

ARTHROSCOPIC MANAGEMENT OF MENISCAL ROOT TEAR INJURY

By

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ABSTRACT

Background: Meniscal root tears are becoming increasingly recognized. They can cause rapid progressive arthritis.

Objective: The purpose of this study was to document the radiological and functional outcome of arthroscopic management of meniscal root tears injuries.

Patients and Methods: The study was conducted on 15 patients with 15 meniscal root tears from January, 2017 till January, 2019 presenting to AL - Hussein hospital treated by partial meniscectomy or pullout sutures repair. This study included 9 males (9 knees) and 6 females (6 knees).

Results: The mean age for repair was 36.53 ± 9.12 years (range, 23 to 50 years) and for partial meniscectomy was 56.2 ± 3.96 years (range, 50 to 60 years). Of the 15 knees, 10 were right knees and 5 were left. All clinical outcome measures significantly improved after surgery according to Lysholm and IKDC score. The mean Lysholm score for group of meniscal root repair (group A) increased from 64.5 ± 12.35 to 88.10 ± 10.07 ($P < 0.001$), and the mean Lysholm score for partial meniscectomy (group B) increased from 47.20 ± 11.32 to 86.80 ± 9.41 ($P < 0.001$) postoperatively. The mean IKDC score for root tear repair increased from 56.10 ± 10.97 to 76.70 ± 8.55 ($P < 0.001$), and the mean IKDC score for partial meniscectomy increased from 41.40 ± 10.85 to 59.60 ± 8.33 ($P < 0.001$).

Conclusions: Meniscal root repair has increased in popularity and when done in selected patients resulted in a high rate of healing and restoring the ability of the meniscus to dissipate axial tibiofemoral loads, thereby slowing or halting arthritic progression.

Keywords: Root tears injury, partial meniscectomy, pullout suture repair.

INTRODUCTION

A meniscus root tear is described as a radial tear or avulsion at the posterior horn attachment to bone for medial or lateral meniscus (Johannsen *et al.*, 2012). Medial meniscal tears are common in patients with chronic ACL insufficiency, while lateral meniscal tears are found in acute ACL injuries (Feucht *et al.*, 2015).

Specifically, meniscal root tears result in a loss of hoop stress, as well as functional load distribution, exposing the articular cartilage to abnormal forces that are comparable to those following total meniscectomy (Starke *et al.*, 2010).

MRI diagnosis of root tear is based on the presence of radial tears on the axial plane, signs of truncation and extrusion on

the coronal plane, and the ghost sign from the sagittal plane (*Choi et al., 2012*).

Partialmeniscectomy is the preferred treatment option in patients with chronic root tears and symptomatic grade III or IV chondral lesions (pre-existing arthritis) who fail non-operative treatment, and patients with partial root tears with a major portion of the footprint intact (*Miten et al., 2016*).

The goal of surgical repair is to restore joint contact pressures, joint kinematics and delay the development of osteoarthritis (*Pache et al., 2018*).

Several techniques and fixation methods have been described to repair either medial or lateral root tears. The surgical techniques fall into two broad categories: pull-out suture repairs and suture anchor repairs. Recent description of surgical landmarks has facilitated accurate identification of the roots and the key is anatomic repair irrespective of the technique used (*Ahn et al., 2010*).

The present work aimed to test the effectiveness of the arthroscopic transtibial pull out suture technique (TPS) in restoring the meniscal function back to normal hopefully reversing any deleterious effects caused during the time lapse between root tear occurrence and its repair.

PATIENTS AND METHODS

The study was conducted on 15 patients with 15 meniscal root tears from January, 2017 till January, 2019 presenting to AL- Hussein Hospital treated by partial meniscectomy or pullout sutures repair. This study included 9 males (9 knees) and 6 females (6 knees).

The mean age for meniscal root repair was 36.53 ± 9.12 years (range, 23 to 50 years) and for partial meniscectomy was 56.2 ± 3.96 years (range, 50 to 60 years). Of the 15 knees, 10 were right knees and 5 were left. The mean follow-up period was 6 month. Surgery was performed if a patient had persistent mechanical pain despite 3 months of conservative treatment, including administration of nonsteroidal anti-inflammatory drugs and muscle strengthening exercises. Before arthroscopic surgery, we obtained magnetic resonance imaging (MRI) studies that were suggestive of a meniscus root tear in all patients.

