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Complications - Other

Effect of Patellar Resurfacing on Patellofemoral Crepitus in Posterior-Stabilized Total Knee Arthroplasty

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ABSTRACT

Background: Patellofemoral crepitus (PC) is a complication of total knee arthroplasty (TKA). Although patellar resurfacing (PR) directly influences the kinematics of the patellofemoral joint, the influence of PR on PC is unclear. The purpose of this study was to investigate the influence of PR on the incidence of PC.
Methods: This study included 84 knees from 69 patients who underwent TKA using the Vanguard Complete Total Knee System, with or without PR (n = 42 each). Clinical evaluation of the incidence of PC; Knee Society Score; and radiographic measurements of patellar tilt, patellar distance, patellar shift, Insall-Salvati ratio, patellar flexion, femorotibial angle; and rotation of the femoral component was performed. Parameters were evaluated preoperatively and at postoperative months 2, 6, 12, and 24. Logistic regression analysis was conducted to investigate the effect of PR on the risk of PC.
Results: The incidence of PC was significantly higher in the non-PR group than the PR group (33.3% vs 4.8%). The knees of the PR group displayed a significantly increased patellar tilt, medially shifted patella, and decreased patella flexion angle compared with those of the non-PR group. There were no significant differences in the other radiographic parameters or Knee Society Score. The absence of PR was associated with a much higher risk of PC (odds ratio, 10.37; 95% confidence interval, 2.18-10.37).
Conclusion: PR may decrease the incidence of PC by increasing the patellar tilt and medial shift and positioning the patella more closely parallel to the femur. PR is recommended during TKA with this prosthesis.

Patellofemoral crepitus (PC) is infrequent, yet troublesome complication of posterior-stabilized total knee arthroplasty (TKA). PC originates secondary to peripatellar fibrosynovial hyperplasia at the junction of the superior pole of the patella and the distal quadriceps tendon, which becomes entrapped within the patellofemoral joint during knee flexion of 30°-60°. One reported average time to presentation of PC was 10.9 months (range, 4-27) [1]. Symptoms range from asymptomatic crepitation to a painful, palpable, and audible clunk, which may require treatment consisting of either arthroscopic or open debridement [1-7]. It is supposed that patella clunk is a specific implant-related pathology and PC is a clinical observation which may not share the same pathophysiology.

As the etiology of patellofemoral crepitation and clunk syndrome is multifactorial, several key factors have been reported to be associated with their pathophysiology and an increased risk of PC. Early intensive studies have been carried out examining the design of the femoral component and the surgical techniques as key factors related to PC development. Significant factors associated with PC include previous surgeries, smaller femoral component size, thicker polyethylene bearings, reduced preoperative patellar tendon length, decreased postoperative patellar tendon length an Insall-Slvati ratio, increased femoral component flexion, increased postoperative posterior femoral condylar offset, and a high intercondylar box ratio of femoral components (the intercondylar box height vs the anterior-posterior height of the femoral component) [1,8,9]. These reported results have greatly contributed to the development of new designs for the femoral component and surgical techniques to minimize PC in TKA with patellar resurfacing (PR). However, some patients who undergo modern TKA still suffer from PC, and further study is needed to clarify its etiology.

PR directly influences the kinematics of the patellofemoral joint, which is adjacent to the lesion location common to PC. Thus, it is

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speculated that PR may affect the occurrence of PC. Despite the importance of PR on PC, very few previous studies have been performed examining TKA with PR, and little is known regarding the influence of PR itself on PC. Thus, the purpose of this study was to examine whether PR influences the incidence of PC, and if so, to investigate which radiographic parameters describing the patellar position and inclination are associated with PC development.

Patients and Methods

We carried out a retrospective, nonrandomized, comparative study of consecutive patients to examine if PR affects the occurrence of PC in TKA. This study was approved by the institutional review board of our hospital. All patients were adequately informed of the study procedures and provided written, informed consent. This study included 84 knees from 69 patients who underwent TKA using the posterior-stabilized Vanguard Complete Total Knee System (Biomet, Warsaw, IN) between 2010 and 2013. During the surgical procedures, PR was not performed on the first 42 knees (non-PR group) and was performed on the knees thereafter (42 knees, PR group). This switch to PR was due to surgeon preference, and there was no break in a consecutive series. Patients with a severe deformity (varus angulation of more than 20° or a flexion contracture of more than 30°), valgus deformity, rheumatoid arthritis, or a history of previous knee surgery were excluded.

