ACL Repair: Current Concepts

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Disclosures

- Consultant for Arthrex
- Type 1: Minimal Tissue on Femur. Avulsion Tear.

- Type 2: 20% Tissue on Femur. Proximal 1/4th Tear.

- Type 3: 33% Tissue on Femur. Proximal 1/3rd Tear.

- Type 4: 50% Tissue on Femur. Mid-Substance Tear.
ACL Repair


Autologous BPTB ACL Reconstruction Results in Lower Failure Rates Than ACL Repair with and without Synthetic Augmentation at 30 Years of Follow-up: A Prospective Randomized Study.

RESULTS: A total of 113 patients (75%) were available for the follow-up evaluation; 39 patients were in the primary repair group, 39 in the LAD group, and 35 in the BPTB group. Through telephone calls and investigation of patient medical records, 40 of these patients were excluded from further analyses because of revision surgery, knee arthroplasty in the involved or contralateral knee, or ACL reconstruction in the contralateral knee. One patient in the BPTB group had undergone revision ACL reconstruction compared with 12 in the primary repair group (p = 0.002) and 9 in the LAD group (p = 0.015). Seven patients had undergone knee arthroplasty in the involved knee, with no significant difference among the groups. In the remaining patients, no significant differences were found among the 3 groups with regard to range of motion, laxity, or Tegner and Lysholm scores. Radiographic evidence of osteoarthritis, defined as an Ahlbäck grade of 2 through 5, was found in 42% of the operatively treated knees, with no significant differences among the groups.

CONCLUSIONS: In the present 30-year follow-up results of a randomized controlled study, the BPTB graft augmented with the remnants of the ruptured ligament provided superior results with regard to the number of revisions compared with both the primary repair and LAD groups. No significant differences were found with respect to range of motion, laxity, activity, function, radiographic evidence of osteoarthritis, and knee arthroplasties.
Arthroscopic primary repair of proximal anterior cruciate ligament tears seems safe but higher level of evidence is needed: a systematic review and meta-analysis of recent literature.

van der List JP¹,²,³, Vermeijden HD⁴,⁵, Sierijveit IN⁴,⁶, DiFelice GS⁵, van Noort A⁴, Kerkhoffs GMMJ⁶,⁷,⁸.

RESULTS: A total of 13 studies and 1,101 patients (mean age 31 years, mean follow-up 2.1 years, 60% male) were included. Nearly all studies were retrospective studies without a control group and only one randomized study was identified. Grade of recommendation for primary repair was weak. There were 9 out of 74 failures following primary repair (10%), 6 out of 69 following repair with static augmentation (7%) and 106 out of 958 following dynamic augmentation (11%). Repair with dynamic augmentation had more reoperations (99; 10%), and more hardware removal (255; 29%) compared to the other procedures. All functional outcome scores were >85% of maximum scores.

CONCLUSIONS: This systematic review with meta-analysis found that the different techniques of primary repair are safe with failure rates of 7-11%, no complications and functional outcome scores of >85% of maximum scores. There was a high risk of bias and follow-up was short with 2.1 years. Prospective studies comparing the outcomes to ACL reconstruction with sufficient follow-up are needed prior to widespread implementation.
RESULTS: Twenty-eight studies satisfied the inclusion criteria, comprising 2,401 patients (52.3% male, 35.7% female, 12.0% unspecified gender) with mean age ranging from 6.0 to 43.3 years. Most studies were conducted in Europe (82.1%), were level of evidence IV (60.7%), and were designed as case series (57.1%). Fourteen investigations (50.0%) used primary suture repair and 14 (50.0%) used dynamic intraligamentary stabilization. Preoperative ranges for Lysholm, International Knee Documentation Committee Score subjective, and Tegner scores were 28 to 100, 94.1 to 100, and 2 to 9, respectively. Postoperative ranges for the same measures were 80 to 100, 54.3 to 98, and 3.67 to 7, respectively. Time to return to sport/work ranged from 3.1 ± 3.3 to 17.4 ± 1.5 weeks. Frequency of rerupture, revision ACL surgery, and overall reoperations were as high as 23.1%, 33.3%, and 51.5%, respectively. Overall ACL repair survivorship ranged from 60.0% to 100.0%. In subgroup analysis for proximal ruptures treated with repair, the rates of revision ACL reconstruction (ACLR) and total reoperations were as high as 12.9% and 18.2%, respectively.

