# The addition of an extra-articular anterolateral ligament reconstruction to an ACL reconstruction with hamstring tendons smaller than 7 mm produces results similar to isolated ACL reconstruction with tendons larger than 8 mm in diameter: a matched-pair analysis

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INTRODUCTION:

The hamstrings are the most used graft for ACL reconstruction. Unlike bone-patellar tendon-bone or quadriceps tendon graft options, hamstrings diameter is not always predictable. A recent study by Charalambous et al. concluded that in around 6% of the cases hamstrings grafts can be insufficient for an adequate ACL reconstruction.

Several studies in the literature report that hamstring tendons smaller than 8 mm in diameter produce worse results and have a higher rate of reconstruction failure. This was the conclusion of studies performed by Jagadeesh et al., Conte et al. and Magnussen et al. Firth et al. also concluded that larger graft diameter was significantly associated with reduced odds of asymmetric pivot shift. In this way, most of the surgeons avoid to use grafts that are 7.5mm or less.

However, the effect of an extra-articular reconstruction to smaller grafts in not well established. A biomechanical study performed by Marom et al. have shown that the addition of a lateral tenodesis transferred loads from the ACL graft to the LET. Engebretsen et al. also concluded that the addition of an iliotibial band tenodesis to an existing standardized intraarticular reconstruction significantly decreased the force in the ACL graft by an average of 43%. In the clinical scenario, Zaffagnini et al. reported good results after a minimum of 20 year follow up of a double hamstring technique associated with a lateral plasty. They reported only 1 graft rupture out of 52 reconstructions.

Thus, the aim of this study is to compare patients undergoing ACL reconstruction with hamstrings graft of 7mm or less in diameter associated with an anterolateral ligament reconstruction with isolated ACL reconstructions with a graft larger than 8mm. Our hypothesis is that the results will be similar.

METHODS:

Descriptive data and clinical outcomes were prospectively collected and retrospectively evaluated from patients who underwent primary ACL reconstruction with and without the addition of an anterolateral ligament reconstruction from June 2013 to January 2020 and with a minimum follow-up of 2 years. Patients with an hamstrings autograft 7mm or less in diameter combined with an ALL reconstruction (HT-ALL group) were matched in a 1:2 propensity ratio to patients with isolated HT 8mm or larger (HT-group).

Patients with associated injuries, except meniscus, that required additional surgical procedures (except for an ALL reconstruction) and patients with previous contralateral knee injury were not included for this evaluation.

ACL reconstruction was performed using the outside-in technique for preparing the femoral tunnel. The tunnel was positioned close to the anteromedial bundle of the ACL in the lateral femoral condyle. The tibial tunnel was created at the center of the ACL footprint. The hamstring graft was passed from the tibia to the femur, and fixation was performed with absorbable interference screws. The femur was fixed first and the tibia second, with around 30 of knee flexion.

Patients in the HT-ALL group also underwent reconstruction using the outside-in technique with tripled semitendinosus and single gracilis grafts for ACL reconstruction; the remaining portion of the gracilis was used for ALL reconstruction. Reconstruction was performed by fixing the ALL onto the femur and tibia with an interference screw. The femoral tunnel used for the ALL was the same one used for the ACL reconstruction. In combined ACL and ALL reconstructions, the femoral tunnel was performed with entry point in the external surface of the lateral condyle slightly posterior and proximal to the lateral epicondyle, to replicate the ALL femoral attachment. The tibial tunnel for the ALL was created between the Gerdy tubercle and the fibular head, approximately 5 to 10 mm below the lateral articular plateau. Tibial fixa- tion was performed with an interference screw in neutral rotation and full extension.

Data were collected from medical records and databases of operated patients completed prospectively during normal patient follow-up. The following data were collected: patient data (age and sex), time from injury to surgery, KT-1000 arthrometer laxity, pivot shift, associated meniscal injury and treatment (meniscectomy or repair), intra-articular graft size, follow-up time, occurrence of graft failure, and postoperative Lysholm knee scale and International Knee Documentation Committee (IKDC) subjective form scores. Graft failure was based on clinical ACL failure criteria (physical examination showing laxity with no clear endpoint for Lachman and anterior drawer tests or pivot-shift positivity associated with instability complaints) and when imaging showed a new graft rupture.

RESULTS:

Thirty patients submitted to a combined ACL + ALL reconstruction with an ACL graft 7mm or smaller were identified from our database. This group was matched by age, sex, time from injury to surgery and meniscal tears, to 60 from a database of 474 patients submitted to an isolated ACL reconstruction with a hamstring graft of 8mm or larger.

Both groups were similar regarding all pre-operative variables. Mean ACL graft diameter was 6.8 +/- 0.4mm fot the HT-ALL group and 8.6 +/- 0.6mm for the HT group ($p < .00001$). HT-ALL group presented one failure (3.3%) and HT group presented 3 failures (5%) ($p=1$). Post-operative KT-1000 was similar between groups (2.1 +/- 1.1mm vs 1.9 +/- 1.2mm; $p=0.11$) as well as post-operative pivot shift ($p=0.17$). Subjective IKDC scores did not present any difference between the groups (86.1 +/- 7.1 vs 87.5 +/- 8.2; $p=0.28$) as well as the Lysholm score (90.4 +/- 6.2 vs 89.4 +/- 7.3; $p=0.84$)

DISCUSSION AND CONCLUSION:

This is one of the first studies to clinically compare the effect of an ALL reconstruction in cases of grafts considered to be of small diameter for ACL reconstruction. According to the results present, even if the ACL graft is 7mm or less, comparable results of a reconstruction with a graft 8mm or larger can be achieved if an ALL reconstruction is added.

Although we do not advocate ACL reconstruction with small-diameter grafts, even with the possibility of associated ALL reconstruction, this scenario should be further studied in the literature.