The Knee 21 (2014) 1269–1274

Contents lists available at ScienceDirect

The Knee

Alignment of the tibial component of the unicompartmental knee arthroplasty, assessed in the axial view by CT scan: does it influence the outcome?

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ARTICLE INFO

Article history:
Received 2 March 2014
Received in revised form 19 May 2014
Accepted 27 June 2014

Keywords:
Unicompartmental knee arthroplasty
Tibial component
Axial alignment
CT scan
Clinical outcomes

ABSTRACT

Background: The ideal position of the unicompartmental knee arthroplasty (UKA) in the axial plane remains undefined the medical literature. The aim of this study was to observe how tibial components are placed in the axial plane and identify whether this could influence the postoperative clinical outcome.
Methods: A retrospective transversal study of 101 UKA was performed in 88 patients by a single surgeon. Postoperative CT scans were performed at a mean follow-up period of 71 months (36 to 150), and clinical and functional outcomes were assessed by the WOMAC and the KSS scores. Patients were divided several times in two groups depending on a different WOMAC or KSS value each time, and differences in axial angulation were analyzed in every comparison. Distribution of data and influence on outcomes were also analyzed.
Results: The tibial component was positioned with a mean angulation of 11.9° (−1 to 32) of external rotation (ER). A lower angle of ER was observed in all comparisons in the groups with better outcomes. Differences between groups were statistically significant when a good result was defined as a WOMAC score lower than 10.
Conclusions: Variability in axial positioning (33 °) is higher than in other planes due to the free-hand technique. A trend towards better outcomes is observed when the tibial component is placed in a lower angle of ER. Rotational alignment in UKA should be investigated in subsequent studies with larger sample sizes.
Level of evidence: Level III, retrospective comparative study

1. Introduction

Unicompartmental knee arthroplasty (UKA) is considered by many surgeons the procedure of choice for the treatment of unicompartmental osteoarthritis (OA). The kinematics of the knee after UKA is similar to that of the arthritic knee [1], as the integrity of the anterior cruciate ligament, and lateral and patellofemoral compartments are preserved. Over the years the indication for UKA has been controversial due to early unsuccessful experiences in the 1970s [2]. Subsequent studies have demonstrated lower long-term failure rates [3] and more satisfactory outcomes in comparison with total knee arthroplasty (TKA) [4]. On the other hand, survival rates have been demonstrated to be lower for UKA [5].

This controversy has led to decreased popularity for this device, which is indicated under very strict criteria. Therefore, most of the radiological studies of knee prosthesis are based on TKA, and there is limited literature evaluating the influence of the alignment in UKA. Most of these studies analyze the positioning of the tibial component in the sagittal [6–8] and coronal [9–12] views by simple radiographs. To our knowledge, there is only one study on the alignment of the tibial component in the axial plane, measured by CT scan [13]. Nevertheless, comparison with long-term clinical data was not carried out in this study.

The aim of our study was to observe how tibial components of UKA are positioned in the axial view and show the variability between patients. We also aimed to analyze if rotation of the tibial component is an important factor in the clinical outcome. The biomechanical consequences of such variation in positioning have not been studied yet, and could be the cause for ongoing pain or early failure of a UKA.

1.1. Patients and methods

Between April 1999 and December 2009, 210 consecutive medial UKA were performed on 186 patients and recorded on to a database. Surgery was carried out by a single senior surgeon (JFA), always using the same surgical technique. The indications used for UKA were a medial OA grade 2 or 3 for Ahlbäck classification [14], Cartier's angle < 6° for the tibia in the coronal view [3], femorotibial angle < 10° of varus or valgus, and mild limitation of range of motion.

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http://dx.doi.org/10.1016/j.knee.2014.06.008
0968-0160/

