ligament (PCL) reconstruction combined with posterolateral corner reconstruction. The purpose of this study is to compare the clinical outcomes of single- and double-bundle transtibial PCL reconstruction combined with reconstruction of the lateral collateral ligament (LCL) and popliteus tendon for posterolateral corner insufficiency.

Methods: The study population consisted of 42 patients who had undergone PCL reconstruction between March 2002 and July 2006, and for whom a minimum of two years of follow-up data were available. We compared clinical outcomes of two surgical techniques: a single-bundle technique with remnant preservation (23 patients, single-bundle group) or a double-bundle technique (19 patients, double-bundle group), each combined with reconstruction of the lateral collateral ligament and popliteus tendon for posterolateral corner insufficiency.

Results: There were no difference between the single- and double-bundle groups in the mean side-to-side difference of posterior translation measured with Telos stress radiography (4.2 ± 1.7 vs. 3.9 ± 1.6 mm, p = 0.628), and rates greater than 5 mm were 22% in single-bundle group and 21% in double-bundle group. Regarding the posterolateral rotatory laxity, there were no differences between the two groups in the mean side-to-side difference in the dial test. (5.3° ± 2.7° vs. 5.1° ± 2.4° at 30°, p = 0.801; 6.7° ± 2.7° vs. 6.7° ± 2.4° at 90°, p = 0.917), or in varus stress radiography (1.2 ± 1.2 mm vs. 1.3 ± 1.4 mm, p = 0.722). The Lysholm knee scores were 85.7 ± 7.6 in the single-bundle group and 87.7 ± 7.3 in the double-bundle group (p =0.392). There was a trend of no difference between the groups in IKDC knee score (p =0.969). The rates of abnormal and severely abnormal categories in IKDC were 30% in single-bundle group and 26% in double-bundle group.

Conclusion: Double-bundle PCL reconstruction combined with posterolateral corner reconstruction does not appear to have advantages over remnant preserving single-bundle PCL reconstruction combined with posterolateral corner reconstruction with respect to the clinical outcomes or posterior knee stability.

Tension Changes within the Bundles of Anatomic Double Bundle ACL Reconstruction at Different Knee Flexion Angles: An In Vivo Study using Three Dimensional Finite Element Model (SS-46) *Yon Sik Yoo, M.D., Bishnu Prasad Patro, M.D., Heon Young Kim, Ph.D., Hak Jin Kim, MS, Young Jin Seo, M.D.*

Introduction: Recent studies dispute the previous notion of reciprocal relationship between the bundles and advocate that both bundles shorten with flexion. The purpose of this study is to evaluate the tension change and biomechanical behavior of the reconstructed AM and PL bundles during knee range of motion, after an anatomical double bundle ACL reconstruction using 3D in vivo finite knee model.

Methods: An in-vivo study was conducted in five males, with a mean age of 29.4±5.3years without history of previous knee pathology. Subjects' right knee was scanned using high resolution CT scanner at 4 different knee positions (0°, 45°, 90° and 135°). Software was used to create, manipulate, and analyze the 3D model. The model was assembled and meshed using Hyperworks (Altair engineering). Bone/ligament and ligament/ligament contact were modeled using penalty formulation assuming a frictional coefficient of 0.1. Finite element analysis was performed with ABAQUS/Explicit code. In 0°analytic model, four 7mm diameter tunnels were drilled at center of each AM and PL footprint of femur and tibia leaving a bone bridge of 1.5mm. Bundles with a pretension of 40N put into respective tunnels and fixed at middle of each tunnel. Next, reconstructed knee was superimposed to discrete 45°, 90° and 135° of knee flexion with the positional information of the coordinates. Digital length of virtual bundles measured from centre of each tunnel. The change of stress distribution within the ligaments and contact between the bundles and surrounding bony structure during different knee positions was assessed.

Results: In both AM and PL bundles, the digital length was longest in full extension (3.88±0.43 and 2.93±0.31 cm respectively). With flexion i.e. at 45° and 90°, both bundles lose their linearity more so with PL bundle, the loss in tension of PL bundle was regenerated by its internal twisting and impingement to the tibial lateral intercondylar tubercle acting as bridge and that of AM bundle due to minimal change in its length. In full flexion, knee attains a stable position likely due to restoration of ligament length and twisting of the ligaments. In extended knee, the maximum principal stresses were located in the mid-anterolateral portion of the AM and PL bundles reaching maximum values of 11.45 and 12.21Mpa, respectively.

Conclusion: The length of both bundles were maximum at extension, gradually decreasing with flexion; still both the bundles maintain sustained tension at 45 degree, 90 degree and 135 degree of knee position. The regain of ligament tension with flexion by internal twisting and impingement between the bundles and with surrounding bone suggest final tensioning of bundles in extension would regain joint stability at various knee positions.