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The Knee

Results of total knee replacement with a cruciate-retaining model for severe valgus deformity—A study of 48 patients followed for an average of 9 years ☆

Esa Koskinen [c,*], Ville Remes [b], Pekka Paavolainen [a], Arsi Harilainen [a], Jerker Sandelin [a], Kaj Tallroth [a], Jyrki Kettunen [c], Pekka Ylinen [a]

[a] ORTON Orthopaedic Hospital, ORTON Foundation, Helsinki, Finland
[b] Department of Orthopedics and Traumatology, Peijas Hospital, Helsinki University Central Hospital, Finland
[c] ORTON Research Institute, ORTON Foundation, Helsinki, Finland

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ABSTRACT

The objectives of the present study were to find out the results and the factors affecting survival after primary knee arthroplasty with a cruciate-retaining prosthesis in severe valgus deformity. Forty-eight patients (52 knees) participated in the current follow-up study. All patients were followed at least 5 years or to first revision. Mean follow-up time was 9 years (range, 1 to 17 years).The Kaplan–Meier analysis revealed 79% (95% CI 68% to 91%) survival rate with revision for any reason and 81% (95% CI 70% to 93%) survival rate with revision for instability as an endpoint at 10 years. Preoperatively TFA was 23° (range, 15°–51°) in valgus and 7° (range, 21° valgus–4° varus) in valgus postoperatively. Of the 14 re-operated patients, eight were revised because of progressive postoperative medial collateral ligament instability. All re-operations were performed during the first 4 years of the follow-up. The mean TFA was 15.5° valgus postoperatively for those eight and the odds ratio for a revision was 2 (95% CI 1–3, $p = 0.025$) when compared to the rest of the study population. The residual valgus deformity increases the risk of re-operation and it should be avoided. If proper soft-tissue balance cannot be achieved or there is no functional medial collateral ligament present more constrained implants should be used. In selected cases where both bony correction and ligament balancing have properly been achieved the use of a cruciate-retaining type of prosthesis is justified.

1. Introduction

In an osteoarthritic knee varus deformity is more common than valgus. Apart from primary osteoarthritis (OA), valgus deformity may be secondary to rheumatoid arthritis, polio, renal osteodystrophy, rickets, or a consequence of an intra-articular fracture.

Primary total knee arthroplasty (TKA) in patients with a severe valgus deformity may be challenging since the bony anatomy differs from the more common varus knee. The valgus knee may have complex angular deformities with varying degrees of flexion and external rotation. Typically the tibia is in external rotation, the lateral femoral condyle is hypoplastic, and the patella may be subluxated or dislocated. There is often bone loss on the lateral femoral condyle (Fig. 1). One study has shown a greater risk of component malposition [1].

Results of TKA for severe valgus deformity with a cruciate-retaining (CR) or posterior stabilized (PS) implant have been published [1–8]. However, there are only a few studies that report long-term results [3,6]. Miyasaka et al. [6] published series of 60 valgus knees treated with a CR model. They had a 91% survival rate after an average follow-up time of 13 years. In their study, the preoperative tibiofemoral angle (TFA) averaged 17° in valgus. The survival rate was good, although the rate of postoperative instability was as high as 24% because of extensive lateral ligament release. Elkus et al. [3] described a new soft-tissue release technique and published an excellent 9 year follow-up result with a calculated estimate of 83% survival rate at 15 years without any late medial collateral instability being recorded with a PS implant. In their study 42 knees with mean preoperative alignment of 15° valgus were followed up for a minimum of 5 years with an average of 9 years.

Objectives of this study were to examine clinical and radiological long-term outcomes and factors affecting the survival in a primary knee arthroplasty for severe valgus deformities with a cruciate-retaining prosthesis.

2. Patients and methods

2.1. Patients

During the years 1988–2000 a total of 1974 TKAs were performed in our hospital. Of these patients, 176 (9%) had preoperative TFA ≥ 15° valgus. Ninety-three (53%) patients were either primary OA ($n = 79$)

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* Corresponding author. Tel.: +358 415066788.
E-mail address: esakos@utu.fi (E. Koskinen).

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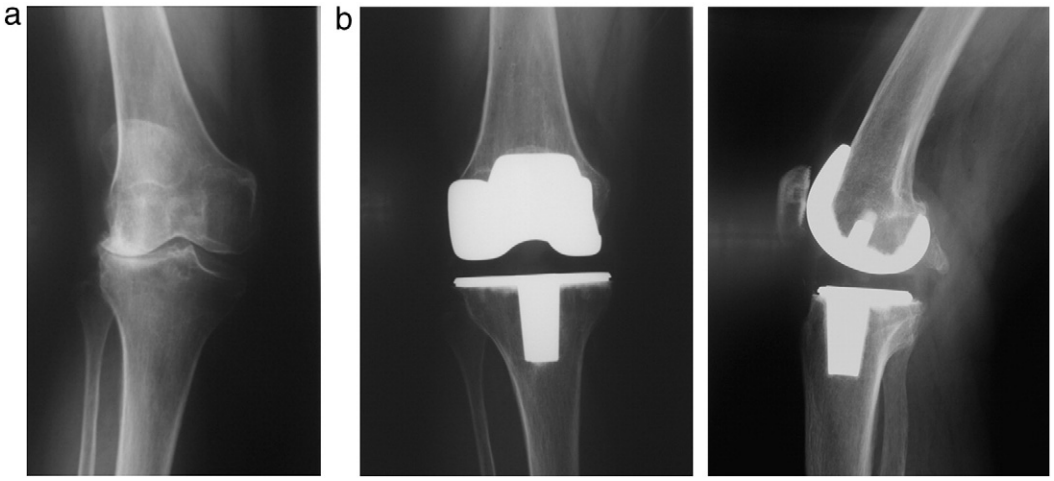

