Thursday March 13, 2014
1:00 PM – 3:30 PM

2014

Meniscus Transplantation Study Group Meeting

Hyatt Place New Orleans Convention Center
Meeting Place 1 & 2
881 Convention Center Blvd
New Orleans, LA 70130

2014 Meeting Agenda

Welcome and Introduction

Kevin R. Stone, MD

Presentations

Moderated by Scott Rodeo, MD

Alteration in contact stress patterns on the tibial plateau after meniscectomy and meniscal allograft transplantation.
Presented by Scott A. Rodeo, MD

Meniscal scaffolds: results and indications. A systematic literature review.
Presented by Elizaveta Kon, MD

Long-term outcomes of medial CMI implant versus partial medial meniscectomy in patients with concomitant ACL reconstruction.
Presented by Giulio Maria Marcheggiani Muccioli, MD

Influence of Meniscal Injury, Partial Meniscectomy, or All-Inside Repair on Perceived Function following Allograft ACL Reconstruction.
Presented by John Nyland, MD

Meniscal-tibial skirt ligaments: The key to proper anatomic fixation
Presented by Kevin R. Stone, MD

Open Discussion

The group is encouraged to participate in an open discussion of issues in meniscus transplantation

Alteration in contact stress patterns on the tibial plateau after meniscectomy and meniscal allograft transplantation

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Hospital for Special Surgery, 535 East 70th Street, New York, NY 10021. [+]Presenter

Introduction

The effect of meniscectomy and allograft placement on contact stresses have been well characterized using cadaveric models subjected to simplified loading conditions[1, 2]. Contact mechanics under dynamic, physiological activities are less clear. The objective of this study was to evaluate the dynamic contact stress patterns on the tibial plateau under multidirectional loads mimicking human gait.

Methods

A modified, load controlled, knee simulator was used to apply multi-directional loads intended to mimic gait[3, 4] across seven human cadaveric knees (Fig 1a). Contact stresses across the tibial plateau were measured using an electronic sensor (4010N, Tekscan Inc., MA) (Fig. 1b). The sensor was placed underneath the menisci covering the tibial plateau, and data was recorded at 100 Hz for 20 continuous gait cycles.

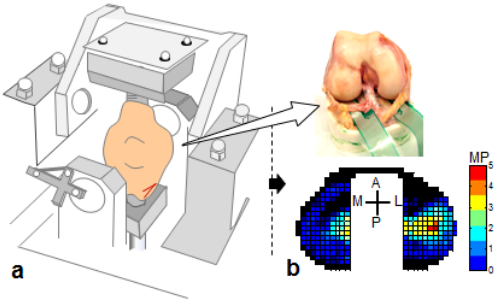

Figure 1 (a) Experimental setup of the dynamic knee joint simulator. (b) Contact stresses on the tibial plateaus measured by Tekscan sensor.

The following conditions were testes: (i) ***intact condition***, (ii) ***MAT condition***, where the medial meniscus was resected with bone plugs en-bloc, which were then reduced back to their respective insertions, (iii) ***meniscectomy condition*** where the meniscus was removed. The contact stress data were analyzed to identify the common patterns across the tibial plateau[4]. Briefly, a custom written program compared the profiles of contact stress throughout a gait cycle, from locations across the tibial plateau. Similarity between load profiles was assessed using a normalized cross correlation coefficient (NCC). The locations with NCC $\geq$ 0.93(1= identical) were identified and considered as identical patterns.

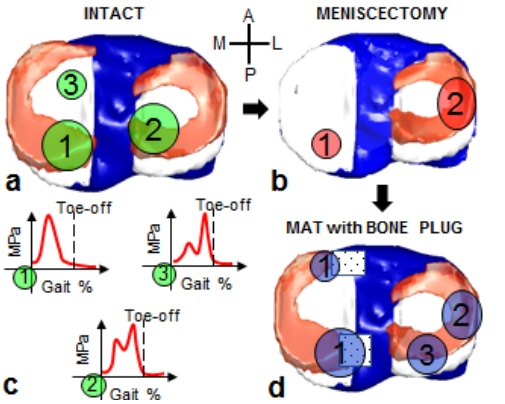

Figure 2 Contact stress patterns for the intact, medial meniscectomy and MAT conditions.

