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ORIGINAL ARTICLE

A comparison of the Transtibial Pullout Technique and all-inside Meniscal Repair in Meniscus Posterior Root Tear

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Abstract

Background: ***A meniscus root tear occurs when the posterior horn connects to the bone via a radial rupture or avulsion. Responsible for maintaining meniscal stability.***

Aim: ***To assess clinically and radiologically patients who suffered from root tears of the meniscus repaired by the pullout suture versus the all-inside technique.***

Patients and methods: ***This prospective comparative investigation was conducted on 20 cases in which, clinically and radiologically, patients suffered from root tears of the meniscus repaired by the pullout suture technique vs. the all-inside technique done in Al-Azhar University hospitals. Patients were divided into two groups: Group I (all inside meniscal repair) included eight patients, and Group II (transtibial pullout) included 12 patients.***

Results: ***Between the All Inside Meniscal Repair Group and the Transtibial Pullout Group, there was no statistically significant variation as regards site and mechanism of injury, duration of complaint, range of motion (ROM), magnetic resonance imaging (MRI) findings, and pre-operative Lyshom score, while there was statistically substantial variation regarding postoperative Lyshom score.***

Conclusion: ***When carried out appropriately, both methods may provide positive outcomes. Meniscal suture could be an alternative way to treat meniscus posterior root repair (MMPRT) in carefully chosen patients if the damage pattern allows it. Additionally, there was no statistically substantial variation in the damage mechanism between the transtibial pullout group and the all-within meniscal repair group.***

Keywords: All inside meniscal repair; Transtibial pullout; meniscus posterior root tear

1. Introduction

The most frequent procedure used to treat meniscus damage is knee arthroscopy. [1]

Comprehensive visibility of the intra-articular anatomy is necessary for an adequate arthroscopic assessment and surgical intervention to resolve knee disease. [2]

It may be difficult to fully see or execute procedures in certain parts of the knee without risking iatrogenic cartilage injury, knee arthroscopy's most prevalent side effect. [3]

Meniscal stability, which is essential for healthy meniscal function, is the responsibility of the meniscus roots. The meniscus would be unstable in the absence of the meniscus root attachments. [4]

A meniscus root tear refers to a radial rip or avulsion at the posterior horn attachment to the bone for a medial or lateral meniscus. [5]

Patients with acute ACL injuries are more likely to have lateral meniscal tears than medial meniscal tears, which are more prevalent in those with chronic ACL inadequacy. [6]

In particular, meniscal root rips lead to a loss of effective load distribution and hoop stress, which exposes the articular cartilage to aberrant pressures similar to those that occur after a complete meniscectomy. [7]

This research aimed to assess clinically and radiologically patients suffering from root tears of the meniscus repaired by the pullout suture versus the all-inside technique.

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2. Patients and methods

This prospective comparative investigation was conducted on 20 cases in which, clinically and radiologically, patients suffered from root tears of the meniscus repaired by the pullout suture technique vs. the all-inside technique done in Al-Azhar University hospitals. Individuals are split into two groups: Group I (all inside meniscal repair) included eight patients, and Group II (transtibial pullout) included 12 patients.

Inclusion criteria: males and females, arthroscopic exploration showing posterior meniscal root tear, confirmed negative varus-valgus stress test at thirty° of knee flexion preoperatively, and Varus angle < 5°

Exclusion criteria: The patient presents with a history of repeated ligament injuries, malalignment of more than five degrees, ipsilateral knee ligamentous reconstructive surgery, and osteoarthritis with Kellgren-Lawrence grade three to four arthrosis in the operating knee.

Ethical considerations: The information collected from participants is private. The study participants' names will not appear in any publications or reports related to this research. The aim and design of the trial, together with the risk-benefit analysis, were disclosed to the participants prior to their admission. Consent that was informed was acquired.

Procedures:

