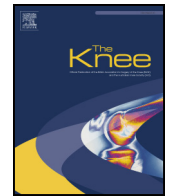




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The Knee



Unexplained pain following total knee arthroplasty: Is rotational malalignment the problem?☆

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ABSTRACT

Background: Malrotation of tibial and femoral components is a potential source of pain following total knee arthroplasty (TKA). This study aimed to 1) compare component rotation in TKA patients with unexplained pain versus a control group with well-functioning TKAs and 2) investigate the relationship between TKA component rotation and pain.

Methods: Seventy one patients with unexplained pain after primary TKA were compared to a control cohort of 41 well functioning TKA patients. Both groups underwent post-operative computed tomography (CT) scans to assess component rotation. Findings were compared between the painful and control TKA groups.

Results: We found no difference in femoral component rotation between the painful and control groups (mean 0.6° vs 1.0° external rotation (ER), $p = 0.4$), and no difference in tibial component rotation (mean 11.2° vs 9.5° internal rotation (IR), $p = 0.3$). Also, there was no difference in combined mal-rotation (tibial + femoral rotation) between the groups (mean 10.5° vs 8.5° IR, $p = 0.25$). Fifty-nine percent of patients in the painful group had tibial component rotation >9° IR vs 49% in the control group.

Conclusion: In the largest study yet on component rotation after TKA, we found no difference in the incidence of tibial, femoral, or combined component mal-rotation in painful versus well-functioning TKAs. Tibial component IR relative to the junction of the medial to middle thirds of the tibial tubercle appears to be common in patients with well-functioning TKAs. The significance of slight tibial IR should be interpreted with caution when evaluating the painful TKA.

Level III retrospective case-control study.

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1. Introduction

Total knee arthroplasty (TKA) alleviates pain and improves mobility in patients with knee arthritis. However, despite advances in operative technique, modifications in implant design and improvements in post-operative rehabilitation, the dissatisfaction rate at one year is as high as 19% [1,2]. Post-operative pain, often “unexplained”, is the greatest predictor of patient dissatisfaction after TKA [3]. The New Zealand Joint Registry reports “pain” as being the most frequent cause for revision TKA in 2015 [4].

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Several studies have described a correlation between component malrotation and patellofemoral maltracking, stiffness and painful TKA [5–10]. Furthermore, the incidence of component malrotation has been reported as high as 56% in patients with unexplainable pain post-TKA [6].

The evidence evaluating the significance of component malrotation in TKA patients with unexplained pain is limited. Previous studies have been small, with variable outcome measures. We investigated the relationship of implant rotation and unexplained pain using computed tomography (CT) in two cohorts of patients: TKA patients with unexplained pain, and a group of well-functioning TKA patients.

2. Methods

Between January 2009 and January 2014, 125 patients with knee pain since the time of their index TKA were evaluated at the Mayo Clinic Arizona. The painful knee cohort consisted of patients who underwent their primary procedure at our tertiary center and those referred from other centers. Unexplained pain was defined as TKA patients seeking review for symptoms of ongoing pain at rest and/or with activity, poorly controlled with analgesia, and non-responsive to physical therapy. Patients were evaluated according to a protocol including clinical examination, x-rays, blood tests including inflammatory markers, synovial fluid analysis and three dimensional (3D) CT scanning.

Patients with a previously well-functioning TKA, a previously revised TKA, and those with an identifiable cause for pain were excluded (Figure 1). Infection was excluded either by the presence of a normal serum C-reactive protein with no clinical suspicion of infection, or by knee aspirate. No TKAs in the study had clinical evidence of instability. Seventy-three patients with ‘unexplained’ pain underwent CT for rotational analysis and long leg films for coronal alignment. The implants used in the index procedure were variable, as patients presented from a range of centers. The mean time from surgery to CT scan was 37 months (range, two to 102 months).

The control group consisted of 48 patients from North Shore Hospital, Auckland, New Zealand. All patients underwent primary TKA between 2012 and 2013 by one of four knee arthroplasty specialists. Computer navigated, cemented, mechanically aligned triathlon cruciate retaining (CR) prosthesis was used in all patients (Stryker, Kalamazoo, MI). This group was the control group in a previously reported randomized controlled trial [11]. ‘Well-functioning’ was defined as a modified Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score >70 at two years post-operatively [12]. Seven patients were excluded as they did not meet this criterion leaving 41 patients in this control cohort. The average WOMAC score was 91.3 points (range, 71 to 100).

Patients in both cohorts underwent CT scans of their knees to determine component rotational alignment. The patient was positioned supine on the CT table with the knee in full extension. Metal reduction protocol was used and 0.6 mm thick axial slices perpendicular to the knee’s mechanical axis were taken. Femoral component rotation was calculated using the technique described by Berger et al. [5]. The slice which most clearly identified the surgical epicondylar axis (SEA) defined as a line from the medial epicondylar sulcus to the lateral epicondyle was used. The posterior condylar line (PCL) running along the posterior aspect of the medial and lateral prosthetic condylar surface was also drawn. The posterior prosthetic condylar angle (PPCA) was subtended between these two lines and neutral femoral component rotation was defined as 0° (Figure 2) [13,14]. We did not use gender specific PPCA as this is not supported in the literature [15–17].

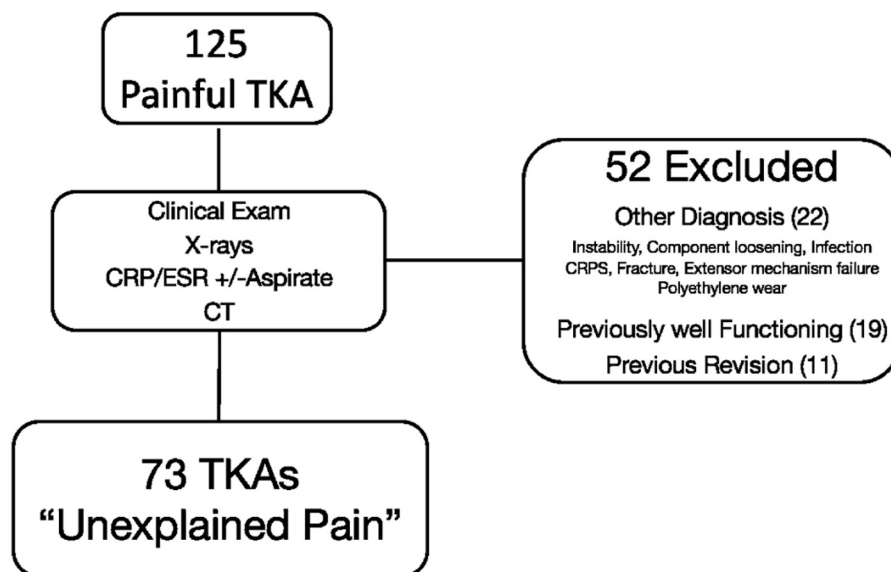


Figure 1. Painful cohort selection process. A flow diagram shows the patient selection process for the unexplained painful TKA group. Fifty-two patients were excluded; 11 revised TKA, 19 previously well-functioning TKA and 22 with an explainable cause for pain identified.

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