Intra-Operative Assessment Of Mid-Flexion Instability In Total Knee Arthroplasty

INTRODUCTION:
Soft-tissue balancing of the knee is fundamental to the success of total knee arthroplasty (TKA). Preparing equal and rectangular extension and flexion joint gaps is the most important goal in TKA because this facilitates functional restoration of the knee. However, joint gap before implantation might differ from that after implantation. The purpose of this study was to measure the joint gap after implantation throughout full range of motion of the knee using a unique tensor device, which had completely the same shape as total knee prosthesis we used (Figure 1).

METHODS:
We carried out multicenter study of intra-operative assessment of joint gap in 259 knees undergoing posterior stabilized (PS) mobile-bearing TKA. Before implantation, the joint gap was measured using a tensor device, which had completely the same shape as total knee prosthesis we used (Vanguard RP, Biomet, Warsaw, IN) (Figure 2). Patella was reduced and quadriceps tendon was sutured by two stitches. The center width and asymmetry (tilting) under the distracting force of 120N were measured with the patellofemoral joint reduced and the quadriceps sutured. (Figure 2).

RESULTS:
The mean width of the joint gap was not constant through full range of motion (10.1mm, 12.3mm, 12.0mm, 11.9mm, 11.0mm, and 11.0mm in 0, 30, 45, 60, 90, 120, 145 degrees) (Figure 4). The mean thickness of polyethylene insert used was 10.9 mm. The tilt of the joint gap was almost constant through full range of motion (0.8, 0.3, 0.0, 0.0, 0.0, 0.5 degrees varus in 0, 30, 45, 60, 90, 120, 145 degrees) (Figure 5).

DISCUSSION:
The joint gap after implantation was small in extension and deep flexion (p<0.05), and became the largest in mid-flexion (p<0.05). To our knowledge, this is the first report on the objective data of mid-flexion instability during TKA. This mid-flexion instability was shown during the position in which post and cam did not engage. Use of another articulating surface design or post-cam mechanism should be considered to deal with mid-flexion instability after TKA.

SIGNIFICANCE:
We carried out multicenter study of intra-operative assessment of joint gap in 259 knees. This study showed that joint gap became loose in mid-flexion after implantation. To our knowledge, this is the first report on the objective data of mid-flexion instability after TKA.