

Secondary resurfacing of the patella in total knee arthroplasty

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A B S T R A C T

Anterior knee pain following primary total knee arthroplasty is common and can be difficult to treat satisfactorily. We reviewed 28 consecutive patients (29 knees) who underwent secondary resurfacing of the patella for persistent anterior knee pain and report on the results. Mean follow up was 28 months (range 12–61) with no cases lost to follow up. Oxford knee scores, range of motion, the patient's assessment of outcome and overall satisfaction were recorded.

Seventeen out of 19 (59%) felt their knee was better following patellar resurfacing, 10 out of 29 (34%) felt it was the same and two out of 29 (7%) felt it was worse. There was a significant improvement in Oxford knee scores ($p < 0.001$) and significant increase in patient satisfaction ($p < 0.001$) following secondary resurfacing. While secondary resurfacing of the patella does not provide the solution for every case of anterior knee pain following total knee joint replacement, in greater than 50% of cases it can be effective at relieving symptoms and in this series carries a low risk of worsening symptoms or complications.

Keywords:

Secondary patellar resurfacing
Anterior knee pain
Patellofemoral
Knee

1. Introduction

Anterior knee pain (AKP) following primary total knee replacement (TKR) is common, with average reported rates of around 10% [1–4]. There are however a number of studies reporting rates far higher than this from 25 to 43% [5–9]. If the symptoms are of patellofemoral origin and related to a degenerate patella, in selected cases, subsequent resurfacing the patella (a secondary resurfacing procedure), may offer a solution. There is however, little published data on the results of this procedure; with existing studies based on small numbers of cases. Currently the main body of literature reflects unfavourably on it. One review suggests that the chances of worsening symptoms are not dissimilar to that of improving them [10], while another indicated that it may increase dissatisfaction and hasten revision [11].

We performed a retrospective review of our arthroplasty database of a consecutive series of 30 patients (31 knees) who underwent secondary resurfacing of the patella and report on the results. As far as we are aware, this represents the largest review in the literature of this procedure to date.

2. Patients and methods

In the 5 year period 2002 to 2007, 30 patients (31 knees) underwent secondary resurfacing of the patella for persistent AKP following primary TKR, in our department. All patients had persistent

AKP with patellofemoral joint tenderness and degenerative changes of the unresurfaced patella on plain radiograph skyline views (Fig. 1). All had negative infective markers on blood testing. There were no obvious femoral or tibial implant rotational abnormalities, or signs of over sizing of the femoral component, either on clinical grounds or at the time of surgery.

During the same 5 year time period, 1923 primary TKRs were performed in the same department – all without computer assisted navigation. In the majority of cases the patella was not resurfaced at the time of the index procedure. In 166 out of 1923 knees (8.6%) the patella was resurfaced at the time of TKR with our indications for this being either the presence of rheumatoid arthritis or of a dysplastic patella with sagittal ridging and adequate remaining bone stock.

As per our departmental protocol for arthroplasty review all data were collected prospectively by the department's outcome assessment team before the secondary resurfacing procedure, at 3 months and then yearly post surgery. At all time points the Oxford knee score (OKS) [12], the patient's satisfaction with their knee replacement (very satisfied, satisfied, unsure or dissatisfied) and the range of motion (measured by goniometer in degrees) were recorded. In an attempt to minimise bias patients were asked by an independent member of the outcome assessment team, to rate whether they felt the knee was better, the same or worse following the secondary resurfacing procedure. Particular note was made of question 12 of the OKS, which evaluates the patients' ability to descend stairs and has been used in previous published studies to assess specifically the patellofemoral joint [13]. Radiographic assessment of patella height was performed by the lead author (SJS) via both Blackburne Peel [14] and Insall Salvati [15] methods at three time points, pre operation primary TKR, pre and post secondary resurfacing.

