ABSTRACT INTRODUCTION:
Anterior knee pain from a unresurfacing patella is secondary to altered patellofemoral biomechanics. Many authors advocated that the patella should always be resurfaced, because of a low complication rate and less postoperative anterior knee pain\(^5\). In contrast, other authors debate that the clinical results of nonresurfacing the patella are similar to that of resurfacing\(^6\). We speculated that femoral component design is a major factor of postoperative patellofemoral symptoms in TKA without patella resurfacing and causes various reported clinical results. We investigated an anatomic basis for this possibility by evaluating the conformity of various femoral components to prosthetic patellar components and to native cadaver patellae in different flexion angles.

METHODS:
To determine the effects of different femoral component designs on conformity of the patellofemoral joint, 5 total knee prostheses (Low Contact Stress, Miller-Galante II, NexGen, Porous-Coated Anatomic, and Total Condylar prostheses) were investigated. Three-dimensional model of the knee prostheses (patellar and femoral components) and the normal patella were developed with ATOS (Advanced Topometric Sensor, GOM mbH, Braunschweig, Germany) from a manufactory with guarantee of accuracy. The patellar articular surface and anterior flange of the femoral component were divided into three equal parts from the proximal to distal pole. Patella was contact with a prosthetic femoral component at low (0 to 30 degrees), mid (30 to 60 degrees), and high (60 to 90 degrees) flexion angles. The result was better than Miller-Galante II prostheses that of resurfacing 5-8. We speculated that femoral component design or surgical technique rather than whether the patella was resurfaced. Although the conformity of the MG II prosthetic component featuring a non-anatomic patellofemoral groove which is not originally designed to accommodate the native patella. This prostheses may work well when the patellar component is also used. However, when the patella is not resurfaced, the decrease contact area with a native patella would increase the patellofemoral pressure, with subsequent inferior clinical results.

Every femoral component is designed to articulate with the corresponding prosthetic patella. However, a non-anatomic anterior flange of femoral component is not compatible with native patella, which may explain why some patients developed patellofemoral symptoms after TKA with a nonresurfaced patella. Stair climbing is an activity that requires loading of the patellofemoral joint at high degrees of knee flexion. Although the Nexgen prostheses had inferior conformity to native patella near full extension (i.e., at a low flexion angle), the conformity was good (average, 3.57 and 4.54 degrees respectively) at mid or high flexion angles. A prostheses with a femoral component having good conformity with a native patella at a high flexion angle could be expected to produce satisfactory results if the TKA without patella resurfacing. The etiology of patellofemoral pain after TKA in which the patella was not resurfaced is probably multifactorial. When proper component positioning and balancing of the ligaments and extensor mechanism were achieved, the major factor required for an excellent result appears to be the geometry of the femoral component design.

This study demonstrates that prosthetic design can adversely affect patellofemoral joint biomechanics. If the surgeon prefers not to resurface the patella, an optimally designed femoral component should be used to allow for more normal patellofemoral joint kinematics.

REFERENCES:

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THE EFFECT OF FEMORAL COMPONENT DESIGN ON CONFORMITY OF THE PATELLOFEMORAL JOINT

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