January 2011

Arthroscopic repair of meniscal tears with inside-out technique

Hasnain Raza
Aga Khan University

Kashif Abbas
Aga Khan University

Masood Umer
Aga Khan University

Original Article

Arthroscopic repair of meniscal tears with inside-out technique

Hasnain Raza, Kashif Abbas, Masood Umer
Department of Orthopedic Surgery, The Aga Khan University Hospital, Karachi.

Abstract

Objective: To review the clinical results of arthroscopic meniscal repair and to identify factors that may affect the outcome.

Methods: A total of 15 arthroscopic meniscal repairs with inside-out in 14 patients over a 7-year period were evaluated retrospectively. The mean age was 41.2 ± 11.5 years with a range of 26-64 years. Eleven patients underwent repair for medial meniscal tear, two patients for lateral meniscus and one patient for both in the same knee. All patients were functionally evaluated by Lysholm functional knee scores over an average follow-up of 1year and 5 months (range: 0.5-7 years).

Results: The mean Lysholm score was 84 out of a maximum of 100. Functional outcome was excellent in 6 patients, good in 5, fair in 2 and poor in one patient. The patient with poor outcome was young with a chronic tear; she had concomitant ipsi-lateral radiculopathy and also had signs of reflex sympathetic dystrophy. One 64 year old patient with fair outcome developed a post-operative flexion contracture of 15 degrees. She also had moderate osteoarthritis of the medial compartment. One patient developed saphenous nerve neuralgia which was relieved spontaneously after a few months.

Conclusion: All patients with excellent results were relatively younger with an acute tear. Elderly patients with concomitant osteoarthritis of the knee joint did not have a satisfactory outcome even if the tear was acute.

Keywords: Arthroscopic repair, Meniscal tear, Inside out technique (JPMA 61:10; 2011).

Introduction

Menisci are vital for the functional well being of the knee. An intact meniscus is crucial for maintaining normal knee function, such as shock absorption, joint lubrication and load transmission across the knee joint. It increases contact area and hence decreases contact stress on the articular cartilage.[1,2]

Fairbank in 1948 reported that, if the meniscus is totally or partially excised for meniscal tear treatment, the incidence of subsequent arthritis is significantly increased.[3,4] A meniscal tear can lead to knee osteoarthritis, but knee osteoarthritis can also lead to a

spontaneous meniscal tear through breakdown and weakening of meniscal structure.[5] Hence, it is desirable to preserve menisci whenever possible by repairing them.[6] However, all meniscal tears are not amenable to repair, and each case must be critically assessed for repair suitability.[7]

Warner and Harner classified meniscal tears on the basis of their location in three zones of vascularity — red-red (fully within the vascular area), red-white (at the border of the vascular area), and white (within the avascular area). They use this classification to determine the potential for healing after repair. Tears in red-red and red-white zones have good potential for healing after repair.[8] Successful repair and healing relieves meniscal symptoms and allows the patient to return to full function.[9]

Thomas Annandale performed the first open meniscal repair in 1883 and Hiroshi Ikeuchiis credited with performing the first arthroscopic meniscal repair in 1969 in Tokyo.[10] Meniscal repair techniques have evolved over time from initial open repair to arthroscopically assisted inside-out, outside-in and all inside techniques. Arthroscopically assisted inside-out suture repair technique is well established and considered the gold standard,[11] but some studies showed no difference in healing between all inside and inside-out suture repair technique,[9] and inside-out versus outside-in repair technique.[12]

This study was conducted to review our clinical results of meniscal repair by arthroscopically assisted inside-out technique and to identify factors that may affect results, which in turn influence our future management of such cases.

Patients and Methods

This is a case series, including retrospective review of all patients who underwent arthroscopic assisted meniscal repair for isolated meniscal injury. Patients who had stable tears which were not subluxating into the joint or who had concomitant procedures done such as anterior cruciate ligament reconstruction or proximal tibial fracture fixation were excluded.

All patients presented with pain and limitation of range of motion of the knee joint. They could not squat and had difficulty in walking. Data was collected and analysed on SPSS version 16.0.

Patients were divided into two groups based on the time interval between onset of symptoms and repair, early (within 3 months) and late (beyond 3 months).

