The Knee xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

The Knee

Should the position of the patellar component replicate the vertical median ridge of the native patella?

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ARTICLE INFO

Article history:
Received 21 February 2016
Received in revised form 28 July 2016
Accepted 15 September 2016
Available online xxxx

Keywords:
Total knee arthroplasty
Patellar tracking
Patellar component

ABSTRACT

Background: In total knee arthroplasty (TKA), the position of the patellar component can affect patellar tracking. However, the patellar component cannot always replicate the original high point of the patella because of anatomical variance. This study investigated whether altering the highest point of the patella can affect outcomes of primary TKA, especially in patients having a patella with a far-medialized median ridge.

Methods: A retrospective review was performed for 177 knees (143 patients) treated with primary TKA between July 2011 and March 2014. Group 1 (34 knees) had the patellar component displaced over three millimeters from the median ridge, while Group 2 (143 knees) had the patellar component placed on the original median ridge position. The one-year follow-up outcomes were reviewed, including: patellar tilt angle, Knee Society Score, Feller Patellar Score, and modified Kujala Anterior Knee Pain Score.

Results: Mean ($\pm$ standard deviation) displacement of the patellar component in Group 1 was 3.97 $\pm$ 0.97 mm lateral to the original position of the median ridge, with a significant decrease in lateral patellar tilt angle ($P < 0.001$). Lateral patellar tilt showed a positive correlation with the medialization of the patellar component ($P < 0.001$, $r = 0.401$). Ability to rise from a chair was better in Group 1 ($P = 0.025$). There were no other between-group differences in other clinical outcomes.

Conclusions: There should be no need for the patellar component to replicate the original highest point of the native patella in primary TKA.

1. Introduction

Obtaining proper patellofemoral joint kinematics is crucial to achieving good postoperative clinical outcomes in total knee arthroplasty (TKA) [1]. Maltracking of the patellar component in TKA can lead to complications such as subluxation, dislocation, excessive wear, implant failure, restricted range of motion (ROM), or chronic pain [2–4]. Several technical factors may contribute to correct patellar tracking in TKA, including: precise bone cutting, proper alignment, positioning of components, soft-tissue balancing, and the geometry of the femoral component [5–7].

Classically, to improve patellar tracking, medialization of the patellar prosthesis during patellar resurfacing has been recommended [8–10]. Several biomechanical studies have reported that medialization of the patellar component reduces both lateral

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http://dx.doi.org/10.1016/j.knee.2016.09.014
0968-0160/

retinacular tension and patellofemoral contact force [11–13]. Clinical studies have shown definite decreases in the rate of lateral retinacular release as a result of medialization of the patellar component [14,15]. With the consensus being in favor of medialization, many surgeons place the patellar component based on the position of the median ridge. Hofmann et al. emphasized that the surgeon should attempt to place the high point of the component at the location of the median ridge, which is the normal high point of the patella in the individual patient [14]. However, in some patients with a small medial facet, especially in East Asian patients, reproducing the median ridge can lead to overhang of the medial prosthesis, in which case it is not possible for the patellar component to replicate the original high point of the patella.

The native anatomy and kinematics of the patellofemoral joint vary by individual. Because the high point of the patella can act as a fulcrum for patellar tracking, positional changes from the original high point of the patella could affect its original kinematics [16]. From previous literature, however, it is unclear which correlations exist between the various positions of the high point and the patellar tracking in the knee joint, and which changes in patellar tracking might be expected by altering the position of the high point of the patella.

Therefore, the present study was performed to investigate possible correlations between the position of the geometrical high point and the patellar tracking in both native and resurfaced patella, and to evaluate the clinical and radiological results according to alterations in the position of the original high point of the patella. It was hypothesized that altering the original high point of the patella would affect (1) the patellar tilt angle and (2) postoperative clinical outcomes, particularly in relation to anterior knee symptoms.

2. Materials and methods

A retrospective review was made of the medical records for all patients admitted to the Orthopedic Department of a single hospital from 01.07.2011 to 31.03.2014. In total, 426 knees (310 patients) had TKA performed by a single senior surgeon (CHC) during that period. Of these, 177 knees (143 patients) met the inclusion criteria of a primary TKA with patellar resurfacing, and were included in the present study (see Figure 1 for the flow diagram of exclusion criteria). Subjects were divided into two different groups, depending on whether or not the patellar component replicated the median ridge of the native patella: Group 1, in which the patellar component was displaced by >3 mm from the median ridge, and Group 2, in which the patellar component replicated the median ridge exactly. Consequently, 34 knees (30 patients) in Group 1 and 143 knees (113 patients) in Group 2 were included in the analysis. The disproportionate allocation numbers in the groups were allowed for to reduce selection bias and increase statistical power.

Posterior substituting (PS) types of four different prostheses were used in the current study: Scorpio NRG (Stryker Orthopedics®, Mahwah, NJ, USA); Nexgen LPS (Zimmer®, Warsaw, IN, USA); PFC Sigma (Johnson & Johnson®, Raynham, MA, USA); and Optetrak (Exactech®, Gainesville, Florida, USA). All-polyethylene, dome-shaped patellar components with three fixation lugs were used in all cases. The numbers of implanted knees with each design and size of the patellar component are shown in Table 1.

2.1. Surgical technique

A medial parapatellar approach under pneumatic tourniquet control was used in all cases. Rotational alignment of the femoral component was based on the transepicondylar axis. The femoral components were placed in the center of the femoral cutting

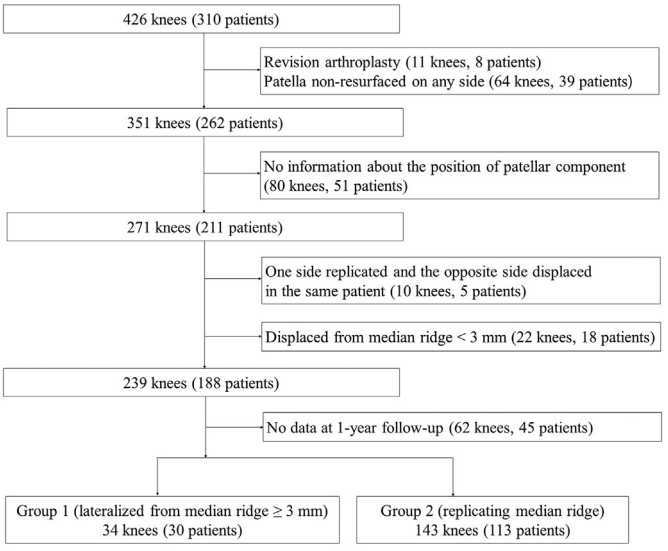

Figure 1. Flow diagram for exclusion criteria.

Please cite this article as: Lee RH, et al, Should the position of the patellar component replicate the vertical median ridge of the native patella?, Knee (2016), http://dx.doi.org/10.1016/j.knee.2016.09.014