



## Does malrotation of components correlate with patient dissatisfaction following secondary patellar resurfacing?



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### ABSTRACT

**Background:** The aim of our study was to identify whether there was any correlation between the outcome of secondary patellar resurfacing and malrotation of either the femoral or tibial component.

**Methods:** We identified patients that underwent secondary patellar resurfacing following previous primary total knee arthroplasty (TKA) at a single, large orthopaedic department. Patients were reviewed for range of movement, satisfaction, health status and knee function. CT scanning was performed, assessing rotational alignment of the components.

**Results:** Twenty-one patients (23 knees) were reviewed. Nine out of 21 (39%) were satisfied while 14 (61%) remained dissatisfied after the secondary patellar resurfacing. There were no complications after the secondary procedure. All knees were internally rotated. The mean femoral internal rotation in the satisfied group was 0.92°, and in the dissatisfied group was 2.88° of internal rotation. In the dissatisfied group eight out of 14 TKAs were in >3° femoral internal rotation compared with only one in nine TKAs in the satisfied group ( $p < 0.05$ ).

**Conclusions:** Investigation for malrotation should be considered in patients with post-operative pain, especially anteriorly, causing significant dissatisfaction amongst patients following TKA. This is especially true if the patella has not been primarily resurfaced and secondary resurfacing is being considered. Patients with more than 3° of femoral internal rotation undergoing secondary patella resurfacing should be warned of the possibility of a poor outcome. It may well be that if the underlying problem is component malrotation, revision knee replacement may lead to a more satisfactory outcome than secondary resurfacing alone.

**Level of Evidence:** Level of Evidence III.

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### 1. Introduction

Over 75,000 primary total knee arthroplasty (TKA) were carried out in England and Wales in 2010 [1]. Whether or not the patella should be resurfaced during primary TKA continues to be an issue of debate. Early TKA implant designs were associated with significant complaints (20%–40%) of anterior knee pain [2]. This led to the development of patellar resurfacing components. However subsequent femoral component design was more compatible with both natural and resurfaced patellae and there remains a controversy as to whether the patella should be resurfaced or not. Since then, some authors have suggested selective patellar resurfacing [3,4].

There is evidence that not resurfacing the patella is likely to be the most common reason for reoperation following primary TKA [5,6], largely due to persistent post-operative anterior knee pain [7]. Conversely, resurfacing of the patella is not without its own problem such as fracture, avascular necrosis and loosening [8].

The decision making process as to whether or not to resurface the patella during TKA therefore varies according to location, surgical and patient related factors. Some surgeons resurface all patellae at the time of primary TKA, others will never routinely resurface. Numerous centres and surgeons attempt to use specific criteria (preoperative or intraoperative) for choosing those patients suitable for patellar resurfacing. Several authors have attempted to set out criteria to aid preoperative decision making in relation to patellar resurfacing as a part of TKA [5,9]. Examples of criteria used for patient selection for resurfacing include a history of anterior knee pain or other symptoms of patellofemoral involvement in the disease process, radiological evidence of patellofemoral involvement, clinical evidence of involvement during surgery, loss of patella height/thickness and patella baja/alta. Contraindications to patellar resurfacing include soft/osteoporotic bone, small patellae, extreme wear/thinning of the patella and, in some cases, young patients with high demand [5,9]. Thus far, a method for accurately predicting which patients can avoid patellar resurfacing has not been agreed [10].

There are few studies in the literature which have reported the outcomes of secondary patellar resurfacing for anterior knee pain [11–14]. The patient satisfaction outcome from these studies varies

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from 40% to 90%. The secondary patellar resurfacing procedure can lead to further complications such as fracture and patellar maltracking and there is some evidence that late resurfacing may hasten revision [13].

It has long been suspected that malrotation of the femoral and tibial components at the time of primary TKA may lead to subsequent patellofemoral problems [15]. Berger et al. [15] reported on the outcome of 30 patients undergoing revision surgery for patellofemoral complications. Minor degrees of combined internal rotation were associated with patella subluxation whereas major amounts of internal rotation were associated with patella dislocations and prosthesis failure. None of the studies on secondary patellar resurfacing have identified the causes of the unsatisfactory outcomes.

The aim of our study was to assess the outcome in a retrospective series of patients that underwent secondary patellar resurfacing for persistent anterior knee pain following previous TKA without primary patellar resurfacing. We observed the common factors that these patients possessed, paying particular attention to component rotation, in order to identify predictive outcomes likely to lead to poor results following secondary patellar resurfacing. In particular, we analysed whether those patients that underwent secondary patellar resurfacing had the femoral and/or tibial components implanted in a malrotated position during the primary procedure. In addition, any observed malrotation was correlated with clinical outcome of the secondary procedure.

## 2. Methods

We identified all patients that underwent secondary patellar resurfacing for persistent anterior knee pain following previous primary TKA within an 8½ year period at a single, large elective orthopaedic department. All of these patients had been assessed for persistent anterior knee pain and infection and aseptic loosening had been excluded as possible causes. They were deemed suitable for secondary patellar resurfacing based on clinical and radiographic findings.