Transtibial Pullout Repair for Meniscal Posterior Root Tear

The patient underwent an arthroscopy to repair a meniscal root tear. The procedure involved creating anterolateral and anteromedial portals, with the anteromedial portal being the working portal. Knee exploration was performed to inspect the articular cartilage status of the femur and tibia, and an articular injury was recorded. A limited synovectomy was applied to facilitate the view, and a meniscal root tear was diagnosed. If the medial joint compartment tightness was severe, continuous valgus-stressing manoeuvres were applied to stretch the medial collateral ligament (MCL). A limited pie crusting technique was applied to widen the MCL, allowing root repair. A transosseous pullout suture was employed to re-implant the torn root in situ. A suture-passing device was utilized to facilitate sutures piercing into the meniscus substance. To avoid synovial bridges, the suture tips exited the knee through the same aperture in the working portal. After passing the two simple sutures through the posterior horn of the torn root, the tibial tunnel was drilled. The re-implantation of the meniscal root was performed using a low-profile tibial ACL marking hook for drill guides (Arthrex, USA), which was applied to the tibial tunnel to avoid injury to the articular cartilage. The original ACL guide wire was drilled through the aiming device to avoid neurovascular injury. A self-retaining device was placed at the tibial incision for better visualization, and soft tissues were dissected. A 7-mm cannulated drill bit was used, allowing much of the meniscal root substance to be re-implanted again on the tibial plateau. A curettage spoon was performed over the guide wire tip to avoid sudden cannulated drill bit entry into the knee joint or the femoral condyle articular cartilage. The four limbs of the two simple sutures were retrieved using various methods, such as a right-angled probe or ring forceps. A wide-bore cannula loaded with number-zero proline was used, easily retrieved from inside the knee and out through the working portal. The tension was applied to prevent meniscal laxity and meniscal root-free mobilization. After suctioning extra irrigation fluid inside the knee joint, the tibial incision was closed in layers with the two arthroscopy portals. No drains were used to allow for intentional postoperative haemorrhage and stem cell retrieval from the tibial tunnel reaming.

All-inside meniscal repair:

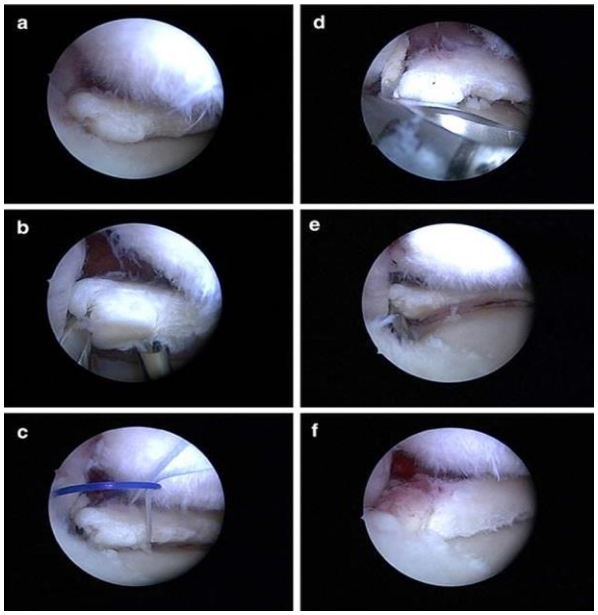
Diagnostic Arthroscopy:

Besides the patellar tendon, standard anteromedial and anterolateral portals were created. Using a 30° arthroscope, the knee joint was examined. We explored the root tear and determined the kind of tear. Transtibial pullout sutures may be used to repair root avulsions (types 3 and 5). On the other hand, side-to-side repair procedures may be used to repair paracentral radial rips (types 1, 2, and 4) that are close to the root and have a large stump. We suggest using a scorpion antegrade suture passer to repair radial meniscal root rips in cases where there is a substantial meniscal root stump using two side-to-side approaches. A percutaneous discharge of the medial collateral ligament enhanced access to and visualization of the posterior horn of the medial meniscus. The surgeon felt at ease using the anterolateral and anteromedial portals to introduce and observe the device for internal meniscal correction.

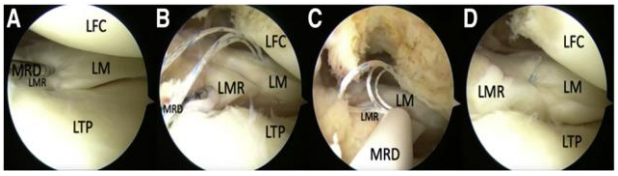
Antegrade Suture Passer Approach

The knee was repaired for lateral meniscal radial root surgery in a figure-of-eight posture. The anteromedial portal is the recommended viewing location, whereas the anterolateral portal is where the Scorpion antegrade suture passer enters. Sutures were securely passed through, and sufficient access was acquired under the femoral condyle. An Orthocord No. 2 suture was put into the antegrade suture passer and inserted through the radial rip on both sides. To join the borders of the radial rip, the knot was knotted arthroscopically. This method may also be integrated with an all-inside device for meniscal correction for the second stitch. A cannula was used to tie knots and sutures for soft-tissue

management. An absorbable suture was advised because it lowers the possibility of knot interference in the knee joint. It is essential to employ an antegrade suture passer designed for use in the knee that can pass beneath the lateral femoral condyle and reach the lateral meniscus. With antegrade suture passer accessibility from the anteromedial portal, the knee at twenty° flexion, and a valgus force employed for medial meniscal radial root tear repair, the anterolateral portal offered the best view.



