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Summary:
Adding a capsulodesis to transitiial posteromedial root repair, we can decrease the meniscal extrusion at 1 year follow up.

Data:
Purpose: the aim of the present study was to assess whether arthroscopic capsulodesis associated with transitiial posteromedial root repair may reduce meniscal extrusion that is frequently associated with the clinical failure of this kind of repair. Method: a multicenter randomized prospective study including patients with isolated lesions of the posteromedial meniscal root was performed. Only root lesion of type 2 and 4 according to LaPrade classification were included. Exclusion criteria were: varus knee > 4° and joint degeneration grade > 2 according to the Kellgren-Lawrence classification, BMI > 35. Power analysis was carried out using as primary outcome the difference in meniscal extrusion: 10 patients per group were enough for a power > 80%. We included 11 patients per group considering 10% of possible dropouts. The 22 patients were randomized: in group 1 a transtibial root repair was performed, in the group 2, in addition to the same repair, an arthroscopic capsulodesis was performed. A prospective follow-up by MRI at 3,6,12 months to assess meniscal extrusion was made. All measurements were performed by two different observers. For each case, measurements were taken twice, keeping the result of the first measurement blind. Inter and intra class agreements were calculated. The meniscal extrusion was calculated in coronal images at the maximum point of extrusion. Measurement was performed drawing two lines: one vertical line intersecting the peripheral margin of the lateral tibial plateau (LTP) at the point of transition from horizontal to vertical. A second perpendicular line was drawn from the outer margin of the meniscus to the former line to measure the degree of extrusion. Additionally, when the graft was extruded less than 3 mm beyond the LTP, it was considered minor extrusion, conversely, major extrusion was considered when the meniscus more than 3 mm of subluxation. Results: the intraclass correlation coefficient obtained was considered excellent (0.89; 95% CI: 0.84-0.92) and the high calculated & coefficient (0.78; 95% CI: 0.62-0.84) showed excellent agreement between observers. No differences were detected in preoperative meniscal extrusion (group 1 28.35 ± 11.28 mm VS group 2 27.12 ± 12.37 mm; p= 0.342). The meniscal extrusion in group 2 was lower both at 6 and 12 months postoperative (p=0.019). In both groups at 12 months, preoperative extrusion decreased (p=0.005). Preoperatively in 8 cases of group and 9 cases of group 2 presented major extrusion (p=0.965) whereas at 12 months postoperatively major extrusion was detected in 7 cases of group 1 and in 3 cases of group 2 (p=0.031). Conclusion: Arthroscopic capsulodesis limits meniscal extrusion at 1 year follow up when associated with transtibial repair of a posteromedial root tear. Longer-term clinical follow-up is needed to understand the clinical impact of this radiological finding.

Category: Knee · Meniscus

Biomechanical Comparison of Lateral Meniscus All-inside Radial Repair Techniques in a Cadaveric Model

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Summary:
This study evaluated biomechanical properties of four all-inside, meniscus-based repairs to radial tears of cadaveric human lateral meniscus and found that reinforcing vertical suture meniscus repairs with horizontal suture significantly increases load to failure.

Data:
Introduction Meniscal injuries are among the most common orthopedic injuries in the United States. Radial meniscus tears were historically treated with partial meniscectomy, often leading to poor outcomes. Repairing radial tears preserves meniscal tissue, may delay knee degeneration, and leads to better long-term outcomes. Repair techniques for radial tears vary and should be evaluated for differences in biomechanical properties and failure mechanisms.1-3 All-inside, meniscus-based suture repairs have shorter operating times, minimize risk of nerve injury, and are increasingly possible with novel devices.3 Objective Our objective was to evaluate four all-inside techniques to repair radial tears in human cadaveric lateral menisci. We chose two techniques – the Double Vertical (DV) and Double Vertical Cross (DVX) – that bridged the tear directly. We chose two other techniques – the All-inside Rebar (AR) and our novel Oblique Box (OB) – that added reinforcing stitches to engage the bridging stitches. We hypothesized that AR and OB would have higher load to failure than DV and DVX. Methods 36 fresh-frozen lateral human menisci were randomized into four groups of nine. A complete radial tear was created at the midbody of the meniscus. Suture repairs were performed using 2-0 braided suture. We repaired the menisci using the DV, DVX, AR, and OB techniques with meniscus-based suturing to simulate the all-inside, meniscus-based approach with all knots tied on the superior surface of the menisci. The DV repair used two sutures in loops perpendicular to the tear. DVX used two sutures in loops that crossed over the tear. AR used two sutures in loops parallel to the tear acting as reinforcing rebar and two bridging sutures perpendicular to tear and outside rebar sutures. OB used two sutures to create a trapezoidal reinforcing box on either side of the tear and two bridging sutures in loops perpendicular to tear and inside the box. The repaired menisci underwent load to failure testing and were analyzed statistically. Results Failure occurred due to suture cutout. Repair constructs that lacked a reinforcing-type suture (DV and DVX) cut through or “cheese-wired” at lower loads than repairs with reinforcing sutures (AR and OB). The AR repair sustained the highest load to failure, nearly 3x stronger than the two non-reinforcing type repair constructs. Mean load-to-failure values for each repair group were 60 N ± 24.5 for DV, 58 N ± 17.4 for DVX, 168 N ± 33.9 for AR, and 105 N ± 9.0 for OB. These results show that reinforcing vertical suture meniscus repairs with some type of horizontal suture (e.g. AR or OB) significantly increases load to failure for all-inside, meniscus-based techniques. Conclusions In a cadaveric lateral meniscus model, all-inside radial repairs using rebar suture techniques had higher ultimate load to failure and reduced risk of “cheese wiring”. These data may provide useful information for surgeons to consider when deciding how to repair radial meniscal tears to maximize patient outcomes. Future biomechanical study should compare all-inside vs. inside-out repairs. Clinical outcomes of these various all-inside radial repair techniques are also critical.