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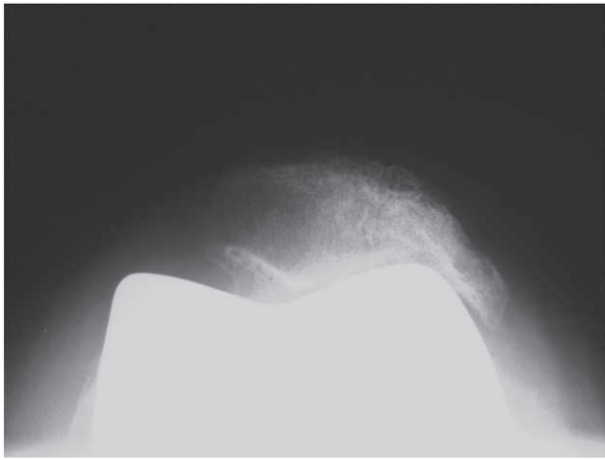


Fig. 1. Skyline view of degenerate patella.

One patient who died of unrelated causes and one who developed dementia were excluded leaving 28 patients (29 knees) to follow up, with a minimum follow up of 1 year. There were 10 males and 18 females with the mean age at time of secondary resurfacing 72 years (range 55–89). The mean time interval to secondary resurfacing following primary TKR was 29 months (range 11–89). Mean follow up was 28 months, (range 12–61) post resurfacing, with no cases lost to follow up. Two fixed bearing TKR implants were used at the time of primary surgery: 18 (62%) PFC Sigma TKRs (Depuy International, Warsaw, Indiana, USA) and 11 (38%) Kinemax TKRs (Stryker, Kalamazoo, Michigan, USA), giving a secondary patellar resurfacing rate of 18 out of 508 (3.5%) in the PFC group versus 11 out of 1249 (0.9%) in the Kinemax group.

3. Statistical analysis

Paired statistical tests were performed to determine changes in outcome measures before and after surgery. Where differences were normally distributed, paired *t* tests were used; otherwise a Wilcoxon test was performed. All analyses were done using Minitab (version 15) with a significance level of 5%. For the purpose of analysis the experimental unit was a knee and for each test *n* = 29.

4. Results

4.1. Outcome

At mean 28 months 17 out of 19 (59%) felt their knee was better following secondary resurfacing, 10 out of 29 (34%) felt it was the same and two out of 29 (7%) felt it was worse. There was a good correlation observed between this outcome and lower post-operative OKS, as illustrated in Table 1. In those with a primary PFC implant, 12 out of 18 (66%) were better, four out of 18 (22%) the same and two out of 18 (11%) worse following the secondary resurfacing procedure. While with the Kinemax knee four out of 11 (36%) were better and seven out of 11 (64%) remained the same post-operatively. There was no correlation between time from TKR to secondary resurfacing and success of outcome (Mann–Whitney *p* = 0.125).

Table 1
Pre- and post-operative Oxford knee scores.

Outcome	Mean pre-op resurfacing OKS ^a	Mean post-op resurfacing OKS ^a
All cases <i>n</i> = 29	46 ± 6.0	34 ± 10.1
Better <i>n</i> = 17	45 ± 6.0	28.5 ± 8.6
Same/Worse <i>n</i> = 12	47.6 ± 5.8	41.7 ± 6.3

^a Oxford knee score – possible scores 12–60, lower score better.

Table 2
Mean OKS from arthroplasty database for the same 5-year study period (2002–2007) for comparison.

Group	Number	Mean pre-operation OKS ^a	Mean 3-year post-operation OKS ^a
Database total 2002–2007	1923	45.3	25.9
Primary Kinemax not resurfaced	1249	44.4	25.5
Primary Kinemax resurfaced	76	45.3	23.4
Primary PFC not resurfaced	508	44.4	27.9
Primary PFC resurfaced	90	45.5	23.2

^a Oxford knee score – possible scores 12–60, lower score better.

4.2. Oxford knee scores

An improved OKS was observed in 26 out of 29 (90%) at latest review when compared to pre-resurfacing, with a significant reduction in OKS (paired *t*-test, *p* < 0.001), Table 1. Mean improvement in score was 12.1 [95% CI (8.19, 15.95)].

Of the 26 out of 29 in which the OKS improved with surgery, five (19%) had obtained their maximum improvement by 3 months, 15 (58%) by 1 year and the remaining six (23%) by 18 months. No improvement was observed beyond this time point.