(A): Transosseous arthroscopic extraction fixation of the root of the medial meniscus. (a) Tear in the medial root, (b) Penetration of the meniscus with a lasso, (c) Shuttled fibre wire through the meniscus tissue, (d) Positioning of a tibia-align guide at the anatomical attachment of the posterior root, (e) Penetration of the tibia by the drill, (f) Reduction of the root to the tibia



(B): A lateral (G) & medial (H) segment of the paracentral lateral meniscal radial root are visible in this anterolateral arthroscopic image of the left knee, which depicts the implementation of the all-inside meniscal repair device (MRD) from the anteromedial working portal. Tightening (I) & trimming (J) the suture repair. (LFC; LM; LMR; LTP; lateral tibial plateau) denotes the lateral femoral condyle, lateral meniscus, and lateral meniscal root, respectively.

Figure 1(A&B). Surgical procedures (intraoperative)

Postoperative care:

Prophylactic parenteral antibiotics were given to the patient for the first twenty-four hours after surgery while they were admitted to the hospital for the night. Patients had follow-up visits to the outpatient clinic for dressing changes one week after surgery, suture removal two weeks after surgery, range-of-motion monitoring six weeks after surgery, and monthly visits until six months after surgery.

Follow-up and rehabilitation:

An MRI was performed three months after the surgery. For six weeks, the patients were crutch-dependent. They were instructed to engage in several daily sessions of straight-leg lift exercises and activities targeting their quadriceps muscles. After the first four weeks, patients were permitted to stretch their bodies up to 90 degrees. After six weeks, patients were permitted to progressively raise their flexion degrees to 120°. Six months after surgery, full flexion and squatting were permitted. Six months following surgery, the individuals resumed their workout regimens.

3. Results

Regarding age, gender, and BMI, there was no statistically substantial variation between the transtibial pullout group & the all-inside meniscal repair group. (Table 1).

Table 1. Distribution of demographic data between two groups.

		ALL INSIDE MENISCAL REPAIR (N=8)	TRANSTIBIAL PULLOUT (N=12)	P VALUE
AGE MEAN ±SD		32.1±6.01	34.9± 8.29	0.423
GENDER	Males	3 (37.5%)	6 (50%)	
	females	5 (62.5%)	6 (50%)	0.58
BMI MEAN ±SD		28.8± 1.62	27.6±2.24	0.83

P value <0.05 is statistically significant

Table 2 revealed that, regarding the location of damage, there was no statistically considerable variation amongst the two groups.

Table 2. Distribution of site of injury amongst two groups.

	ALL INSIDE MENISCAL REPAIR (N=8)	TRANSTIBIAL PULLOUT (N=12)	P VALUE
SITE OF INJURY			
RIGHT KNEE	3(37.5%)	5(41.7%)	0.85
LEFT KNEE	5(62.5%)	7(58.3%)	

Table 3 demonstrates that, regarding the mechanism of damage, there was no statistically considerable variation between the examined groups for transtibial pullout and all within meniscal repair.

Table 3. Distribution of mechanism of injury between two groups.

	ALL INSIDE MENISCAL REPAIR (N=8)	TRANSTIBIAL PULLOUT (N=12)	P VALUE
MECHANISM OF INJURY			
TRAUMATIC TEAR	3(37.5%)	7(58.3%)	0.36
DEGENERATIVE TEAR	5(62.5%)	5(41.7%)	

Table 4 demonstrates that was noted no statistically considerable variation amongst the research groups regarding the duration of complaints and ROM.

Table 4. Distribution of Duration of complaint and ROM between two groups.

	ALL INSIDE MENISCAL REPAIR N=8	TRANSTIBIAL PULLOUT N=12	P VALUE
DURATION OF COMPLAINT BY WEEKS MEAN ±SD	16±9.4	9.8±10.1	0.184
ROM(FLEXION-EXTENTION) MEAN ±SD	111.25±16.2	114.5±14.6	0.646

Table 5 demonstrates that was observed no statistically significant variation among the two groups with as regards to MRI findings.

Table 5. distribution of MRI findings between two groups.