Category: Knee · Meniscus

Medial meniscus posterior root repair delays but not avoids histological progression of osteoarthritis: randomized in vivo experimental study

Abstract ID# 21765
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Summary:
Medial meniscus posterior root repair delays but not avoids histological progression of osteoarthritic changes randomized in vivo experimental study

Data:
Objective: The purpose of this study was twofold: (1) to describe and compare histopathological results of 3 different treatment options: nonoperative management, partial meniscectomy, and meniscal root repair and (2) to test the hypothesis that radial meniscal root tears treated conservatively predispose to a lower risk of osteoarthritic progression compared to partial meniscectomy. Study Design: Prospective, randomized, and experimental study. Methods: Posteromedial meniscal root tears were carried out in 39 NZW rabbits. The animals were randomly assigned into three experimental groups: partial meniscectomy after root tear (PM, n=13); root tear left in situ (CT, n=13); and translabial root repair (RR, n=13). Contralateral limbs were used as healthy controls. The animals were euthanized at 16 weeks postoperatively; tissue samples of femoral and tibial articular cartilage were collected and processed for macro and microscopic assessment to detect signs of early osteoarthritis (OA). Each sample was histopathologically assessed using the AORSI grading and staging system. Results: Osteoarthritic changes were the hallmark in all three experimental groups. The
root repair group had the lowest scores for cartilage damage (2.5; 2-3) and the meniscectomy group exhibited higher and more severe signs of OA (16; 9-16) compared to the conservative treatment group (5; 4-6). Between group comparison revealed significant differences as the PM group showed significantly higher rate macro and microscopic osteoarthritic changes compared to the RR (p < 0.001) and CT group (p < 0.001). The weight-bearing area of the medial meniscal condyle was the most severely affected and tidemark disruption was evident in all tissue samples. Conclusions: Meniscus root repair could not completely arrest histopathological progression of knee OA but lead to significantly less severe degenerative changes than partial meniscectomy and nonoperative management. Partial meniscectomy leads to the most severe osteoarthritic progression while stable radial tears left in situ presented lower OA progression compared with partial meniscectomy.

Category: Knee - Meniscus

Isolated Meniscus Allograft Transplantation Effectively Reduces Knee Laxity In the Presence of Previous Meniscectomy: In-Vivo Navigation of 18 Consecutive Cases

Abstract ID# 21993
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Summary:
Medial MAT improved knee kinematics by reducing AP translation and VV maneuver. Conversely, Lateral MAT determined a massive reduction of the PS and mild decrease of the AP translation and VV.

Data:
INTRODUCTION: Even if meniscal allograft transplantation (MAT) is a well-established procedure with satisfactory clinical results, there's still a lack of evidence on how medial and lateral MAT influences the intraoperative kinematics of the knee. The purpose of the present study was evaluating the intraoperative kinematics of arthroscopic medial and lateral MAT using a surgical navigation system in ACL-intact knees. METHODS: 18 consecutive patients undergoing MAT (8 medial, 10 lateral) were enrolled in this study. A surgical navigation system was used to acquire and quantify the anterior-posterior displacement at 30 and 90 degrees of knee flexion (AP30 and AP90), the varus-valgus rotation at 0 and 30 degrees of knee flexion (VV0 and VV30) and the dynamic laxity on the pivot-shift test (PS), which was determined through anterior displacement of the lateral tibial compartment (APlat) and posterior acceleration of the lateral tibial compartment during tibial reduction (ACC). Data from before and after MAT were compared. RESULTS: After the Medial MAT there was a significant decrease in tibial translation of 2.6 mm (27%; P = 0.005) for AP30 and 2.3 mm (34%; P = 0.0197) for AP90, a significant difference of 2.5 (51%; P = 0.0019) for VV0 and 1.7° (31%; P = 0.0119) for VV30. However, the medial MAT did not show any reduction in the PS kinematic data. The Lateral MAT determined a significant decrease in tibial translation of 2.8 mm (43%; P = 0.005) for AP30 and 1.9mm (38%; P = 0.018) for AP90 as well as a significant difference of 3.6mm (64%; P = 0.001) for VV0. There was also a significant reduction of the PS of 7.4 mm (39%; P = 0.021) for APlat and 302.9 mm/s² (75%; P = 0.005) for ACC. DISCUSSION AND CONCLUSION: Medial MAT improved knee kinematics by determining a significant reduction with particular emphasis to AP translation and VV maneuver. Conversely, Lateral MAT determined a massive reduction of the PS and mild decrease of the AP translation and Varo-valgus.