For comparison the mean OKS for all primary knee replacements performed at our department over the same time period was obtained from our arthroplasty database. The mean OKS of 34 at latest follow-up following secondary resurfacing was still inferior to the mean score (26) from the database for the other TKRs performed over the same time period, not undergoing a secondary resurfacing procedure (1923), Table 2.

There was a significant improvement in score following secondary patellar resurfacing in response to question 12 of the OKS, (Wilcoxon test, *p* < 0.001), from a mean pre-operation score of 4.2 (± 0.76) to mean post-operation score of 2.9 (± 0.79). Median improvement in score was 1.0 (4 to 3), (95% CI (1.0, 1.5)).

4.3. Satisfaction

There was a significant increase in patient satisfaction following resurfacing (Wilcoxon *p* < 0.001). All patients, 29 out of 29, were dissatisfied with their knee replacement before secondary resurfacing. Satisfaction with the knee replacement overall post-resurfacing at time of maximum follow-up was; 11 out of 29 (38%) very satisfied, four (14%) satisfied, four (14%) unsure and 10 (34%) dissatisfied. There was no correlation between time from TKR to secondary resurfacing and satisfaction.

4.4. Range of motion

There was a trend towards an increase in the mean range of motion in the knee joint at most recent time of review following surgery, with an increase in the mean arc of movement from pre-resurfacing 90° to 97° post-operation, (paired *t*-test *p* = 0.082), (95% CI (1.03, 15.79)).

4.5. Patella height

There was no correlation noted between outcome following secondary resurfacing and the pre- or post-operative patella height assessed via either radiographic method.

4.6. Complications

Post-operative morbidity was low with one case of patella fracture, [one out of 29 (3.4%)]. No other complications were noted.

5. Discussion

Our results show that secondary patellar resurfacing can be effective at relieving persisting anterior knee pain following primary TKR, with significant improvements in Oxford knee scores and patient satisfaction following the procedure. In our series, secondary patellar resurfacing carried a low risk of either worsening symptoms or of complications. To date, there is little published data on the results of this procedure; with the existing studies based on small numbers of cases [2,3,10,11]. In contrast to our study, the majority of this literature reflects unfavourably on secondary patellar resurfacing, both in terms of final outcome and complication rates associated with the procedure.

The decision on whether to resurface the patella at time of primary TKR remains controversial. Reported complications associated with patellar resurfacing (fracture, dislocation, osteonecrosis, component

wear, dissociation, loosening, patella clunk syndrome, “over stuffing” of the PFJ [1,4]) have discouraged some surgeons from its use. With refined insertion techniques and modern implants it is hoped however that a reduction in this complication rate may be achieved [1,6].

While proponents of primary resurfacing report lower incidences of AKP post operation compared to the non resurfaced groups [1,6-8], there have been a number of large studies, including prospective randomised trials, which have shown no significant difference between treatment groups [4,5,16,17]. Literature exists to support either argument, for or against resurfacing the patella. As such there remain three basic strategies for dealing with the patellofemoral joint at the time of primary TKR: never resurface, always resurface or selectively resurface [23]. The aim of this study was not to address the issue of whether the patella should be resurfaced during a primary knee replacement, indeed in our department we fall into the category of selective resurfacing. Our aim was to consider the benefits of a secondary resurfacing procedure, in selected patients with persisting anterior knee pain and symptoms felt to be related to the unresurfaced patella.

The existing literature on secondary resurfacing is based on relatively small number of cases (six to 20 cases) and mainly reflects unfavourably on the procedure [2,3,10,11]. Individual surgeon's views on primary resurfacing may influence whether they favour secondary resurfacing or not. Mockford and Beverland [10] (who routinely do not primarily resurface the patella) reviewed 13 out of 2950 (0.4%) primary TKRs who went on to have secondary patellar resurfacing for persistent AKP. At mean follow up of 45 months four were better, six showed no change and three were worse. They concluded that AKP was not eradicated by simply resurfacing the patella adding that they now consent their patients that the chance of worsening symptoms is equal to the chance of improving them with this procedure. Muoneke et al. [11] reviewed 20 cases of secondary patellar resurfacing at a mean of 36 months reporting a high complication rate with the resurfaced patellae. Complications occurred in six cases (30%), three of which required to have revision surgery. They concluded that AKP following TKR remained difficult to manage and that secondary resurfacing could increase dissatisfaction and hasten revision. Barrack et al. commented on seven cases of secondary resurfacing in the unresurfaced arm of a randomised trial of resurfacing versus non resurfaced TKR in which initially four improved [2], longer term follow up showed that out of the five available for review, pain was present in four cases at average 36.8 months [17]. Karnezis et al. reviewed 14 cases of secondary resurfacing, while nine out of 14 (64%) showed significant improvement in pain, three out of 14 (21%) remained the same and two out of 14 (14%) deteriorated [3]. Our results would suggest low rates, two out of 29 (6.9%), of worsening symptoms/knee scores.

