Rotational positioning of the femoral component in total knee arthroplasty with patellofemoral navigation: bi-centric study about 145 cases

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Introduction: Rotational positioning of the femoral component during the realization of a total knee arthroplasty is an important part of the surgical technique and remains a topic of discussion in the literature. The challenges of this positioning is important because it determines the anatomical result and its effect on the flexion gap and clinical outcome mainly through its impact on patellofemoral alignment. The literature reports numerous methods to achieve this positioning rotary but none of them does provide a satisfactory accuracy. The intraoperative identification of the axis transepicondylar visually or by navigation is not reliable or reproducible. The empirical setting to 3 ° of external rotation, the procedure used to cut or dependent or independent, is not adapted to the individual variability of knee surgery. Indeed, the angle formed by the posterior condylar axis and trans-epicondylar axis (angle between posterior condyles plane and trans epicondylar axis= alpha angle) is subject to large individual variations.

The authors propose a novel technique, using the navigation of the trochlea to determine the rotation of the femoral component. The principle is to consider the rotation of the femoral implant as "ideal" when it makes a perfect superposition of the prosthetic trochlea with the native bony trochlea on patellofemoral view at 60 ° when planning the femur. The bottom of the prosthetic trochlea is well aligned with the Whiteside line, identified during the trochlear morphing, itself perpendicular to the trans-epicondylar axis.

The authors hope to encourage centering patellofemoral joint prosthesis, thus favoring the original kinematics of the extensor apparatus.

The purpose of this study is to demonstrate firstly, that the navigation of the trochlea is a reliable and reproducible method to adjust the rotation of the femoral component relative to the trans-epicondylar axis taken as reference and the other, the rotation control by this method is not done at the expense of the balance gap in flexion.

Materials and Methods: It is a bi-centric study prospective, nonrandomized, including continuously recruited 145 patients in two French centers operated by two senior operators. All patients were included in the year 2010 and have all been revised three months and one year of surgery. The average age of patients was 71 years [53, 88]. The sex ratio was 60% female. It was made no selection of patients who have all been included consecutively in the study and in the two centers. In all cases, the rotation of the femoral component was determined by intraoperative navigation of the trochlea. The authors compared the alpha angle (angular divergence between the plane and the posterior bi-condylar plane and trans-epicondylar axis) obtained by this method and that calculated on a pre-or postoperative scan. The authors also measured the space between femur and tibia internal and external side in flexion (90°) to assess the impact on the balance in flexion.

Results: There is excellent agreement between the results obtained by the method of CT scan and the trochlear navigation technique. In addition, this technique allows to achieve a quadrilateral space gap in flexion.
Discussion: The authors found large individual variation in the distal femoral epiphyseal torsion (angle alpha). They demonstrate that the navigation of the trochlea is a reliable and reproducible method to adjust the rotation of the femoral component relative to the trans-epicondylar axis taken as reference and provides, concomitantly, a quadrilateral space gap in flexion.