	ALL INSIDE MENISCAL REPAIR (N=8)	TRANSTIBIAL PULLOUT (N=12)	P VALUE
GHOST SIGN			
PRESENT	4(50%)	8(66.7%)	0.46
ABSCENT	4(50%)	4(33.3%)	
MEDIAL MENISCAL EXTRUSION			
>3 MM	5(62.5%)	7(58.3%)	0.85
<3 MM	3(37.5%)	5(41.7%)	
CHONDROMALACIA PATELLAE			
YES	2(25%)	4(33.3%)	0.69
NO	6(75%)	8(66.7%)	

Table 6 revealed that in terms of the preoperative Lysholm score, were observed no statistically important variations amongst the two groups; however, in terms of the postoperative Lysholm score, were noted statistically important variations among the two groups.

Table 6. Distribution of Preoperative & Postoperative Lysholm score among two collections.

	ALL INSIDE MENISCAL REPAIR N=8	TRANSTIBIAL PULLOUT N=12	P VALUE
PREOPERATIVE LYSHOLM SCORE	43.1±4.7	39.8±6.2	0.21
POSTOPERATIVE LYSHOLM SCORE	70± 17.4	85.6±14	0.04

CASE PRESENTATION

Case 1: Done by transtibial pullout suture technique

Female patient 45 years old presented with left knee pain 3 months ago after twisting trauma the condition started of acute onset and progressive course increased by activity and decreased by rest.

Examination

Inspection: normal alignment.

Palpation: medial joint line tenderness specially at posterior Part

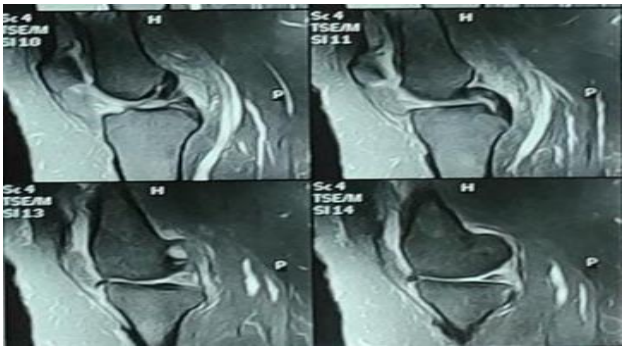
ROM: 90-0-0.

Special test: Postive McMurray test

Preoperative Lysholm score 42/100

Postoperative Lysholm score: 88/100

(A): Showing X-ray knee which apparent normal.



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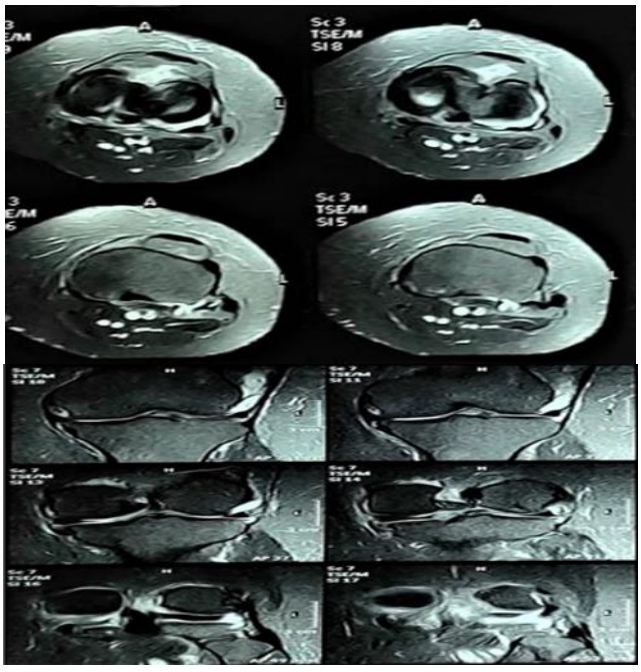

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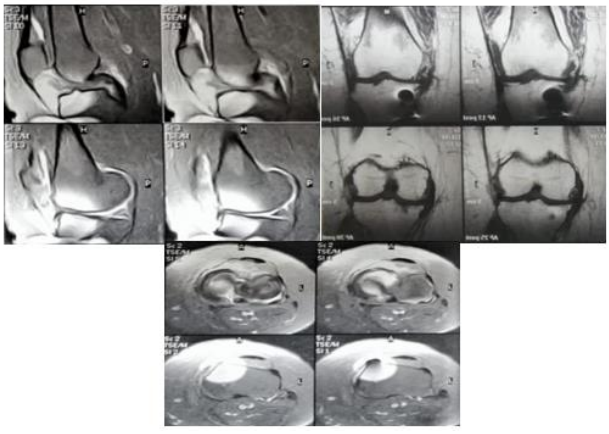
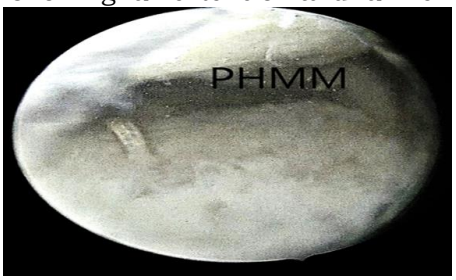
(B): Showing MRI finding 1-ghost sign in sagittal cuts 2- meniscal extrusion more than 3 mm.