Inclusion criteria:

- Patient's aged 23 – 60 years of both sexes, with meniscus root tear after failure of conservative treatment for at least 3 months (as NSAIDS, stretch exercises, physiotherapy and bracing).
- Acute or degenerative meniscal root tear.
- Isolated medial or lateral meniscus root tear or associated with torn ACL.

Exclusion criteria:

- Patient's refusal.
- Patient's body mass index more than 35 kg/m².
- Known rheumatoid arthritis patient.
- Knee joint malalignment deformity by physical inspection.
- Osteoarthritic knee joint grade II or more according to Kellgren Lawrence Classification based on plain x-ray radiographs.
- Crushed meniscus unsuitable for repair.

- Local condition including: Previous surgery regarding the meniscal tear, Infection, Previous fracture and local malignancy.
- Patients unfit for surgery.

All patients had preoperative clinical assessment in the form of general, and local examination, special tests as Payer's test and McMurray test and investigations including x – ray and MRI of the knee.

Ethical considerations:

Written informed consents were obtained from the participants before the procedure starts which include: the purpose of the study, methods of work, the benefits, the probable risks, confidentiality, and right to withdraw.

After surgery, patients were non-weight bearing on crutches for 6 weeks. A hinged knee brace was applied for the first 2 weeks with the leg in a fully extended position. Patients were instructed to perform quadriceps muscle strengthening exercise, as well as straight-leg raising

exercises several times daily starting immediately postoperatively. Patients were allowed an increase in active range of motion by 30° every 2 weeks till reaching 135°. Gradual weight bearing started at 6 weeks. Full flexion and squatting were allowed 3 months after the surgery. Patients returned to full activity 6 months postoperatively. Patients were scored preoperatively, 6 months postoperatively and at final visits using Lysholm and IKDC score.

Statistical presentation and analysis of the present study was conducted, using the mean, standard deviation, student t- test, Chi-square by SPSS V20. Unpaired Student t-test was used to compare between two groups in quantitative data. Paired t-test was used to compare the parameters pre and after management. Chi-square was used to compare qualitative data. P value < 0.05 was considered significant.

RESULTS

The study was conducted on 15 patients with 15 MENISCAL ROOT TEARS from January, 2017 till January, 2019 presenting to AL -Hussein Hospital treated by partial meniscectomy or pullout sutures repair. This study included 9 males (9 knees) and 6 females (6 knees). The mean age for repair was 36.53 ± 9.12 years (range, 23 to 50 years) and for partial meniscectomy was 56.2 ± 3.96 years (range, 50 to 60 years).

Patients were classified in to 2 groups: group (A) for meniscal root tear treated by pull out suture repair, and group (B) for

degenerative root tear treated by partial meniscectomy.

Age, sex distribution, and body mass index:

Group A: The patient's ages ranged from 23 to 50 years with mean age 36.5 years there were 6 males and 4 females, and the mean BMI was 27.491 ± 0.366 (range, 26.67 to 27.78). **Group B:** Patients ages ranged from 50 to 60 years with mean age 56.2 years there were 3 males and 2 females, and the mean BMI was 32.470 ± 3.055 (range, 29.09 to 36.68) (**Table 1**).

Table (1): Age, sex distribution, and body mass index

| Parameter | | Meniscal root repair Group A | | | Partial meniscectomy Group B | | | P-value |
|-----------|---------------|---------------------------------|-------|--------|---------------------------------|-------|-------|---------|
| Age | Range | 23 | - | 50 | 50 | - | 60 | 0.001 |
| | Mean \pm SD | 36.500 | \pm | 9.120 | 56.200 | \pm | 3.962 | |
| Gender | Male | 6 | | 60.00 | 3 | | 60.00 | 1.000 |
| | Female | 4 | | 40.00 | 2 | | 40.00 | |
| Weight | Range | 60 | - | 105 | 105 | - | 109 | 0.004 |
| | Mean \pm SD | 82.500 | \pm | 15.138 | 107.000 | \pm | 1.581 | |
| Height | Range | 1.5 | - | 1.95 | 1.7 | - | 1.9 | 0.219 |
| | Mean \pm SD | 1.725 | \pm | 0.151 | 1.820 | \pm | 0.084 | |
| BMI | Range | 26.67 | - | 27.78 | 29.09 | - | 36.68 | <0.001 |
| | Mean \pm SD | 27.491 | \pm | 0.366 | 32.470 | \pm | 3.055 | |

