Have Evolving Surgical Methods Improved Clinical Outcomes after Anterior Cruciate Ligament Reconstruction?

Seong-Il Bin, MD, PhD

Department of Orthopedic Surgery, Asan Medical Center, University of Ulsan College of Medicine, Seoul, Korea

Anterior cruciate ligament (ACL) tears are the most common ligament injury in young population who want to participate in sports activities, such as basketball, soccer and skiing. The current standard treatment for this ligament injury is mimicking the native ACL by fixation of an autograft or allograft in the drilled bone tunnels. Orthopedic surgeons hope the reconstructed ACL can restore joint stability and diminish subsequent meniscal and articular cartilage injuries. Although many decades have passed since ACL reconstruction was developed, there still have been numerous changes in surgical methods.

For a long time before the mid-2000s, isometricity of the ACL through knee motion was the main objective of ACL reconstruction to prevent a retear. Isometric ACL reconstruction using the transtibial (TT) technique was considered as the standard surgical method. How about now? Science is evolving and the then overwhelming technique yielding good clinical outcomes is now considered as an old-fashioned one that cannot restore rotational stability after ACL tears¹⁾. The current primary concern of many researchers has shifted to how to accurately restore the native anatomic attachment of the ligament. In response, numerous laboratory studies have been conducted to investigate the detailed anatomy of ACL, revealing previously unknown facts such as

direct/indirect insertion and ribbon-like structure of the ACL^{2,3)}. Unfortunately, it has not yet been perfectly reproduced even with the anteromedial (AM) portal or outside-in (OI) technique.

Will these methodological developments improve the clinical outcomes of ACL reconstruction and prevent later arthritic changes? We cannot be sure yet⁴⁾. Recently, a Danish Knee Ligament Reconstruction Registry study reported a rather increased risk of revision ACL surgery when using the AM technique for femoral drill hole placement, compared with the TT technique⁵⁾. Therefore, long-term evaluation of high level studies is necessary to convince us the superiority of the latest technique pursuing anatomic ACL reconstruction and if results are not satisfactory, it will be replaced by another technique in later decades. However, the recent newly introduced surgical methods are considered as innovative efforts of clinicians who wish to overcome the limitations of the pre-existing techniques.

Femoral tunnel placement is known to be more crucial to restore biomechanical properties of the native ACL^{6,7)}. Although controversy still exists regarding the best method for approaching the anatomical femoral footprint, independent femoral drilling using the AM portal or OI technique are documented to have advantages of unconstrained anatomic placement compared to the TT technique⁸⁾.

The current issue of *Knee Surgery and Related Research* contains in vivo studies on tunnel geometry and clinical outcome evaluations after ACL reconstructions. Lee et al. conducted three-dimensional computed tomographic evaluation of femoral tunnel geometry to compare the AM and OI techniques and showed that each independent method resulted in distinctive features of the femoral tunnel and had respective disadvantages. The TT technique is still familiar to many orthopedic surgeons⁸⁾ and it

Correspondence to: Seong-Il Bin, MD, PhD
 Department of Orthopedic Surgery, Asan Medical Center, University of Ulsan College of Medicine, 88 Olympic-ro 43-gil, Songpa-gu, Seoul 05505, Korea
 Tel: +82-2-3010-3528, Fax: +82-2-488-7877
 E-mail: sibin@amc.seoul.kr

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can be a feasible method for modified oblique femoral tunnel placement in anatomic reconstruction⁹⁾. However, the modified TT technique may have another problem caused by oblique tibial tunnel drilling to reach the anatomic femoral footprint via the tibial tunnel. Nha et al. evaluated secondary aperture widening of the tibial tunnel which may happen during passing the reamer for femoral tunneling through the first-made tibial tunnel. They insisted that a lower tibial tunnel angle would reduce iatrogenic aperture widening. However, we do not know the clinical implications of these results. Indeed, clinical outcomes may be more important than intraoperative or immediate postoperative evaluations. Kim et al. reported the mid-term outcomes after anatomic ACL reconstruction using the AM portal technique. They showed somewhat increased anteroposterior laxity between the short-term and mid-term follow-ups, but it was less than 3 mm without clinical significance. Dhillon et al. compared clinical outcomes between the medial meniscus-deficient and intact knees with chronic ACL tears. The importance of the medial meniscus as a secondary stabilizer is well documented in the study. In a meniscectomized knee, an excessive load to the reconstructed graft may lead to early failure and clinical outcomes can be improved with concomitant medial meniscus transplantation¹⁰⁾. This study reaffirmed the importance of medial menisci as a secondary stabilizer.

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