(D): Showing post-operative x-ray showing end button in correct position.



(E): Showing post-operative MRI after 6 months showing PHMM in place without meniscal extrusion with disappearance of ghost sign in sagittal plane

(F): Showing full extension and full flexion.



(G): Showing healed MMPRT.

Figure 2. Photos of case 1

4. Discussion

According to our findings, there was no statistically substantial variation in gender or age between the all-inside meniscal repair group and the transtibial pullout collection.

Our findings concur with those of DZIDZISHVILI et al.,[8] who found that there were no discernible variations between the groups regarding BMI, sex, knee laterality, the cause of injury, and the amount of time between injury and surgery.

Our findings show no statistically meaningful variation in the damage location between the transtibial pullout group and the inside meniscal repair group.

Our findings concur with those of DZIDZISHVILI et al.,[8] who found no statistically significant variations across the collections regarding sex, BMI, knee laterality, mode of injury, and duration from injury to surgery.

Our findings show no statistically substantial variation in the damage mechanism between the transtibial pullout group and the inside meniscal repair group.

Our findings concur with those of DZIDZISHVILI et al.,[8] who revealed substantial variation between the cohorts regarding the mechanism of injury.

Our results showed statistically substantial variation between the all-inside meniscal repair group and the transtibial pullout group according to the duration of the complaint and ROM.

Our results agree with those of Hiranaka et al.,[9] who found statistically considerable variation

between the two groups according to duration of complaint and ROM.

According to our findings, the MRI results (ghost sign, chondromalacia patellae, medial meniscal extrusion, and osteochondral defect) revealed a statistically substantial variation between the all-inside meniscal repair group and the transtibial pullout group.

Our results agree with Okazaki et al.,[10] who found that no substantial variation in preoperative (LME) lateral meniscus extrusion was observed between groups inside the meniscal repair group (1.6 ± 0.9) and transtibial pullout (p= 0.34). No substantial variation in postoperative LME was noted amongst the inside meniscal repair group and transtibial pullout (p = 0.10).

Our results disagree with those of Yoon et al.,[11] who found 16 patients in the transtibial pullout repair group and 28 patients in the all-inside repair group. Both groups saw a rise in the postoperative extrusion ratio; however, the all-inside repair group experienced a considerably smaller change in the extrusion ratio (P =.009) and the postoperative meniscus signal (P =.011). The all-inside group had a considerably superior recovery, according to postoperative MRI (P =.041).

Kwak et al.,[12] found that the most reliable and poorest prognostic indicator of conservative therapy for MMPRT was the high meniscus extrusion ratio. Early surgical repair was thus advised as the main course of action in these situations.

Our results showed that, according to the preoperative Lysholm score, no statistically substantial variance was observed amongst the examined collections; however, the postoperative Lysholm score showed a statistically important distinction between the two groups.

Our findings concur with those of Yoon et al.,[11] who found 16 patients in the transtibial pullout repair group and 28 patients in the all-inside repair group. At the 2-year follow-up, Lysholm and Tegner scored considerably higher in the all-inside repair group.

Our findings concur with those of Feucht et al.,[6] who found that all individuals' preoperative postoperative Lysholm scores were provided; in the case of the Transtibial Pullout Repair for Posterior Medial Meniscus Root, the Lysholm score increased from 52.4 to 85.9 after surgery.

Points of strength: This research has many advantages. It represents the first case-control comparison of the transtibial pullout approach with all-inside meniscal repair in individuals cured in a normal clinical environment, where the choice to execute a joint preservation treatment is critical to a favourable clinical result.

4. Conclusion

When carried out appropriately, both methods may provide positive outcomes. If the damage pattern permits it, meniscal suture could be considered a therapeutic alternative for the treatment of meniscus posterior root repair (MMPRT) in carefully chosen patients. Additionally, there was no statistically substantial variation in the damage mechanism between the transtibial pullout group and the all-within meniscal repair group.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

There are no conflicts of interest.

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