All clinical outcome measures significantly improved after surgery according to Lysholm and IKDC score. The mean Lysholm score for meniscal root repair (group A) increased from 64.5 ± 12.35 to 88.10 ± 10.07 ($P < 0.001$), and the mean Lysholm score for partial meniscectomy (group B) increased from

47.20 ± 11.32 to 86.80 ± 9.41 ($P < 0.001$). The mean IKDC score for meniscal root repair (group A) increased from 56.10 ± 10.97 to 76.70 ± 8.55 ($P < 0.001$), and the mean IKDC score for partial meniscectomy (group B) increased from 41.40 ± 10.85 to 59.60 ± 8.33 ($P < 0.001$) (**Table 2**).

Table (2): Preoperative and postoperative lysholm and IKDC score

| Score | | Groups | | | Meniscal root repair Group A | | | Partial meniscectomy Group B | | | P-value |
|------------------|------------------|---------------|---------|-------|---------------------------------|---------|-------|---------------------------------|-------|--|---------|
| Lysholm Score | Pre | Range | 43 | - | 81 | 37 | - | 65 | 0.021 | | |
| | | Mean \pm SD | 64.500 | \pm | 12.349 | 47.200 | \pm | 11.323 | | | |
| | Post 6 Months | Range | 71 | - | 100 | 58 | - | 84 | 0.003 | | |
| | | Mean \pm SD | 88.100 | \pm | 10.071 | 68.800 | \pm | 9.418 | | | |
| | Differences | Mean \pm SD | -23.600 | \pm | 3.340 | -21.600 | \pm | 4.219 | | | |
| Paired Test | P-value | <0.001 | | | <0.001 | | | | | | |
| IKDC Score | Pre | Range | 37 | - | 71 | 32 | - | 59 | 0.029 | | |
| | | Mean \pm SD | 56.100 | \pm | 10.969 | 41.400 | \pm | 10.854 | | | |
| | Post 6 Months | Range | 63 | - | 87 | 50 | - | 73 | 0.003 | | |
| | | Mean \pm SD | 76.700 | \pm | 8.551 | 59.600 | \pm | 8.325 | | | |
| | Differences | Mean \pm SD | -20.600 | \pm | 3.169 | -18.200 | \pm | 4.025 | | | |
| Paired Test | P-value | <0.001 | | | 0.001 | | | | | | |

DISCUSSION

Treatment of root tears has been focused on arthroscopic partial meniscectomy or repair since conservative treatment fails to restore native anatomy, which may induce arthritic changes over time (*Choi et al., 2012*). However, certain

patients could be treated properly by conservative treatment (*Han et al., 2010*). And the clinical outcomes of conservative treatment have been reported to be competent with early diagnosis and proper treatment protocols (*Shelbourne et al., 2011*). If conservative treatment of root

tears failed, patients might miss proper chance for meniscus repair. Therefore, the patient's pain might increase and arthritic change might be aggravated as time goes (*Krych et al., 2016*).

The chondroprotective effect of repair appears to be encouraging. *Kim et al., (2011)* reported that MRT repair provided significantly better clinical and radiological results than partial meniscectomy, and that medial meniscus extrusion decreased after repair, as determined by magnetic resonance imaging (MRI). However, it is difficult to obtain definitive information on clinical and MRI results after MRT repair because of the few studies conducted on the subject. Furthermore, the prognostic factors of repair have not been determined. Accordingly, we undertook to document the clinical and MRI results of arthroscopic pullout MRT repair and to identify the factors associated with poor prognosis.

This study included 9 males (9 knees) and 6 females (6 knees). The mean age for repair was 36.53 ± 9.12 years (range, 23 to 50 years) and for partial meniscectomy was 56.2 ± 3.96 years (range, 50 to 60 years). Of the 15 knees, 10 were right knees and 5 were left. The mean follow-up period was 6 month.

Before arthroscopic surgery, we obtained magnetic resonance imaging (MRI) studies that were suggestive of a meniscus root tear in all patients.

