Mobile-bearing Tka Reduced The Postoperative Anteroposterior Laxity Comparing To Fixed-bearing TKA In The Same Patients

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Introduction: Proper anteroposterior (AP) joint displacement is an important indicator of good clinical outcome following total knee arthroplasty (TKA) [1,2]. However, the degree of postoperative AP joint displacement can be affected by the design of articulating surface of total knee prostheses. We hypothesized that type of prosthesis influences the AP joint displacement in mid-flexion range. We compared the AP joint displacement between a conventional fixed-bearing prosthesis and a mobile-bearing prosthesis in bilateral TKA.

Methods: We investigated 74 knees in 37 patients who had bilateral TKAs. All the patients received a conventional fixed-bearing PS prosthesis in one knee (Vanguard PS; Biomet, Warsaw, IN) and a highly congruent mobile-bearing PS prosthesis in the other knee (Vanguard RP; Biomet, Warsaw, IN). These two types of prostheses were manufactured by the same manufacturer. Except for the design of the articulating surface, two prostheses were identical. Operative technique and postoperative therapy were also identical in both knees. Post cam mechanism was designed to engage from 30° of flexion in mobile-bearing prosthesis, but from 70°of flexion in fixed-bearing prosthesis (Figure 1). Congruity of upper articulating surface was designed to be higher in mobile-bearing prosthesis than in fixed-bearing prosthesis (Figure 2).

AP joint displacement was measured using the KT-2000 arthrometer, at 30° and 75° in flexion, after the operation according the previously validated method [3,4] (Figure 3). Patients’ preference was also evaluated.

Results: The AP displacements at 30° of flexion was 9.3 ± 4.2 (mean ± SD) mm in the knees with the fixed-bearing prosthesis, and 6.2 ± 2.7 mm with the mobile-bearing prosthesis (p < 0.001). Mean displacements at 75° of flexion was 5.8 ± 2.8 mm in the knees with the fixed-bearing prosthesis, and 4.3 ± 1.8 mm in the knees with the mobile-bearing prosthesis (p = 0.002). AP displacement in mid-flexion was significantly less in the knees with the mobile-bearing prosthesis than in the knee with fixed-bearing prosthesis. The difference of the range of motion of the knee joint was not statistically significant (p=0.464). 27% of patients preferred the knee with mobile-bearing prosthesis, 14% preferred the knee with fixed-bearing prosthesis, and 59% could not tell the difference.

Discussion: This study clearly showed that the design of the prosthesis influenced the AP joint displacement in mid-flexion range. The mobile-bearing prosthesis reduced the AP laxity in mid-flexion comparing to the fixed-bearing prosthesis. We suspect that the conformity of mobile-bearing prosthesis improved the AP stability but did not disturb the postoperative range of motion of the knee joint. AP stability of mobile-bearing prosthesis might affect the patients’ preference.
There were advantages in this study. First, we compared the laxity in the same patients. For measurement of AP displacement using KT-2000 arthrometer, differences among the patients should be considered. However, we compared the one knee to the other knee in the same patients. Therefore, we suspect that the influence of individual variation was little in this study. Second, the manufacturer, instrument, operative technique, and surgical team were identical between two groups, except for the design of the articulating surface. Therefore, we believe that this study justly evaluated the relationship between the design of articulating surface and the AP laxity.

We measured the AP joint displacement in mid-flexion using the KT-2000 arthrometer. AP joint displacement in the mobile-bearing prosthesis was significantly less than that in the fixed-bearing prosthesis.

**Significance:** We measured the anteroposterior (AP) laxity in mid-flexion using the KT-2000 arthrometer. AP laxity in the mobile-bearing prosthesis was significantly less than that in the fixed-bearing prosthesis.

![Figure 1: At 30° of flexion, post-cam mechanism was designed to engage in mobile-bearing prosthesis (A), but does not in fixed-bearing prosthesis (B).](image)
Figure 1: Congruity of upper articulating surface was designed to be higher in mobile-bearing prosthesis (A) than in fixed-bearing prosthesis (B).

Figure 3: Anteroposterior displacement was measured using a KT-2000 arthrometer at 30° (A) and 75° (B) in flexion. An anterior force of 133 N and a posterior force of 89 N were applied.