Results & Discussion

Three distinct patterns were found at different regions on the tibial plateaus of intact knees (Fig. 2a, c). After medial meniscectomy, the area of ***pattern-1*** was greatly reduced, as indicated by the red circle in Fig. 2b. ***Pattern-2*** was absent completely, and the location of ***pattern-3*** changed on the lateral plateau. For the MAT condition, the area of ***pattern-1*** was restored at the posterior horn of medial meniscus (Fig. 2d); ***pattern-1*** also appeared at the anterior horn. Moreover, ***pattern-3*** was found at a new location close to the posterior horn of lateral meniscus.

In summary, contact stress patterns are disrupted after medial meniscectomy; allograft placement helps but does not fully restores intact patterns. We are currently exploring if the change in patterns leads to accelerated, premature joint degeneration[5].

References: 1. Alhalki, *AJSM* 1999; 2. Alhalki, *AJSM* 2000; 3. Bedi, *JBJS* 2010; 4. Wang and Chen, *J Biomech* 2014; 5. Hutchinson et al. AJSM, 2013

MENISCAL SCAFFOLDS: RESULTS AND INDICATIONS. A SYSTEMATIC LITERATURE REVIEW

Elizaveta Kon*, Giuseppe Filardo, Luca Andriolo, Stefano Zaffagnini and Maurilio Marcacci

Introduction

The possibility of preserving or reconstructing the damaged meniscal structure should always be considered due to the extensively documented detrimental effects of meniscal deficiency on knee homoeostasis. Scaffold-based repair has been proposed as a solution to fill meniscus defects after a partial meniscectomy. The aim of this systematic review was to document the available clinical evidence to support meniscal scaffold implantation, analyzing results and indications for the treatment of meniscal loss.

Methods

The systematic review of the literature was performed searching three medical electronic databases: PubMed, Scopus, and the Cochrane Collaboration. The guidelines for Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) were used. Relevant data were then extracted and collected in a unique database with consensus of two observers. Furthermore, to assess the methodological quality of the collected data, the subscales of a modified Coleman Methodology Score (CMS) were determined.

Results

A total of 23 studies on two scaffolds (CMI - Menaflex, ReGen Biologics, USA; Actifit, Orteq, United Kingdom) met the inclusion criteria of this systematic review and were used for the final analysis: more than half of them have been published in the last 3 years when an increment in the interest on this surgical approach was observed. Overall good clinical results have been documented in 613 patients, mainly young men affected by symptomatic chronic lesions, with a cumulative failure rate of 6.1% and presence of newly formed tissue documented both at histological and MRI evaluation in most cases. However, there is a lack of comparative trials and the average study quality is low.

Conclusion

Studies have been published over many years, but the available literature presents just a low number of reports. Only recently an increase in publications has been seen, mainly due to the introduction in the clinical practice of the second synthetic scaffold. Safety and positive results have been shown for both scaffolds, but the literature lacks randomized trials at long-term follow-up to confirm real potential and most appropriate indications of meniscal scaffold implantation.

Long-term outcomes of medial CMI implant versus partial medial meniscectomy in patients with concomitant ACL reconstruction.

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Purpose

To compare the clinical, objective and radiographic long-term results of patients with ACL lesion and partial medial meniscus defect, treated with ACL reconstruction and partial medial meniscectomy or medial CMI implant.

Materials and Methods

Seventeen patients treated with combined ACL reconstruction and medial CMI and 17 patients treated with ACL reconstruction and partial medial meniscectomy were evaluated with mean follow-up 9.6 years with Lysholm, Tegner , objective and subjective International Knee Documentation Committee (IKDC), VAS for pain. Arthrometric evaluation was performed with KT 2000. Weigh-bearing X-ray antero-posterior and Rosenberg view are also performed and evaluated with Kellgren-Lawrence score, Allback score and joint space narrowing.

Results

Pre-operative demographic parameters and clinical scores between patients treated with CMI and partial medial meniscetomy revealed no significant differences. A significant improvement of all the clinical scores was detected in both groups from pre-operative status to final follow-up. No significant difference between groups were found for clinical and radiographic scores, however the chronic subgroup of patients treated with CMI showed significant lower level of post-operative knee pain compared to patients treated with partial medial meniscectomy. Higher values of knee stability and pain reduction were reported for CMI patients, although not statistically significant.