All patients were treated arthroscopically with inside-out technique. This technique, as the name implies, involves placing sutures into the knee by a needle through a cannula and retrieving outside the joint capsule. A few centimeter incision was made, dissecting and retrieving the sutures just outside the capsule and tying a secure knot. Additional sutures were then placed in similar fashion at approximately 3 to 5-mm intervals to complete the repair. Vertical sutures were placed for all tears. After suturing, the stability of the stitches were checked by arthroscopy. In almost all cases size 1 prolene was used except one in which size 1 PDS suture was used as prolene was not available on one day, but PDS can also maintain its strength for at least 6 months which is good enough time for the meniscus to heal. Though this patient had a good clinical outcome but still it is recommended to use Prolene 1 as the suture of choice. Any additional procedures that promote and augment healing were not done such as trephine, drilling or fibrin clot.

Immediately after the operation, the knee was immobilized in a brace with intermittent range of motion at knee, for 4 weeks depending on the size, extent and stability of the tear. The postoperative regime was partial weight bearing for 4-6 weeks. Activity was then gradually increased over the next few weeks. Squatting and running activities were not allowed for 3 months. Sports activities were permitted only after 6 months. Healing of all repairs were assessed clinically; no imaging study was done for confirmation due to cost constraints.

A questionnaire based on the Lysholm functional knee scores was filled by the patient himself or one of the authors in the clinic during patient's follow up visit or by conversation with patient on telephone. Clinical assessment of results was based on questionnaire analysis. The scores of 95and above out of 100 were considered excellent, 84 to 94 good, 65 to 83 fair and below 65 were poor. The functional outcome in patients with excellent and good scores were accepatable while fair and poor outcome were unaccepatable. Lysholm functional knee scoring system is well established and has acceptable reliability, validity and responsiveness.[13]

Results

A total of 15 arthroscopic meniscal repair were done with inside-out technique in 14 patients, (8 females and 6 males) over the period of seven years, from January 2001 to December 2007.

The mean age at repair was 41.2 ± 11.5 years. Only four patients were above the age of 50 years. Three had a good outcome and one a fair outcome. Increasing age was not considered a barrier for repair of the

Table-1: Arthroscopic repair of meniscal tears with inside-out technique.

Serial No.	Age (years)	Sex	Duration of symptoms (months)	Location of tear (medial, lateral or both menisci)	Functional outcome
1	55	Female	6	Medial	Good
2	34	Female	0.5	Medial	Excellent
3	35	Female	0.5	Both	Excellent
4	48	Male	12	Lateral	Excellent
5	32	Female	6	Medial	Poor
6	32	Male	24	Medial	Excellent
7	42	Male	6	Medial	Fair
8	38	Female	2	Medial	Excellent
9	64	Female	36	Medial	Fair
10	55	Female	5	Medial	Good
11	51	Female	2	Medial	Good
12	37	Female	2	Medial	Good
13	28	Male	3	Medial	Excellent
14	26	Male	4	Lateral	Good

Figure-1: Case 2: 34 years old lady whose medial meniscus repaired with inside out technique, minimal surgical scar marks visible on medial aspect of left knee.

Figure-2: Case 8: 38 years old lady whose medial meniscus repaired, demonstrating full range of motion at knee joint. Her functional outcome score was excellent.

meniscus as long as it was a traumatic and non-degenerative tear which was amenable to repair.

Ten patients were below the age of 50 years. Eleven patients were treated for medial meniscal tear, two for lateral and one for both in the same knee. Right and left knees were equally affected. Six patients had early and eight had late repairs. Twelve injuries were traumatic including sports related injuries and road traffic accidents.

All tears which were located in the peripheral vascular zone i.e. outer one third and at meniscosynovial junction were repaired. There were 12 longitudinal tears, one oblique tear and two cases with bucket handle tears. All of them were greater than 1 cm, and all were located in the posterior or postero-lateral horn. All of these were unstable tears which were dislocatable but reducible into the joint. The articular cartilages in all cases were found to be preserved except one where we found early degenerative changes.