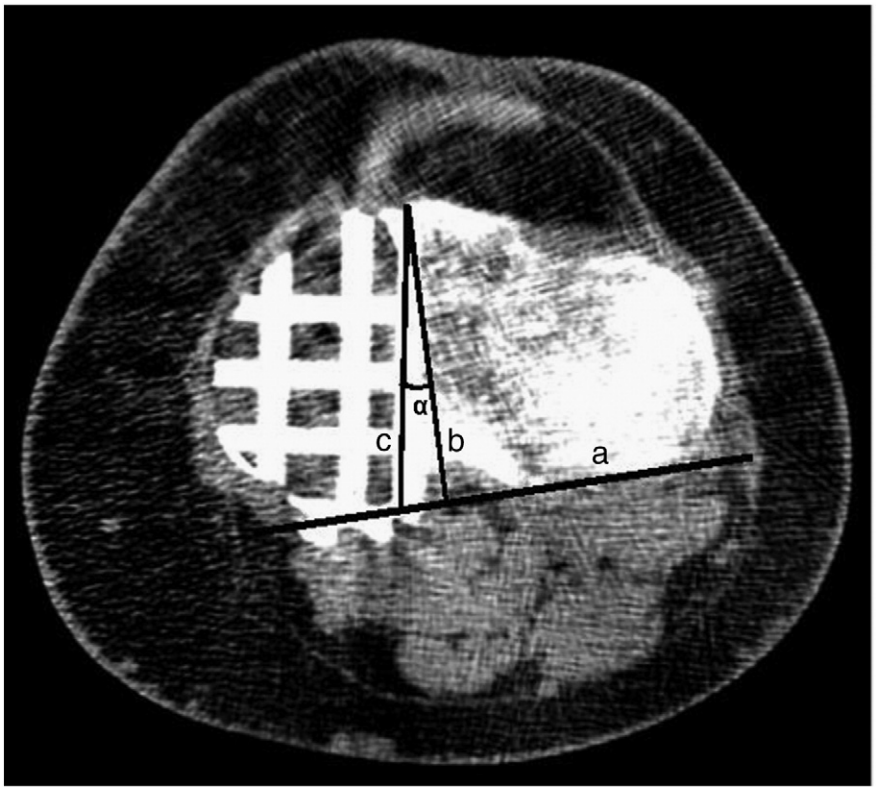

Fig. 1. Rotational angle of the tibial component in the axial view of a CT scan, measured by the Yoshioka protocol. a: tangent to the posterior rims of the tibial plateau; b: anteroposterior axis of the tibia; c: the most lateral edge of the tibial component; α: rotational angle of the tibial component.

Twenty-six patients were excluded based on exclusion parameters, including patients with lateral or femoropatellar OA before the index surgery (12 cases), anterior cruciate ligament injury or plastia (3), other ligamentous instabilities, history of infection (1), revision TKA performed before the beginning of the study (9) and patients over the age of 80 (1). All patients had a follow-up longer than 3 years, unless revision arthroplasty was performed before. Patients included in the study were contacted by telephone and invited to return for a follow-up visit. Fifty-eight patients were not located or did not want to participate in the study. The result was 102 patients attending to the clinical visit. The study was explained to the patients, and a written consent was taken. Fourteen patients refused to perform CT scans, so the end result was 88 patients (101 knees). All 101 cases were included in this retrospective transversal study, as sample size could not be estimated due to the lack of references about the population variance of axial alignment in UKA. The first 11 cases received the Genesis unicompartmental knee replacement (Smith & Nephew, Inc, Memphis, TN) and the next 90, the Accuris Uni Knee System (Smith & Nephew, Inc, Memphis, TN). From the 109 knees that could not be included in the study, 20 received the Genesis and 89 the Accuris.

Intra-operatively, a mid-vastus approach was performed, the patella was laterally subluxated, osteophytes were removed and the intecondylar notch was enlarged in every case. The sagittal cut of the tibia was performed using a free-hand technique, in the most lateral rim of the medial plateau, with a slight external rotation with respect to the anteroposterior (AP) tibial axis. The transverse tibial cut was

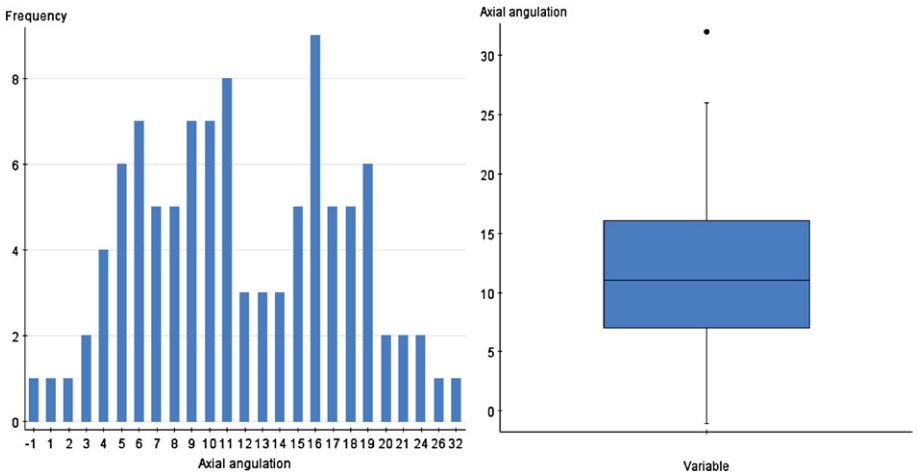

Fig. 2. Distribution of cases according to the alignment in the axial plane (histogram and boxplot).