

We studied retrospectively the outcome of PFA in 51 consecutive patients (56 knees) with isolated PFOA treated between 1977 and 1983. There were 24 women and 27 men with a mean age of 50 years (30 to 77) and a mean follow-up of 17 years (15 to 21). Before PFA, 38 patients (74.5%) had undergone a total of 74 operations on the involved knee, including seven Maquet procedures, five realignment procedures and two osteosyntheses for a patellar fracture. In 42 of the 56 PFAs, some form of debridement of the patella was also undertaken.

During follow-up, seven patients with ten PFAs died of unrelated causes and were excluded from the study. None had required a revision of their PFA and none had been planned. One further patient, who had a good result 14 years after PFA, was excluded as rheumatoid arthritis became apparent as the underlying diagnosis during follow-up. In total, therefore, 11 PFAs were excluded leaving 45 in the study group. In all of these the indication for a PFA was iso-
lated PFOA leading to severe discomfort in daily living, such as pain at rest. The indications were, retrospectively, confirmed by reviewing the preoperative radiographs and radiological or orthopaedic notes. While reviewing the radiographs, special attention was given to possible tibiofemoral degenerative changes which were scored according to Kellgren et al.²¹ (Table I), who judged the presence of osteophytes to be less important than narrowing of the joint space.

**Surgery and postoperative treatment.** All patients received a Richards model patella II prosthesis (Smith & Nephew Richards Inc, Memphis, Tennessee), introduced through a medial parapatellar incision and a medial incision of the capsule. The V-shaped femoral component was cemented onto the femoral groove and the ridge of the cemented patellar component appropriately aligned in the sagittal direction by using two marking sutures. Immediately after surgery, range of movement exercises (0˚ to 90˚) were started as tolerated by the patient. Weight-bearing was restricted for two weeks.

**Assessment.** For the follow-up study, the notes were reviewed for short-term, surgery-related general complications such as urinary or respiratory tract infections or cardiovascular problems and complications specifically related to the PFA. The same observer (HJK) evaluated both clinically and radiologically all 42 patients who were able to visit the outpatient clinic. One was unable to attend and was assessed by telephone.

The patients were asked subjectively to score their PFA into one of four categories: 1) no further symptoms; 2) some improvement compared with the preoperative situation; 3) no improvement; or 4) worse than before the operation. Two patients were uncertain as to whether or not their situation had been improved by PFA, and their assessment was scored in category 3. For statistical analysis, groups 3 and 4 were combined because of the small number of patients involved.

For each patient, the knee score was assessed objectively using the American Knee Society Score (maximum 200 points).²²,²³

**Statistical analysis.** For analysis we used the non-parametric Kruskal-Wallis test and the Wilcoxon two-sample test (Statistical Analysis Systems, Cary, North Carolina) and for the survival graphs, SPSS (SPSS Inc, Chicago, Illinois).

**Results**

**Short-term complications related to surgery.** There were no wound infections or clinical signs of an infected prosthesis. Clinically obvious venous thrombosis was seen in four patients despite the routine use of an oral anticoagulant drug (acenocoumarol).

**Further surgery related to the PFA.** During the initial period of the study minor additional operations, such as manipulation under anaesthesia, arthroscopy or open debridement of the joint were necessary after eight procedures (18%).

Revision of the PFA was needed in seven cases (15.5%). In one this was because of patellar loosening, in two for catching of the prosthesis, perhaps due to malposition of one of the components, and in one for maltracking. All patients did well after these operations. In the remaining three, a patellectomy was performed, in one patient with a

<table>
<thead>
<tr>
<th>Grade</th>
<th>Osteoarthritis</th>
<th>Radiological features</th>
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<tbody>
<tr>
<td>0</td>
<td>Absent</td>
<td>None</td>
</tr>
<tr>
<td>1</td>
<td>Doubtful</td>
<td>Minute osteophyte</td>
</tr>
<tr>
<td>2</td>
<td>Minimal</td>
<td>Definite osteophyte, minimal narrowing of joint space</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>Moderate loss of joint space with moderate or small osteophytes</td>
</tr>
<tr>
<td>4</td>
<td>Severe</td>
<td>Severe narrowing of joint space, subchondral sclerosis, large osteophytes</td>
</tr>
</tbody>
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Table I. Criteria for the radiological features of osteoarthritis based on the atlas of standard radiographs.

Kaplan-Meier survival graphs for conversion of a) the patellofemoral arthroplasty to a TKA and b) of the patellofemoral arthroplasty for any reason.
bilateral PFA, without symptomatic improvement. Subsequently, the femoral components were removed bilaterally and a high tibial osteotomy was undertaken unilaterally in another hospital, again without improvement. For 12 PFAs further surgery was required because of progressive tibiofemoral osteoarthritis. Two patients in this group underwent a high tibial osteotomy and are functioning well to date. The remaining ten patients required a conversion of the PFA to a total knee arthroplasty (TKA) after a mean period of 15.6 years (10 to 21). The mean survival time was 19.5 ± 0.45 years (95% CI 18.6 to 20; Fig. 1a). All except for one had been satisfied with the result of their PFA for a long time and stated that tibiofemoral discomfort had become more severe only in the year before the revision operation. In two patients more than one operation was undertaken. These involved an open debridement combined, with a revision of the patellar button in one patient, and a revision to a TKA 12 years after the PFA with a patellar realignment in the other. The survival graph for a PFA using revision for any reason as the endpoint shows a mean survival time of 17.8 ± 0.8 years (95% CI 16.3 to 19.4; Fig. 1b).

