Editorial on five-strand hamstring autograft versus quadruple hamstring autograft with graft diameters 8.0 millimeters or more in anterior cruciate ligament reconstruction: clinical outcomes with a minimum 2-year follow-up

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Anterior cruciate ligament (ACL) ruptures are common injuries, often requiring surgical reconstruction. While many agree the injury needs to be addressed with reconstruction, no single technique has been accepted as superior to other options. This manuscript addresses a unique albeit difficult issue to address intraoperatively. In patients undergoing ACL reconstruction with semitendinosus (ST)-gracilis (G) autograft, Magnussen showed that grafts less than 8mm in diameter required revision ACL reconstruction at a statistically significant percentage, inversely proportional to graft size.(1) That study changed the way orthopaedic surgeons approach soft tissue grafts for ACL reconstruction, with many surgeons planning ahead for how to deal with a smaller 4 strand graft that is more prone to re-rupture. Options include folding the graft into a multiple strand construct, allograft augmentation, or contralateral leg supplementation.

Calvo and colleagues compared two cohorts of patients: one had 4 strand ST-G grafts that were at least 8 mm in diameter (average 8.5 mm), with a second cohort who had insufficient 4 strand graft diameter (average 7.2 mm) who were therefore converted to a 5 strand construct (new average 9.2mm) for the reconstruction. There were no statistically significant differences in patient reported outcome scores or re-rupture rates, confirming that converting to a 5 strand option to achieve sufficient graft diameter yields similar results to a larger 4 strand graft.

This manuscript has many strengths to highlight. Long term follow-up of at least 2 years (range: 2–4 years) provided ample time for recovery and return to sport, all while affording the subjective outcome measures to be collected. One study showed that those who undergo ACL reconstruction have a higher incidence of repeat injury after reconstruction within 2 years (2). Moreover, all patients had magnetic resonance imaging (MRI) follow-up at 6 months thereby providing more objectivity and limiting the clinical interpretation of rerupture. While clinical examination cannot be replaced, subjectivity would certainly play a significant role in this cohort.

The study did an excellent job of controlling for confounding. Both cohorts underwent similar surgical techniques in terms of tunnel preparation and fixation using femoral tightropes and tibial interference screws thereby permitting the groups to be more similar for comparison. These fixation techniques are common practice in ACL reconstruction surgeries. Moreover, the cohorts had strict inclusion and exclusion criteria. No one in the entire cohort was more than 3 months out from initial injury. After this time frame, the lack of ACL stability requires the secondary stabilizers, notably the meniscus, to help control rotation and anteroposterior (AP) translation. Mushai *et al.*, in a cadaveric model, found that the medial meniscus plays a role in AP translation during Lachman testing while the lateral meniscus is an important restraint during anterior translations with valgus and rotatory loading (3). They also excluded any multiligamentous injury and notably those with any meniscal or chondral injuries. By ensuring no other significant pathology existed about the knee, no other factors could be confounding their subjective outcome measures.

As an added strength to the study, the investigators tested multiple configurations in the lab to create the 5-strand graft construct prior to applying the technique in patients. Of the three configurations (circular, S, partial quadruple), the partial quadruple configuration was found to be biomechanically advantageous. While their data was not published on this testing, we believe this partial quadruple configuration being sutured together may be stronger given the final loop that goes over the top. It is similar to the S configuration though it has the additional coverage of the inner loop.

Although the re-rupture rate in the quadruple bundle cohort of 9% (3/35) is higher than the 1.7–6.2% revision rate for grafts of similar size quoted in the Magnussen paper, this may be influenced by the relative size of the cohort.

The authors highlighted among their limitations the size of the overall cohort. This cohort size is powered to 80% and as the authors noted, the need to triple the ST graft is not a common requirement, especially since many patients may have bone-patellar tendon-bone (BPTB) graft done if the hamstring graft length was in question during preoperative planning. Performing this study prospectively would add additional strength and help limit confounding to an even greater extent.

Overall, 5-strand autografts had no statistically or clinically significant differences from the widely utilized technique of quadruple bundled autograft reconstructions. This study is interesting in that it poses a solution to a problem that may not always be recognized preoperatively. Moreover, it affords the surgeon to use autograft entirely and avoid creating a hybrid graft. As we've shown at our institution, hybrid grafts had a failure rate of 13.8% while autografts failed at a rate of 3.4% (4). We agree with the authors that using a 5-strand autograft reconstruction is a valid approach to increase graft diameter to desired levels to reduce the risk of re-rupture.

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Footnote

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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