The patients were reviewed in a research clinic and the clinical assessment was carried out by two subspecialty surgeons. Patients were assessed for their subjective general health status with an SF-12 questionnaire, giving a value relating to the patient's own perspective of their general health (ranging from 12 to 50).

The patients were also asked whether or not they were satisfied with the secondary procedure. Evaluations for knee function with an inverted Oxford Knee Score [16] were measured, recording an ascending value in relation to perceived higher knee function (ranging from 0 to 48). In addition, patients were assessed for patellofemoral function with a Hospital for Special surgery Patellofemoral Score [17], providing a value from 0 to 100 relating to improved function and symptoms.

Rotational alignment was measured using Computerized Tomography (CT) scans with a Toshiba Aquilion ONE™ scanner. A 200 mm section with the midpoint at the knee joint line was scanned at a slice thickness of 2 mm. The rotational femoral component angle was defined as the angle between the surgical epicondylar axis and the posterior condylar line of the femoral component. The rotational tibial component angle was defined as the angle between a line connecting the centre of the tibial component and the medial third of the tibial tubercle and a line perpendicular to the posterior condylar line of the tibial component (Figs. 1 and 2). The ideal femoral component and rotational tibial angles are defined as within 3° of the target angle (0°) [18]. Measurements were taken by a consultant radiologist.

The data was considered to be normally distributed and therefore parametric. It was statistically analysed by comparing the group means of dependent variables using unpaired t-tests. Fischer's test was used to compare categorical outcomes. Correlation between variables was analysed using Pearson's correlation coefficient. Statistical significance was set at  $p < 0.05$ .

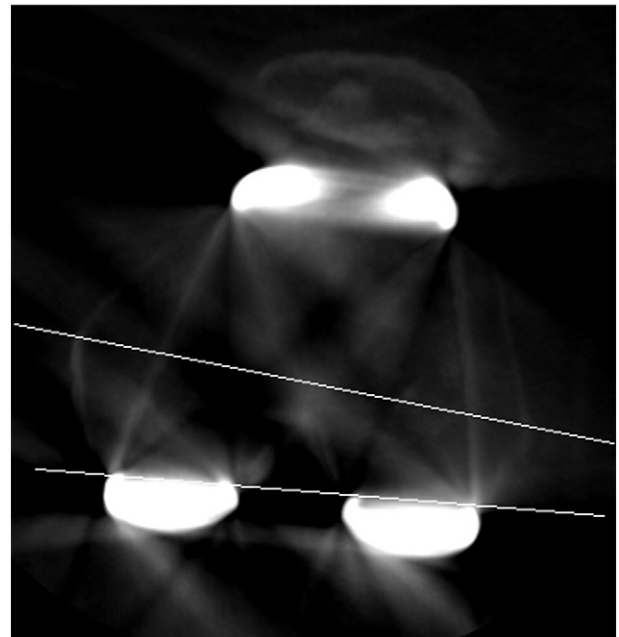


Fig. 1. Axial CT image of an example femur displaying the lines representing the transepicondylar axis and the femoral implant orientation.

## 3. Materials

Within our department approximately 5000 primary total knee arthroplasties were carried out without patellar resurfacing between January 2003 and June 2011. During this period, 25 patients (27 knees) underwent secondary patellar resurfacing following previous TKA. Of these patients, three declined participation in the study and one was not contactable.

Twenty-one patients (23 knees) were clinically reviewed. Mean time to follow up from the secondary surgery to the clinical review was 33.9 months. All surgical procedures, both primary and secondary, were carried out within our department.

All patients had the PFC Sigma prosthesis (DePuy, Warsaw) implanted at primary surgery. Two implants were posterior stabilized and the remaining 21 were cruciate retaining, including two rotating bearing implants.

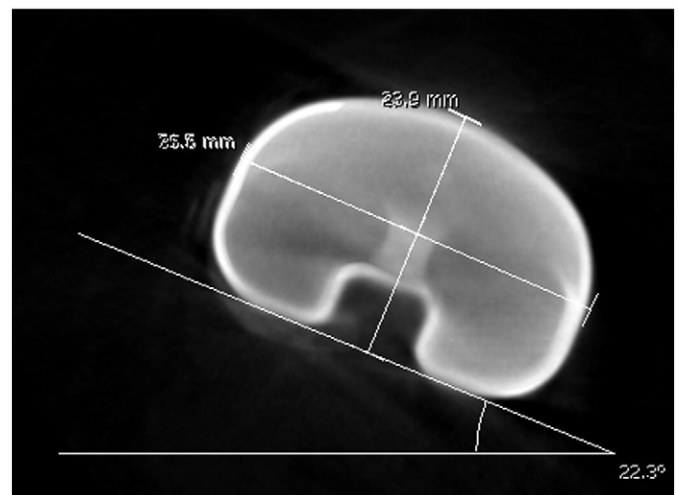


Fig. 2. Axial CT image of an example tibia displaying the lines representing the posterior condylar axis and the tibial implant orientation (with measurements).

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