In summary, of the 27 reoperations needed for 25 PFAs (two needing two reoperations), 30% were minor interventions, 26% involved the patellofemoral joint or the prosthesis itself, while 44% could not be attributed to the PFA or patellofemoral joint but to progression of the disease.

Clinical results and knee score. Of the 45 PFAs, 35 remained available for follow-up once those which had been con-

Anteroposterior and lateral radiographs of a 46-year-old man with isolated patellofemoral osteoarthritis a) and b) preoperatively, c) and d) one year after PFA and e) and f) 18 years after PFA. The knee score was 195 points and the patient was in satisfaction group 1.
verted to a TKA were excluded (ten PFAs). Of the 35 PFAs, 22 caused no further symptoms and had a mean knee score of 190 points (160 to 200; Fig. 2). The results for eight implants were very satisfactory when compared with the preoperative situation. These patients had only occasional pain and a mean knee score of 148 points (71 to 175). In this group, a 59-year-old patient with a low knee score of 71 points was awaiting conversion to a TKA 19 years after his PFA. He had been very satisfied until the year before revision was scheduled. There was no improvement following three PFAs and the symptoms were worse following two. In this group of five implants with fair or poor results, the mean knee score was 89 points (30 to 118). A patellectomy was undertaken in three with moderate results.

Discussion

Given the number of extensive procedures after the implantation of a PFA in this series, we conclude that patellofemoral unicompartmental arthroplasty has a high complication rate. A significant issue is progression of the disease, necessitating conversion to a TKA. Perhaps a PFA should be compared with operations such as high tibial osteotomy, in which a successful outcome at ten years is considered a good result.

The overall mean knee score of the entire series, including the failures, was 167/200 points. The mean knee score of the patients with a good or excellent result, excluding the patient who is awaiting conversion to a TKA, was 183 points (145 to 200). This score is high and compares favourably with the outcome after TKA, and may reflect the lower mean age in our series when compared with that of patients undergoing TKA. A PFA lacks, however, the intrinsic limitations in movement that a TKA can induce. All our patients were able to flex the knee to at least 125° after PFA. We therefore consider that our population is different from that with tricompartmental osteoarthritis of the knee which is in agreement with other authors who have considered that PFOA is a different entity to tibiofemoral osteoarthritis.24,25 Thus, treatment in patients with isolated PFOA should not be postponed until tibiofemoral osteoarthritis makes a TKA essential. Not only can the intervening period be long, but postponing treatment in these often young patients places severe limitations on their ability to work and their quality of life.

The overall results in 30 of our 35 patients (86%) with their PFA still in situ are good or excellent. Nine of the ten patients in whom conversion to a TKA was necessary had a good result for a mean of 15.6 years (10 to 21). These could also be considered as good results and the good or excellent results would have been obtained in 39 of 45 knees (87%).

When analysing the results of the 30 patients with a good or excellent result who still had their PFA in situ, 28 (93%) had a minimum knee score of 150 points (150 to 200) and a mean knee score of 183 points. This shows that the patient’s subjective assessment of their PFA correlates well with a validated and objective knee score. When analysing the result for the remaining five patients with a fair to poor result, two had retrospectively had bicompartamental osteoarthritis before surgery. One further patient had grade-II chondromalasia and not PFOA. In retrospect, these had not been appropriate indications for a PFA and for this reason these may have been excluded from our study. Perhaps with more careful patient selection a higher rate of good or excellent results may be obtained. We agree with Blazina et al13 who stressed the importance of careful patient selection when patellofemoral replacement is considered.

Provided that a PFA is successful, and as long as there is no progression of disease, the result can be excellent and long-lasting. Given a rate of loosening of only 2% for the patellar component after a mean follow-up of 17 years, we conclude that loosening of the prosthesis is not a problem. With these small numbers, we cannot assess whether or not minor involvement of the medial or lateral tibiofemoral compartment influences the outcome. The Kellgren classification also has considerable intraobserver and interobserver variation.

Given the 86% long-term good or excellent results in our study, and in agreement with other studies, we feel that a patellectomy should only be considered as a salvage procedure in patellofemoral osteoarthritis or trauma.9,26,27 Moreover, patellectomy is unfavourable in knees in which a TKA may be needed in the future, as it changes the lever arm of the quadriceps muscles which, in turn, may result in an extension lag and instability of the knee.26,28,29 In our series, a patellectomy was needed as a salvage procedure after three PFAs. In one patient with bilateral PFAs the femoral components were subsequently removed elsewhere. This patient was clearly dissatisfied with the result and the PFA was considered to be a failure. Another patient claimed that neither the PFA nor the subsequent patellectomy improved her symptoms. It therefore seems sensible to retain the patella as a fulcrum for the knee extensors and to deal with patellofemoral osteoarthritis at the pathological site itself, by patellofemoral arthroplasty.

We conclude that a PFA is a good option for patients with radiologically documented, isolated, patellofemoral osteoarthritis. The rate of good or excellent results at 86% shows room for improvement. In our series loosening of the PFA was rare and was only seen with the patellar button.

PFA has a long-term survival rate of 98% after a mean follow-up of 17 years in patients without ongoing tibiofemoral osteoarthritis. Since there may be progression of the disease, future problems should be borne in mind. We thus recommend the use of a PFA when isolated patellofemoral osteoarthritis occurs in patients from middle age and onwards.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

References


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