The average post-operative follow up duration was one year and 5 months (range 6-84 months). Functional outcome was excellent in 6 patients, good in 5, fair in 2 and poor in one patient. The mean Lysholm score was 84. All eleven patients with excellent outcome were of age less than fifty years. All patients were happy and satisfied with the outcome at the time of final analysis; three patients were not fully satisfied and they had fair or poor outcome.

Unacceptable results were found in 3 patients and all these had chronic tears.

The patient with poor outcome was young with a chronic tear, she had concomitant ipsilateral radiculopathy and also had signs of reflex sympathetic dystrophy. One 64 year old female patient with fair outcome developed a post-operative flexion contracture

of 15 degrees. She also had mild osteoarthritis of the medial compartment. Both patients with lateral meniscal repair had acceptable outcome.

One patient who underwent both medial and lateral meniscal repair for acute tears had an excellent outcome. One patient developed saphenous nerve neuralgia which was relieved gradually within six months without any surgical intervention.

Discussion

The clinical outcome of arthroscopic meniscal repair is reported variably in different reports. Hantes et al reported 95% success rate in 20 repairs with average follow up of 22 months, whereas Satish et al reported 66% success rate with average follow up of 21 months.[14,15] Acceptable clinical outcome rate in this study was found in 78% of patients with average follow up of 18 months.

The mechanism of injury of original tear, whether traumatic or atraumatic may affect the outcome. Atraumatic tears are low energy tears usually found in knees with degenerative changes. One of the two patients with atraumatic tears in our study has fair outcome which is unsatisfactory. It is believed that healing potential of atraumatic tear is poor so it is not recommended to repair it, if the history is suggestive.

It was also noted that patients with excellent results were all relatively younger patients with ages less than fifty years. Mesiha et al also reported their observation that menisci in older patients are more vulnerable to degeneration hence failure of repair is common, leading to poor functional outcome.[16]

The failure rate of medial meniscal repair was 21.4% compared to none for the lateral meniscus. Other reports have also indicated a relatively higher failure rate of medial over lateral meniscal repairs.[17,18]

At present, there is no universal agreement as to what rehabilitation protocol is best. Shelbourne promoted a more aggressive approach and some believed in allowing range of motion and ambulation as tolerated immediately after the surgery, while others followed a restrictive rehabilitation programme.[11] Barber reported no significant difference in conservative and aggressive post-op regimen.[19] Rehabilitation protocol in this study was based on known guidelines.[17]

Henning et al reported that the failure rate in isolated meniscal repairs decreased from 41 to 8% with the use of fibrin clots.[20] Fibrin-clot augmentation is believed to aid meniscal healing by acting as a chemotactic and mitogenic stimulus for repair cells and providing a scaffold for repair.[21,22] Any such procedure was not used in our study that promotes and augments healing.

In our study better outcome was seen in repairs which were carried out within 3 months of initial injury. It is not clear from literature whether the time period from injury to repair has some role in prognosis. No significant difference was reported by Johnson et al in healing between early and late repairs.[23] However, other studies have demonstrated good success rate in early repairs.[24]

The incidence of complications is generally low in arthroscopic meniscal repair. The overall complication rate in our series was 14.2%. One patient with saphenous nerve neuralgia got relieved without surgical intervention. This is a known phenomenon on the medial side and usually subsides spontaneously.[11,25]

Some factors have been identified in this study which may influence the clinical results of meniscus repair which are worthy of further investigation. The isolated atraumatic meniscal tear in a stable knee may not be amenable to surgical repair, especially if presentation is delayed, even if the tear is 'peripheral'. The ideal post-operative rehabilitation programme in such cases may still need further refinement.

Conclusion

Clinical healing and acceptable results were achieved in 78.6% patients undergoing repair for torn menisci. All patients with excellent results were relatively younger. Elderly patients with a concomitant osteoarthritis of the knee joint did have a satisfactory outcome. Early repairs within 3 months of injury give better results than late repairs.

Disclaimer:

The authors did not receive any funding or grants in support of their research.