Fig. 1. a–b: 71-year female with severe valgus deformity. Tibiofemoral angle is 24° (a). Tibiofemoral angle is corrected to 3° (b).

or rheumatoid arthritis (RA) ($n=14$). Since no significant difference in survival in knee arthroplasty between patients with primary OA or rheumatoid arthritis [9] has been shown therefore the patients with RA were included in to the study. Patients with other diagnoses such as post-traumatic OA and skeletal dysplasias were excluded. Of the 93 patients, 28 had died and 10 patients were bed-ridden in institutions for the elderly due to their old age and poor medical condition. None of the deaths were related to the knee operation.

The purpose of this study was to find out the clinical and radiographic results using condylar CR knee designs. Thus we excluded seven patients who had hinge devices (Biomet, Warsaw, USA. and Waldemar Link, Hamburg, Germany) implanted due to functionally deficient medial collateral ligaments. The remaining 48 patients (52 knees) were asked to participate in the clinical follow-up study and 39 patients (43 knees) agreed. All patients were followed for at least 5 years or to first revision. The patients' reasons for being unable to participate in the follow-up study were old age and poor health in general ($n=6$) and too long travelling distances ($n=3$). These nine living patients, who were not able to participate personally in the last follow-up visit, were interviewed by phone and their medical records and radiographs were evaluated. None of the nine had revision surgery and they were satisfied with their TKA. Of the study patients 25 (48%) had flexion contracture mean of 9° (range, 5 to 30°). Demographic data of the patients are given in Table 1.

2.2. Study design

This was a retrospective follow-up study. Pre- and postoperative data were collected from the patients' records. The physical examination at the last follow-up visit was performed by the first author (E.K.) as an independent observer. The Knee Society Score (KSS) [10,11] was measured preoperatively, at 1 year follow-up, and at the last follow-up, as were weight-bearing anteroposterior (AP) and lateral radiographs as well as long hip-to-ankle mechanical axis radiographs of the leg. At final follow-up a tangential patella (skyline) view [12] was also taken. Radiographs were analyzed by an independent specialist in musculoskeletal radiology (K.T.). The Western Ontario and McMaster Universities Osteoarthritis Index questionnaire (WOMAC) [13] was mailed to the patients along with an invitation to participate in the study. It was completed by the patients at home and returned at the follow-up visit. The answers were checked during the physical examination.

2.3. Operative technique and postoperative treatment

The indication for surgery was clinically and radiographically diagnosed severe knee OA or RA with knee symptoms. All patients were operated under spinal or epidural anaesthesia. All knees were approached through a medial parapatellar incision. A tourniquet was used in all cases. The implants used in this series were; Interax (Howmedica, Rutherford, USA) in 19, Miller-Galante (Zimmer, Warsaw, USA) in 14, AGC (Biomet, Warsaw, USA) in 10, Duracon (Howmedica) in seven and NexGen (Zimmer, Warsaw, USA) in two knees. All implants were CR models. It is assumed that the constraint and conformity of the tibial plateau are similar between implants, noting that the AGC is the least conforming. Numbers were too small to evaluate association between outcome and implant.

The posterior-referencing femoral jig was used to determine the size of the component. In the presence of lateral condylar hypoplasia, correct femoral rotation was achieved by adjusting the jig to correspond with the trans-epicondylar axis. The position of the tibial component was measured using either intra- or extramedullary guides provided by the implant manufacturer. The centre of the rotation was set at the border of medial and central third of the tibial tubercle. There were variations in balancing technique during the early years of the current series. Two knees had medial collateral ligament tightening. One knee the balancing was done with the Interax knee (Table 2) with asymmetrical tibial polyethylene liners.

Table 1
Demographic data of the patients.

Diagnosis	
Primary osteoarthritis	40
Rheumatoid arthritis	12
Gender	
Female	46
Male	2
The mean age at time of index operation (range)	66 years (36 to 86 years)
The mean age at time of last follow-up (range)	77 years (48 to 97 years)
The mean follow-up time (range)	9 years (1 to 17 years)

Table 2
Lateral soft-tissue releases.

Released ligament structure	Number of knees (n)
No releases	4
Iliotibial band (ITB)	11
Popliteus + ITB	3
Lateral collateral (partial or full thickness) + popliteus + ITB	18
Posterolateral corner	3
Medial collateral ligament tightening	2
Balancing done with the Interax knee	1
Balancing unknown	10