Category: Knee - Meniscus

Meniscal Allograft Transplantation Outcome in Adolescents and Young Adults

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Summary:
Factors such as age, sex and laterality of transplant should be strongly considered when conducting surgical planning for patients eligible for MAT to better understand risks and potential outcomes of the procedure.

Data:
INTRODUCTION: Meniscus insufficiency in young patients occurs following recurrent or irreparable tears. In such cases, meniscus allograft transplantation (MAT) is performed to protect joint integrity and prevent subsequent acceleration of arthritic changes. There is limited information on the outcomes of such procedures in an adolescent and young adult population. The purpose of this study was to retrospectively examine patients who underwent MAT at a single children’s hospital and describe their baseline characteristics and outcomes. Methods: We performed a retrospective chart review for all patients who underwent primary MAT at a single children’s hospital between 2015 and 2022. Demographic information and surgical characteristics of all eligible patients were included. The primary outcomes were presence of postoperative complications, reoperation, and graft failure. A logistic regression analysis was performed considering age, sex, affected compartment, discoid meniscus, malalignment, chondral lesion, and concomitant procedure, as risk factors for postoperative complications and re-operation. A subgroup analysis was performed considering only patients who were 18 years old or younger. Results: Forty-eight primary MAT in 47 patients were included in this study. The mean age at time of surgery was 17.15 years, and 54% were females. Half of cases had knee sports related injuries, and 31% had a discoid meniscus. Malalignment was documented in 7 patients (15%). Chondral lesions were found in 30 patients (63%), 90% of chondral lesions were found in the same compartment in which the MAT was performed. Concomitant procedures were performed in 20 patients (42%). Postoperative complications were reported in 26 patients (54%). Re-operation was reported in 13 patients (27%), with mean time to re-operation of 286.92 days. Logistic regression analysis showed that female sex and concomitant procedures significantly increased the risk of postoperative complications, and older age, female sex and lateral MAT significantly increased the risk of re-operation. Subgroup analysis of 33 patients aged <18 years at the time of surgery revealed similar findings to those reported in the full patient analysis. Conclusion: The MAT is an efficient procedure aimed to help preserve joint integrity and can improve function and symptoms in patients with meniscal insufficiency, but it is not without complications. More than 50% of patients in our cohort experienced postoperative complications and 27% required re-operation. Individuals of the female sex with concomitant procedures undergoing MAT have increased risk for postoperative complications. Further, increased age, female sex and lateral MAT also significantly increased the risk of re-operation. These factors should be strongly considered when conducting surgical planning for patients eligible for MAT to better understand risks and potential outcomes of the procedure.

Category: Knee - Meniscus

Analysis of Risk Factors in Arthroscopic Meniscus Repair of Bucket Handle Tear

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Summary:
The rate of incomplete healing after arthroscopic repair of bucket handle tear was significantly higher at the medial meniscus than at the lateral meniscus, but there was no difference in clinical failure between bucket handle medial meniscus tear and lateral meniscus tear.

Data:
Background: Since bucket-handle tears are usually larger and displaced, their repair can be challenging. There have been few comparative studies evaluating clinical and radiological outcomes of bucket-handle meniscal tears. Purpose: This study aimed to assess the clinical outcomes, failure rate, and risk factors for failure of bucket-handle tears that were treated with arthroscopic repairs. Methods: Seventy-four cases of bucket-handle tears (mean age, 27.2 ± 11.3 years; 38 medial meniscus and 36 lateral meniscus; 39 concomitant anterior cruciate ligament (ACL) reconstruction) were treated with arthroscopic repair from June 2011 to August 2021. The exclusion criteria were revisions, fracture histories, combined with microfracture and root repair, Chi-square test, Fisher exact test, Mann-Whitney test analysis and multivariable Cox proportional hazard ratio model were performed to evaluate the factors. These factors were: age, sex, body mass index (BMI, = 25kg/m2), chronicity (≤ 6 months), laterality (medial meniscus or lateral meniscus), and location (posterior horn only, tear involving midbody). They also comprised: tear

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