Editorial Commentary: Does "No Difference" Really Mean "No Difference"? Not All Anterior Cruciate Ligament Transtibial Drilling Techniques Are Created Equal

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Abstract: Despite the preponderance of biomechanical data suggesting that independent femoral tunnel drilling results in more favorable knee kinematics and superior anterior cruciate ligament footprint restoration when compared with transtibial tunnel drilling, equivalent clinical outcomes associated with both techniques continue to be reported. However, readers could contemplate the meaning of "clinical equivalence" and, perhaps, find themselves wanting better ways to detect differences between surgical techniques.

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In "Comparison of Modified Trans-tibial and Outside-in Techniques in Anatomic Single-Bundle Anterior Cruciate Ligament Reconstruction," Lee, Kim, Lee, Kim, and Park[1] reprise the debate over the superiority of one femoral tunnel drilling technique over another. At first glance, one cannot help but ask, "Hasn't this issue been settled?," in light of the preponderance of biomechanical data showing that either outside-in or anteromedial portal femoral tunnel drilling more closely restores rotatory knee stability and consistently puts the femoral tunnel in a more anatomic position.[2-4] However, the authors should be commended for presenting a well-performed, retrospective cohort study that assessed myriad radiographic and clinical parameters associated with consecutive groups of patients undergoing anterior cruciate ligament (ACL) reconstruction with either an outside-in technique or a "modified transtibial technique."[5] Clearly, they do not believe that all transtibial techniques are created equal, showing that anatomic femoral tunnel positions can be achieved with a modified transtibial technique that are comparable with those obtained by independent femoral tunnel drilling.

The nuances of the modified transtibial technique as described by Lee et al.[1] are worth summarizing. The knee is flexed, and the anatomic center of the ACL footprint is marked with an awl that is inserted into an anteromedial portal. A guide pin is then directed through the tibia toward the awl mark, and the knee is progressively extended to engage the guide pin in the anatomic center of the ACL footprint. Lee et al. acknowledge that the guide pin inevitably contacts a point slightly more anterior and proximal to the point that was marked with the awl through the anteromedial portal. Consequently, a key aspect of the technique involves the creation of a "triangular, funnel shaped bone trough," which supposedly accommodates the eccentrically inserted guide pin into the anatomic center of the ACL footprint as the knee is moved from flexion into extension. As the knee is extended, the guide pin becomes bent, so it is exchanged for a straight guide pin, which is inserted and redirected into the same aperture with a series of adjustments in the knee flexion angle. The femoral tunnel is then dilated sequentially with reamers that are passed with the knee in extension and advanced as the knee is subsequently flexed to avoid reaming a short tunnel and/or causing posterior wall damage.

Overall, no significant differences between groups were observed in terms of failure rate, International

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Knee Documentation Committee subjective score, Lysholm score, Tegner Activity Score, instrumented sagittal-plane laxity, functional testing, and pivot-shift examination. Not surprisingly, the modified transtibial technique yielded longer, more vertical tunnels, and the postoperative magnetic resonance imaging results recapitulated previously reported data suggesting that the decreased graft bending angles associated with transtibial drilling resulted in a lower signal-to-noise quotient, which has previously been described as a surrogate for graft maturation.[6,7] It is interesting to note that an analysis of postoperative computed tomography scans showed no significant differences between the 2 techniques in femoral tunnel position as described by the quadrant method proposed by Bernard et al.[8]

The study by Lee et al.[1] has several strengths. First, the authors should be commended for obtaining 100% follow-up among 100 patients at 36 months. Achieving this level of follow-up is a triumph of clinical research and allows for some meaningful comparisons between groups in terms of select functional outcome scores. Second, by obtaining postoperative computed tomography and magnetic resonance imaging, the authors were able to perform relatively precise assessments of the femoral tunnel location and comment rather convincingly on certain features suggestive of graft maturation among patients in both cohorts. However, several notable limitations are worth mentioning as well. On the basis of a number of second-look arthroscopies, it was suggested that the modified transtibial cohort was found to have better-tensioned grafts that were more synovialized. Aside from the subjective nature of such assessments, no mention was made as to whether these examinations were performed by surgeons blinded to the tunnel drilling technique, which obscures efforts to draw substantive conclusions from these data. The authors also rightly pointed out that the femoral-sided fixation was different between the 2 techniques, with the modified transtibial technique involving 2 points of femoral fixation using a fixed-loop cortical button and a cross-pin construct. It is certainly possible to imagine that a more rigidly fixed graft could be associated with less motion in the tunnel, thereby enhancing graft maturation (with a lower signal-to-noise quotient). However, given what has already been shown with transtibial techniques being associated with a lower graft signal-to-noise quotient regardless of graft fixation method, this is a point of questionable significance.

From a broader standpoint, readers are likely to ask, "How does this study contribute to what is already known?" After all, we already know that transtibial techniques result in lower graft bending angles and signal-to-noise ratios in the graft when compared with the same parameters for independent femoral tunnel drilling. Going a step further, we also already know that outside-in techniques result in higher graft bending angles and higher signal-to-noise ratios compared with anteromedial techniques, so it should come as no surprise that the modified transtibial technique essentially outperformed the outside-in technique in these respects. Furthermore, what is keeping those same readers from characterizing this work as just another study that shows no difference between techniques? Lee et al.[1] would likely argue that not all transtibial techniques are alike, and their results show that the modified transtibial technique may very well do a better job of putting the graft in a more anatomic location (one should recall the finding of no difference compared with the outside-in technique). But, ultimately, with no significant clinical difference shown, one cannot help but wonder whether these distinctions really matter.[4]

It would seem then that we are left to contemplate the meaning of the apparent equivalence. As Freddie H. Fu, M.D., has asked time and time again, "Does no difference really mean there is no difference?" Herein lies the potential (and necessity) for the development of better measures capable of discerning subtle yet meaningful differences between patients and techniques. The pivot-shift phenomenon is a poignant example of this fact, given the clear linkages between worse clinical outcomes and residual rotatory knee laxity after ACL reconstruction.[9,10] In the study by Lee et al.,[1] no differences were observed in the proportion of increasing pivot-shift grades between groups. But besides the fact that these assessments were made in a nonblinded fashion, the pivot-shift phenomenon has been shown to be inconsistently reproducible between independent examiners.[11] Consequently, a number of authors have described other methods for quantifying rotatory knee laxity.[12-14] By measuring the translation of the lateral compartment in vivo during the pivot-shift phenomenon, these applications are capable of putting a number next to "a feel." The implications of these technologies, particularly in the setting of a study like that of Lee et al., are fairly obvious, given that recent literature has elucidated the utility of these objective data in the setting of ACL ruptures in isolation and with concomitant injuries.[15,16] Moreover, given what is already known about the kinematic shortcomings of transtibial techniques, perhaps a more exacting focus is needed to assess for in vivo differences in rotatory knee laxity associated with new or "modified" procedures.

The study by Lee et al.[1] shows us that the modified transtibial technique is capable of putting the femoral tunnel in a comparable position to that of outside-in techniques, albeit slightly more anterior. Future initiatives should be devoted toward better understanding the in vivo kinematic consequences of this reconstruction technique. It is important to ask whether "no

difference" really means "no difference." The graft bending angle and signal-to-noise ratio are certainly parameters worthy of investigation, but shouldn't future comparative efforts apply the same level of rigor toward determining which knee-stabilizing procedures are most effective at stabilizing the knee? We think so, and we have the tools to do so—let's use them! In the meantime, keep putting your femoral tunnels (whichever way you do it) where they belong, in the anatomic center of the ACL footprint.

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