Post operative morbidity following secondary resurfacing was low (zero) in the majority of published literature on the procedure [2,10,11]. One series, Karnezis et al. [3], however reported high rates, six out of 14 (30%), which included one case of post operative patella fracture (7%). Our post operative morbidity was low, one out of 29 (3.4%), with one case of patella fracture. At 9 months following the secondary patellar resurfacing, this 82 year old lady fell while getting off the bus, sustaining a minimally displaced patella fracture. Examination revealed minimal discomfort and a reduced but intact straight leg raise (SLR) with a 5 degree extensor lag. Active flexion was present to 80°. It was elected to treat this conservatively. By the 6 week review she could SLR with no extensor lag. This patient went on to fibrous union and to score “very satisfied” with her knee with a final OKS of 28. Patella fracture is a recognised complication of patellar resurfacing, primary or secondary. A retrospective review of the joint registry at The Mayo Clinic reported a periprosthetic patella fracture rate of 0.7% in 12,464 consecutive primary total knee replacements [22]. As in our case, the patella fracture is most often associated with a

well fixed implant and intact extensor mechanism [22]. It can frequently be asymptomatic and discovered only on routine follow up radiographs. In such a case, the fracture can be treated with non operatively, usually with good outcome [22,24].

While the aim of this study was not to directly compare primary implant type rather comment on the group as a whole, some trends between implants were observed. Of interest was the relative higher percentage of patients with the PFC primary TKR, when compared with the Kinemax group, who underwent secondary patellar resurfacing (3.5% versus 0.9%) and who did well with the procedure, 12 out of 18 (66%) versus 4 out of 11 (36%) respectively. In a prospective randomised study of patellar resurfacing in 514 consecutive PFC primary knee replacements, the overall prevalence of anterior knee pain was 25% in the unresurfaced group versus 5% in those resurfaced [8]. In their unresurfaced group, 11 patients underwent subsequent secondary resurfacing with 10 out of 11 (91%) having complete resolution of anterior knee pain. Their recommendation was that with this prosthesis the patella should be resurfaced at the time of primary TKR when possible. While our study does not prove that all PFC knee replacements should undergo primary resurfacing, it does add some weight to the argument that secondary resurfacing can be particularly effective in this sub set of patients.

We accept that accurately assessing anterior knee pain following surgery can be difficult. There are currently no validated anterior knee pain scoring systems available. The OKS is well accepted, validated and has good ease of use for assessment following knee arthroplasty [18]. It has been shown by a range of independent studies to perform very well compared with alternative instruments [19-21]. By additionally looking specifically at question 12 of the score we attempted to address the anterior knee component in more detail. Furthermore we felt that the importance of the patient's own assessment of outcome and satisfaction following the procedure could not be underestimated and we attempted to address this in this study with the outcomes we measured. When considering differential diagnoses prior to secondary resurfacing, the authors accept the limitations of clinical assessment in excluding femoral or tibial rotational malalignment. In our department we now routinely use computed tomography (CT) scanning to assess implant rotation prior to secondary resurfacing and this may improve the results still further.

This study is the largest review of secondary resurfacing in the literature to date with results that contrast with much of the previous literature on this procedure, showing lower rates of worsening symptoms or patella complications than previously described. Persistent anterior knee pain following TKR continues to present a difficult management problem. With appropriate patient selection and an understanding of the limitations of the procedure, secondary resurfacing of the patella can provide a solution with a greater than 50% chance of relieving symptoms and with a relatively low risk of worsening symptoms or of complications.

Conflicts of interest statement

The authors declare there are no conflicts of interest.

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