References

1. Haklar U, Kocaoglu B, Nalbantoglu U, Tuzuner T, Guven O. Arthroscopic repair of radial lateral meniscus tear by double horizontal sutures with inside-outside technique. The knee 2008; 15: 355-9.
2. Voloshin AS, Wosk J. Shock absorption of menisectomised and painful knees: a comparative in vivo study. J Biomed Eng 1983; 5: 157-61.
3. Cox JS, Nye CE, Schaefer WW, Woodstein IJ. The degenerative effects of partial and total resection of meniscus in dogs' knees. Clin Orthop Relat Res 1975; 109: 178-83.
4. Fairbank TJ, Knee joint changes after menisectomy. J Bone Joint Surg Br 1948; 30B: 664-70.
5. Lynch MA, Henning CE, Glick KR Jr. Knee joint surface changes. Long term follow up meniscus tear treatment in stable anterior cruciate ligament reconstructions. Clin Orthop Relat Res 1983; 172: 148-53.
6. Turman KA, Diduch DR. Meniscal repair: indications and technique. J knee Surg 2008; 21: 154-62.

7. Thomas CR. Meniscus repair in 2007. Techniques in Knee Surgery 2007; 6: 233-41.
8. Cannon WG Jr. Arthroscopic meniscal repair. In; Insall, editor. The Knee Surgery, 2001, pp 521-37.
9. Choi NH, Kim TH, Victoroff BN. Comparison of arthroscopic medial meniscal suture repair technique: inside-out versus all-inside repair. Am J Sports Med 2009; 37: 2144-50.
10. Lindenfeld T. Inside out meniscal repair. Instr Course Lect 2005; 54: 331-6.
11. Shelbourne KD, Patel DV, Adsit WS, Porter DA. Rehabilitation after meniscal repair. Clin Sports Med 1996; 15: 596-612.
12. Rodeo SA. Arthroscopic meniscal repair with use of outside-in technique. Instr Course Lect 2000; 49: 195-206.
13. Briggs KK, Kocher MS, Rodkey WG, Steadman JR. Reliability, validity, and responsiveness of the Lysholm knee Score and Tegner activity scale for patients with meniscal injury of the knee. J Bone Joint Surg Am 2006; 88: 698-705.
14. Hantes ME, Zachos VC, Varitimidis SE, Dailiana ZH, Karachalios T, Mailzos KN. Arthroscopic meniscal repair: a comparative study between three surgical tecniques. Knee Surg Sports Traumatol Arthrosc 2006; 14: 1232-7.
15. Venkstachalam S, Godsiff SP, Harding ML. Review of the clinical results of arthroscopic meniscal repair. Knee 2001; 8: 129-33.
16. Mesiha M, Zurakowski D, Soriano J, Nielson JH, Zarins B, Murray MM. Pathological characteristics of the torn human meniscus. Am J Sports Med 2007; 35: 103-12.
17. Canale ST. eds. Canale & Beaty: Campbell's Operative Orthopaedics, 11th ed. Philadelphia: Elsevier, 2001; p.
18. Henning CE, Lynch MA, Yearout KM, Vequist SW, Stallbaumer RJ, Decker KA. Arthroscopic meniscal repair using exogenous fibrin clot. Clin Orthop Relat Res 1990; 252: 64-72.
19. Barber FA. Unrestricted rehabilitation of meniscus repairs. Arthroscopy 1994; 10: 353.
20. Rodeo SA, Warren RF. Meniscal repair using the outside-to-inside technique. Clin Sports Med 1996; 15: 469-81.
21. Allgower M, Hulliger L. Origin of fibroblasts from mononuclear blood cells: a study on in vitro formation of the collagen precursor , hydroxyprolene in buffy coat cultures. Surgery 1960; 47: 603-10.
22. Sethi PM, Cooper A, Joki P. Technical tips in orthopedics: meniscal repair with use of an in situ fibrin clot. Arthroscopy 2003; 19: E44
23. Johnson MJ, Lucas GL, Dusek JK, Henning CE. Isolated Arthroscopic meniscal repair: a long-term outcome study (more than 10 years). Am J Sports Med 1999; 27: 446-8.
24. Eggli S, Wegmuller H, Kosina J, Huckell C, Jakob RP. Long term results of arthroscopic meniscal repair. An analysis of isolated tears. Am J Sports Med 1995; 23: 715-20.
25. Small NC. Complications of arthroscopic meniscal surgery. Clin Sports Med 1990; 9: 609-17.