CONCLUSIONS: Based on our cumulative findings across 2,401 patients from the 28 included studies, it appears that ACLR results in better survivorship and patient-perceived postoperative improvement when compared with ACL repair. At present, ACLR appears to remain the superior treatment strategy in the vast majority of cases.
RESULTS: Thirty-seven MRIs were included from 36 patients. Mean age was 30 years (range: 14-57 years), and mean surgery-MRI interval was 1.5 years (range: 0.1-4.9 years). The radiologist recognized 6 out of 8 reruptures and 26 out of 29 intact ligaments (sensitivity 75%, specificity 90%, and accuracy 86%). Ligaments in the first year were more often hyperintense than after one year (60% vs. 11%, $p=0.02$), most often isointense (60%) between one and two years, and more often hypointense after two years than before two years (56% vs. 10%, $p=0.03$).
Predictors of Healing Ligament Size and Magnetic Resonance Signal Intensity at 6 Months After Bridge-Enhanced Anterior Cruciate Ligament Repair.

Murray MM¹, Kiapour AM¹, Kalish LA¹, Ecklund K¹; BEAR Trial Team¹, Freiberger C¹, Henderson R¹, Kramer D¹, Micheli L¹, Yen YM¹, Fleming BC¹.

RESULTS: A larger cross-sectional area of the repaired ligament at 6 months was associated with male sex, older age, and the performance of a larger notchplasty (P < .05 for all associations). A lower signal intensity at 6 months, indicating greater similarity to normal ligament, was associated with a smaller tibial slope and greater side-to-side difference in quadriceps strength 3 months after surgery. Other factors, including preoperative body mass index, mechanism of injury, tibial stump length, and Marx activity score, were not significantly associated with either MRI parameter at 6 months.

CONCLUSION: Modifiable factors, including surgical notchplasty and slower recovery of quadriceps strength at 3 months, were associated with a larger cross-sectional area and improved signal intensity of the healing ACL after bridge-enhanced ACL repair in this preliminary study. Further studies to determine the optimal size of the notchplasty and the most effective postoperative rehabilitation strategy after ACL repair augmented by a scaffold are justified.
RESULTS: There were no graft or repair failures in the first 24 months after surgery. The IKDC subjective scores in both groups improved significantly from baseline ($P < .0001$) at 12 and 24 months, to 84.6 ± 17.2 in the ACLR group and to 91.7 ± 11.7 in the BEAR group. An IKDC objective grade of A (normal) was found in 44% of patients in the BEAR group and in 29% of patients in the ACLR group at 24 months; no patients in either group had C (abnormal) or D (severely abnormal) grades. Arthrometer testing demonstrated mean side-to-side differences in AP laxity that were similar in the 2 groups at 24 months (BEAR, 1.94 ± 2.08 mm; ACLR, 3.14 ± 2.66 mm). Functional hop testing results were similar in the 2 groups at 12 and 24 months after surgery. Hamstring strength indices were significantly higher in the BEAR group compared with the ACLR group ($P = .0001$).

CONCLUSION: In this small, first-in-human study, BEAR produced similar outcomes to ACLR with a hamstring autograft. BEAR may result in knee stability and patient-reported outcomes at 2 years sufficient to warrant longer term studies of efficacy in larger groups of patients.
Needle Arthroscopy!
RESULTS: Cells of the injury effusion exhibited the greatest viability (86.4 ± 1.31%) when compared with the small volume harvest byproduct tissue (50.2 ± 2.5%, P = .0001), small volume harvest byproduct fluid (48.8 ± 1.88%, P = .0001), large volume harvest byproduct tissue (70.1 ± 5.6%, P = .0001), and large volume harvest byproduct fluid (60.3 ± 3.41%, P = .0001). The culture analysis of fibroblast colony-forming units found on average 1916 ± 281 progenitor cells in the effusion fluid, 2488 ± 778 progenitor cells in the byproduct tissue, and 2357 ± 339 progenitor cells in the byproduct fluid. Flow cytometry confirmed the presence of immature cells and the presence of cells with markers typically expressed by known stem cell populations.
Percutaneous Anterior Cruciate Repair with Needle Arthroscopy and Biologic Aug
Indications (Relative)

- Femoral side (Type 1-3)
- Acute injury
ACL rupture in the immediate build-up to the Olympic Games: return to elite alpine ski competition 5 months after injury and ACL repair.

Praz C¹, Kandhari VK¹, Saithna A²,³, Sonnery-Cottet B¹.

Thank you!