Influence of soft tissue impingement on range of motion during posterior approach THA: in vivo measurement study using CT-based navigation system

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Introduction: The occurrence of impingement is a cause of poor outcomes of total hip arthroplasty (THA); it can lead to instability, accelerated wear, and unexplained pain[1, 2]. While implant impingements [3-5] and bony impingement [6-8] were widely investigated, importance of soft tissue impingement was unclear.

In the THA through posterior approach, it is known that posterior soft tissue repair can decrease the risk of dislocation[9]. However, it is not known whether anterior soft tissue impingement by anterior hip capsule will influence hip ROM. The purpose of this study is to quantitatively measure the effect of anterior capsule resection on hip ROM in vivo during posterior approach THA using hip navigation system.

Methods: From June 2011, 26 hips (25 patients) that underwent primary THA using Stryker CT-based hip navigation system (Stryker-Leibinger, Freiburg, Germany) were the subjects of this study. All were female and the average age at the operation was 59 (47-76) years. Preoperative diagnosis was osteoarthritis of the hip in all patients. All operation was done through posterior approach.

Preoperatively, CT images of the patient were obtained and we planned the position and the size of the implants three-dimensionally on the navigation software. Intraoperatively, after surface registration of the pelvis and femur was done, acetabular cup and femoral stem placement were performed under the navigation system according to the preoperative planning. After reduction of the joint, we measured hip ROM using the same navigation system. Maximum (max) flexion, max extension, max abduction, max internal rotation at flexion 90 degree, max internal rotation at flexion 45 degree, max external rotation at flexion 0 degree without dislocation were recorded. We measured them before and after the resection of anterior hip capsule and compared the difference. For statistical analyses, we used the paired t-test for comparisons.

Results: After the resection of anterior hip capsule, the average increases of ROM were 0.7±3.5 degrees for flexion, 2.3±2.3 degrees for extension, 1.1±2.3 degrees for abduction and 2.1±2.9 degrees for external rotation at flexion 0 degree compared with ROM before the resection. However, it significantly increased 7.5±5.1 degrees for internal rotation at flexion 90 degree (range; -3-20, p<0.001) and 6.1±5.5 degrees for internal rotation at flexion 45 degree (range; -4-18, p<0.001).

Discussion: Compared with bony or implant impingement, assessment of soft tissue impingement by the image was difficult[10]. There had been few reports that focused on influence of soft tissue impingement on ROM by quantitative measurement during THA[11, 12].

Navigation system provided us various methods to quantitatively measure the intraoperative parameters such as hip ROM, pelvic tilt and hip offset[13, 14]. In this study, we used CT based navigation system for assessment of soft tissue impingement. We found that during posterior approach THA, resection of anterior hip capsule brought about average 6-7 degrees, max 20 degrees increase of ROM, especially in the direction of flexion with internal rotation. We also found that this procedure did not change ROM of flexion, extension, abduction and external rotation. These results indicated that, during THA through
posterior approach, resection of anterior hip capsule could reduce the risk of posterior dislocation without increasing the risk of anterior dislocation.

References