



Tibial component overhang in total knee replacement : Incidence and functional outcomes

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The aim of this study was to quantify the incidence and severity of tibial component overhang in total knee replacement and find any relationship between overhang and functional outcome. 532 anteroposterior radiographs of total knee replacements were reviewed retrospectively to identify medial or lateral overhang of the tibial component. Patients completed an Oxford knee score (OKS) questionnaire at mean follow-up of 36 months. Overhang of the tibial component was noted in 13.4% of patients with a mean OKS of 35.3. Severity of overhang did not correlate with OKS.

Overhang of the tibial component is common. However, in this study it was not associated with a worse than expected outcome and increasing severity did not correlate with worse functional scores.

Keywords : total knee arthroplasty ; tibial component overhang ; Oxford knee score.

recognised cause of pain. It has been demonstrated in TKRs with overhanging femoral components that the popliteus tendon may become irritated and in patients with femoral overhang of 3 mm or more, the risk of pain is at least two fold (1,6).

Tibial component overhang has been correlated with worse results in uni-compartmental knee replacement and is often referred to as a cause of pain in TKR (3,7). It is suggested that more problems occur with medial tibial overhang rather than lateral due to the proximity of the medial collateral ligament. However, the evidence for tibial component overhang as a cause of pain in TKR seems largely anecdotal.

Patients experiencing pain after TKR may pursue litigation. If no other cause of pain is found and there is overhang of the tibial component, pain may be attributed to this and negligence assumed. This

INTRODUCTION

Total knee replacement (TKR) is a successful operation for relieving pain and improving function (2). However, a significant number of patients continue to have pain after surgery. Irritation of soft tissues by a prominent prosthetic component is a

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study aims to answer three questions : What is the incidence and amount of tibial component overhang in TKRs performed in a district general hospital ? Is the clinical outcome in patients with an overhanging tibial component universally worse than would be expected in TKR generally ? Is the degree of overhang related to functional outcome ?

PATIENTS AND METHODS

A retrospective review was undertaken of all TKRs performed at a single district general hospital between 01/12/2007 and 01/12/2008. Post-operative AP radiographs of all knees were reviewed on a computer by two reviewers blinded to the clinical outcome of the patients. Radiographs were deemed adequate if they were not rotated, demonstrated by an equal amount of tibial tray visible each side of a midpoint drawn through the keel of the prosthesis, and the x-ray beam appeared parallel to the plane of the flat surface of the tibial tray. Where patients had multiple post-operative radiographs, these were all assessed to look for an adequate film. The radiographs that were assessed were taken from the period immediately post-operative to 24 months post-operative.

Measurements were taken of any prosthetic material outside the boundaries of a vertical line extending from the cortex of the most proximal part of the tibial plateau. It was recorded whether this overhang was medial, lateral or both and consisted of tibial tray, bone cement or a combination of the two. The mean measurements from the two reviewers were used, there were no disparities > 1.5 mm between the two reviewers. To compensate for variations in magnification between different radiographs the operative records were reviewed and the type and size of the tibial component were recorded. The width of the tibial component was measured on the radiograph being assessed and a tray : overhang ratio was calculated. The known actual medial/lateral width of the tibial component from the manufacturer was used to give a measurement of overhang compensated for magnification. Overhang was graded mild (0-3 mm), moderate (> 3-6 mm) or severe (> 6 mm).

Several attempts were made to contact all patients with overhanging tibial components by phone. Patients were interviewed by a single investigator who was blinded to the degree of overhang. Patients were asked if they had undergone any further surgery on the same knee since the index procedure. They were also asked to complete an Oxford Knee Score (OKS) questionnaire (range : 0 worst – 48 best) (4). Data were analysed using

SPSS 16.0 (Chicago, IL, USA). The non-parametric Spearman's rank correlation coefficient was used to test for differences in non-normally distributed data. Linear regression analysis was used to model the association between degree of overhang and functional score. A p-value < 0.05 was deemed significant.

RESULTS

Between 01/12/2007 and 01/12/2008, 532 TKRs were carried out, all through a medial parapatellar arthrotomy. All had radiographs available for review. Fifty four radiographs were inadequate, of which 6 appeared to have some degree of overhang and 48 did not, but this could not be quantified. Of the remaining 478 radiographs, 64 (13.4%) patients had overhang of the tibial component. The incidence of mild, moderate and severe overhang was 1.9%, 9.2% and 2.3% respectively.

The overhang group consisted of 19 males and 45 females with mean duration of follow-up at interview of 36.8 months (range : 30-42). Mean age at interview was 72.6 years (range : 52-90). The components used are shown in table I. Forty-three arthroplasties were performed by or under the supervision of a specialist knee surgeon, 7 were performed by or under the supervision of non-knee surgeon consultants, 14 were performed by locum consultants or associate specialists.