Ten patients underwent repair with pullout suture, 5 patients were underwire partial meniscectomy due to degenerated meniscus. Clinical results, both preoperatively and at final follow-up, were evaluated by use of Lysholm and

IKDC score, Comparison between quantitative variables measured before and after was done using paired t test. For comparing categorical data, Chi square (c2) test was performed. Exact test was used instead when the expected frequency is less than 5, P-values less than 0.05 were considered as statistically significant.

All clinical outcome measures significantly improved after surgery according to lysholm score and IKDC score, The mean Lysholm score for group of meniscal root repair (group A) increased, and the mean Lysholm score for partial meniscectomy (group B) increased postoperatively, the mean IKDC score for root tear repair increased, and the mean IKDC score for partial meniscectomy increased.

The Lysholm score improved significantly from 56.8 to 85.1 by *Kim et al. (2011)*, Lysholm score increased from 52.4 preoperatively to 85.9 postoperatively by *Matthias et al. (2015)*, and increased results from 48.3 preoperatively to 83.2 postoperatively by *Hong-kyo et al. (2012)*.

Compared clinical and radiological outcomes between a medial meniscus root repair cohort and a partial meniscectomy cohort at a follow-up of at least 5 years, reporting significantly better Lysholm and International Knee Documentation Committee (IKDC) scores in the repair group than in the partial meniscectomy group (*Chung et al., 2015*). Meniscal root tear repair, significantly improved in postoperative clinical subjective scores compared to preoperative status but the progression of arthrosis was not prevented, and meniscal extrusion was not reduced (*Chung et al., 2016*).

CONCLUSION

Repair of meniscus root attachments has increased in popularity, and when done properly, in selected patients showed a high rate of healing as well as biomechanical and clinical efficacy in restoring the innate ability of the meniscus to dissipate axial tibiofemoral loads, thereby slowing or halting arthritic progression.

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مناجزه قطع جذر الغضروف الهلالي بالمنظار المفصلي

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خلفية البحث: جذر الغضروف الهلالي يمكن ان يسبب خشونه المفصل بشكل تدريجي وسريع.

الهدف من البحث: توثيق النتائج الاشعاعية والوظيفية لمناجزة قطع جذر الغضروف الهلالي بالمنظار المفصلي.

المرضى وطرق البحث: اجريت هذه الدراسه على 15 مريضا يعانون من قطع جذر الغضروف الهلالي خلال الفتره من يناير 2017 وحتى يناير 2019 بمستشفى الحسين الجامعي؛ حيث تم العلاج عن طريق الاستئصال الجزئي للغضروف الهلالي أو عن طريق الاصلاح بواسطه الغرز الساحبة. وشملت هذه الدراسة 9 ذكور و 6 اناث حيث كان المتوسط العمري لاصلاح القطع 36.53 ± 9.12 سنة ويتراوح بين 23 الى 50 سنة بينما كان متوسط العمر لاستئصال الغضروف 56.2 ± 3.96 سنة يتراوح بين 50 الى 60 سنة.

نتائج البحث: حدث تحسنا ملحوظا بعد الجراحة وفقا لتقييم ليشولم ولجنة التوثيق الدولي للركبة للتقييم الاكلينيكي قبل وبعد العملية. حيث ارتفع معدل ليشولم لمجموعة إصلاح قطع الغضروف (مجموعه أ) من 64.5 ± 12.35 إلى 88.10 ± 10.07 بينما ارتفع لعمليه الإستئصال الجزئي للغضروف الهلالي (مجموعه ب) من 47.20 ± 11.32 إلى 86.80 ± 9.41 وكانت النتائج وفقا للجنة التوثيق الدولي للركبة للتقييم الاكلينيكي لعملية إصلاح قطع الغضروف ارتفع من 56.10 ± 10.97 إلى 76.70 ± 8.55 بينما ارتفع فى عملية إستئصال الغضروف الهلالي من 41.40 ± 10.85 إلى 59.60 ± 8.33 .

الإستنتاج: يؤدي إصلاح قطع جذر الغضروف الهلالي إلى إرتفاع نسبة الشفاء وإستعادة قدرة الغضروف على تبييد الأحمال المحوري مما يؤدي إلى إبطاء أو توقف تقدم خشونة المفصل.