Conclusion

Good long-term clinical results in terms of stability, subjective outcomes and objective evaluation were reported both for medial CMI implant and partial medial meniscectomy, combined with ACL reconstruction for the treatment of partial medial meniscus tears combined with ACL lesion. Chronic meniscal tears treated with medial CMI reported lower level of post-operative pain compared to meniscectomy.

Influence of Meniscal Injury, Partial Meniscectomy, or All-Inside Repair on Perceived Function following Allograft ACL Reconstruction

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Objective: Meniscus health is key to knee osteoarthritis prevention. This prospective study evaluated the influence of meniscus management at time of primary ACL reconstruction using aseptically processed, non-radiated, cryo-preserved allograft tissues on perceived function at ≥ 2 years post-surgery.

Methods: 206 of 335 (64.6%) patients completed the IKDC Subjective Knee Evaluation and Current Health Assessment (CHA). Groups were defined by meniscus management at time of primary ACL reconstruction. One-way ANOVA evaluated group differences for IKDC and CHA subscale scores, surgery age, and time post-surgery. χ^2 tests compared gender, sports level, sports intensity prior to injury and currently, sports frequency prior to injury and currently, IKDC grade and allograft type. Regression analysis evaluated CHA subscale score and IKDC score relationships ($P < 0.05$).

Results: Groups had similar IKDC scores and grades, CHA subscale scores, time post-surgery (4.9 ± 2.9 years), age at surgery (29 ± 11.7 years), gender distribution, sports level, sports intensity and frequency prior to injury, and allograft type (tibialis or peroneus tendon (57.3%, n=118), bone-patellar tendon-bone (29.6%, n=61), hamstring (11.2%, n = 23) or Achilles tendon (1.9%, n=4). Physical function, bodily pain and social function subscales predicted 54% of the IKDC score for the group that did not undergo medial meniscus surgery (n = 133)($P < 0.0001$). The bodily pain subscale predicted 25% of the IKDC score for the partial medial meniscectomy group (n = 56) ($P < 0.0001$). The bodily pain subscale predicted 55% of the IKDC score for the all-inside medial meniscus repair group (n = 17) ($P = 0.001$).

The all-inside medial meniscus repair group had more subjects continue strenuous sports than the partial medial meniscectomy group (n = 56)($\chi^2 = 15.5$, $P = 0.008$). Physical function, vitality, social function, and bodily pain subscales predicted 42% of the IKDC score for the group (n = 152) that did not undergo lateral meniscus surgery ($P < 0.0001$). Physical function, bodily pain and social function subscales predicted 74% of the IKDC score for the partial lateral meniscectomy group (n = 39)($P < 0.0001$). Bodily pain, physical function and social function subscales predicted 91% of the IKDC score for the all-inside lateral meniscus repair group (n = 15)($P = 0.001$). More subjects in the partial lateral meniscectomy group continued strenuous sports than the lateral meniscus repair group ($\chi^2 = 9.5$, $P = 0.04$).

Conclusions: Physical function, bodily pain, and social function CHA subscales related most strongly to IKDC score. The bodily pain subscale had a stronger influence following all-inside meniscus repair or partial meniscectomy. More subjects who underwent primary ACL reconstruction with all-inside medial meniscus repair continued strenuous sports while more subjects who underwent primary ACL reconstruction with partial lateral meniscectomy continued strenuous sports.

Meniscal-tibial skirt ligaments: The key to proper anatomic fixation

Kevin R. Stone, MD[1,2]

[1]The Stone Clinic, San Francisco, CA; [2]Stone Research Foundation, San Francisco, CA

Meniscus allograft transplantation has become increasingly common for patients whose meniscus is irreparably damaged or missing. Many current techniques for meniscus transplantation involve fixation of the horns of the meniscus allograft to the tibia followed by suturing of the allograft body to either the remnant meniscal rim or directly to the synovium. This technique has been shown to cause subluxation and pseudo-shrinkage of the meniscus allograft on postoperative MRI. We believe that the key to proper anatomic fixation of the meniscus allograft to the tibial plateau is the additional fixation of the meniscal-tibial ligaments to the tibia. Further studies are required to document the precise roles of these skirt ligaments and to develop the proper fixation techniques for meniscus allografts.