Overhang was medial in 16, lateral in 39 and combined medial and lateral in 9. Of these 73 overhanging 'parts' of the tibial component, 36 were tibial tray only, 32 were tibial tray and bone cement, 5 were bone cement alone. Mean medial overhang

Table I. — Models of TKR used

| Prosthesis | Number |
|-------------------------|--------|
| Triathlon ^I | 9 |
| Kinemax ^I | 21 |
| Rotaglide ^{II} | 15 |
| AGC ^{III} | 14 |
| PFC ^{IV} | 4 |
| MBT ^{IV} | 1 |

^I Stryker, Mahwah, NJ ; ^{II} Corin Group PLC, Cirencester, UK ; ^{III} Biomet, Warsaw, Indiana ; ^{IV} DePuy, Warsaw, Indiana.

Table II. — Oxford Knee score with increasing overhang severity

| Severity of overhang medial or lateral (Most severe used on combined medial and lateral) | Mean OKS (range) |
|--|------------------|
| Mild (0-3 mm) | 32.4 (11-42) |
| Moderate (> 3-6 mm) | 36.3 (14-48) |
| Severe (> 6 mm) | 34.8 (29-40) |

was 4.1 mm (range : 1.6-15.56 mm), mean lateral overhang was 4.6 mm (range : 1.5-9.17 mm), mean combined medial and lateral overhang was 5.08 (range : 1.5-15.56).

Fifty one patients were available for interview. One patient had died and 12 were not contactable. Of the missing patients : 1 had mild overhang, 10 had moderate and 1 severe. The mean OKS for all patients was 35.3 (range : 11-48). Table II shows functional scores by severity of overhang (medial or lateral). No patients had undergone further surgery on the same knee.

There was no difference in OKS between patients with mild, moderate and severe overhang. This was the case for medial, lateral or combined overhang. Linear regression analysis demonstrated no association between amount of overhang (mm) and OKS.

DISCUSSION

Overhang of the tibial component of a TKR is relatively common in the setting of a district general hospital with an incidence of over 13%. Overhang > 3 mm (i.e. the amount where symptoms have been attributed in other studies) had an incidence of 11.5%. The incidence of overhang < 3 mm is almost certainly higher than reported here. The reason for this under-reporting is most likely that when radiographs were reviewed to identify those for formal measurement, some with < 3 mm overhang were incorrectly assigned as having the tibial component flush with the tibial plateau.

The majority of overhang was lateral which is unsurprising as the intraoperative view of this area is limited compared to the medial side through

a medial parapatellar arthrotomy. Patients with isolated medial overhang had mean OKS 33.25, compared to 36.8 in patients with isolated lateral overhang ; this difference was not significant, so we cannot provide evidence that overhang medially is more symptomatic than laterally as previously suggested (7).

Only 5 patients had overhang arising solely due to bone cement. This type of overhang should be entirely avoidable with sufficient intra-operative exposure. Three of the 5 patients with overhanging cement had > 5 mm overhang and all occurred on the lateral side.

Although our study group consisted exclusively of patients with overhanging tibial components (the vast majority of which were > 3 mm), the functional outcomes did not seem to be dramatically reduced compared to expected levels. One large study of TKR found mean OKS to be 34.8 at 2 years post-operatively, compared to 35.3 observed in our study (5). Although some patients in our study did have a poor outcome, overhang of the tibial component does not seem to give a universally worse outcome than expected from TKR.

We could also find no correlation between amount of overhang and functional outcome. A variety of factors obviously contribute to outcome after TKR but we could not find a strong enough association between overhang and poor function to be detected by the numbers in this study.

This study has several limitations. We only looked at overhang at two points on the circumference of the tibial plateau : true lateral and medial. Disparity between the shape of the prosthesis and the resected bone means overhang can occur at any point and other areas have not been included and may have been missed. The number of inadequate radiographs meant that there were patients where

overhang may be present at the points relevant to this study but we were unable to include them.

Our retrospective design meant that pre-operative data were not available to identify other factors that may influence functional outcome. However, as we have tried to include the entire population of patients with overhang, this is appropriate for answering the research questions posed. Unfortunately, nearly 19% of patients were not available for functional scores and this significant number could potentially bias our results.

This study provides a useful benchmark to others as to the incidence and degree of tibial tray overhang that is experienced in a district general hospital. It is also reassuring that when overhang occurs it is not uniformly associated with a worse than average outcome. Sizing of prostheses can be challenging and a compromise is often found between the risk of subsidence with underhang and the risk of overhang of the component. However, it is essential to gain adequate exposure so that this compromise is kept to a minimum and avoidable mistakes such as cement extrusion are avoided.

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