Preoperative patient data, including age, gender, and body mass index, were recorded. Preoperative and postoperative range of motion of the knee, Knee Society Scores (KSS: total knee score and total function score), incidence of PC and patellar clunk, and rates of other complications were determined. PC was defined as continued grinding sensation with loading of the knee in a 30°-60° range with or without anterior knee pain. Patellar clunk was defined as an audible clunk with or without pain in knee extension to within 30°-45° of full extension after knee flexion. Anterior knee pain was defined as a residual or newly developed pain at the anterior part of the knee in knee motion. Patellar position and inclination were analyzed by examining radiographs of the patella taken in a full-length standing anteroposterior view, a lateral view with the knee in 45° of flexion, and an axial view of the patellofemoral joint in 45° of flexion, preoperatively and at each postoperative follow-up visit. Radiographic parameters of patellar position and inclination, including patellar tilt, patellar distance, patellar shift, Insall-Salvati ratio, patellar flexion, femorotibial angle, and the rotation angle of the posterior condylar axis to the transepicondylar axis, were measured (Fig. 1). Patellar tilt was defined as the angle between the equatorial line of the patella and the intercondylar line [10]. The patellar distance was defined as the distance from the median ridge of the patella, which is the deepest point of the patella in relation to its equatorial line, to the center of the intercondylar sulcus [10]. Patellar shift was defined as the distance between the line passing through the cross point of the meridian line of the patella and the line passing through the equatorial line of the patella or the intercondylar line [11]. The rotational alignment of the femoral component was measured using the radiographs of the axial view of the femoral supracondylar axis, employing Kanekasu technique [12], that were taken preoperatively and 3 months postoperatively. A lateral patellar tilt, medial patellar shift, and external rotation angle of the posterior condylar axis to transepicondylar axis were considered to be positive values.

All operations were performed with a uniform approach and surgical technique by 2 surgeons (H.O. and K.M.) for all knees in our institution, using a medial parapatellar approach through a midline skin incision with patellar eversion. A tourniquet was used during osteotomy. The femoral component was implanted with a rotation

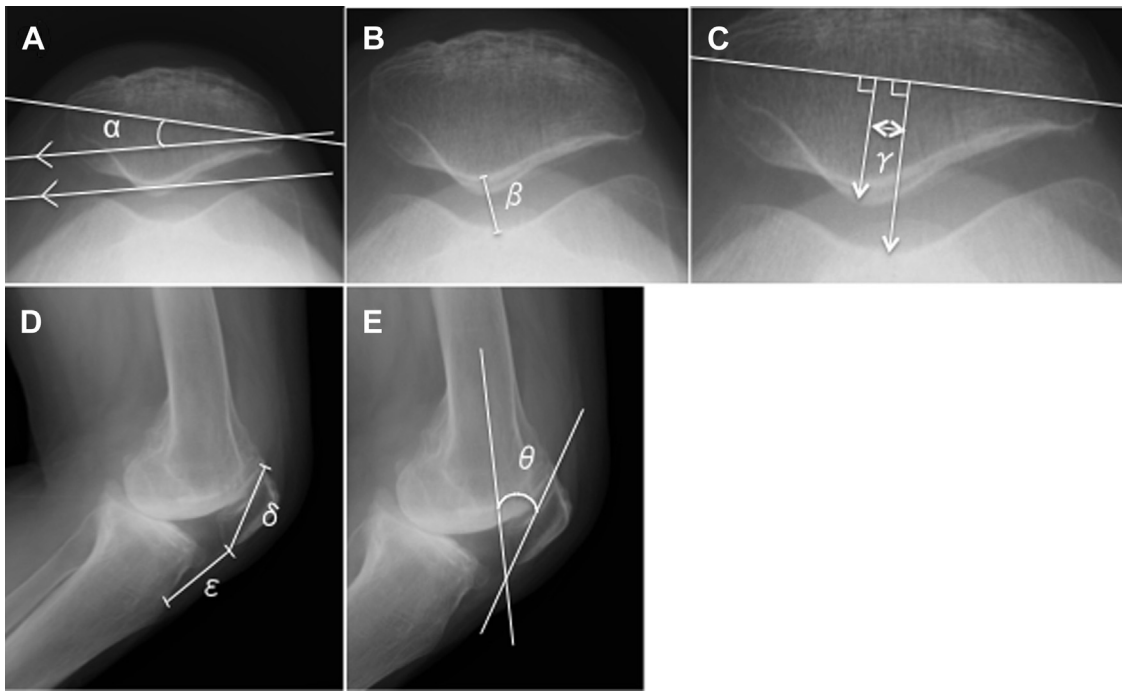

Fig. 1. Radiographic parameters describing patella position. (A) Patellar tilt (α) was defined as the angle between the equatorial line of the patella and the intercondylar line in the anteroposterior view. (B) The patellar distance (β) was defined as the distance from the median ridge of the patella to the center of the intercondylar sulcus in the anteroposterior view. (C) Patellar shift (γ) was defined as the distance between the 2 lines passing the cross points of the meridian line and the equatorial line of the patella with the intercondylar line on the anteroposterior view. (D) The Insall-Salvati ratio was the ratio of δ to ε in the lateral view. (E) The patella flexion angle (θ) was the angle between the patellar and femoral axes in the lateral view. A lateral patellar tilt, medial patellar shift, and external rotation angle of the PCA to TEA were considered to be positive values. PCA, posterior condylar axis; TEA, transepicondylar axis.