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From incision to outcomes: a comparative dive into the functional outcomes of arthroscopic all-inside and outside in meniscal repair techniques

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ABSTRACT

Background: Meniscal repair has been associated with superior outcomes, including enhanced knee function, increased activity levels, reduced osteoarthritis progression, cost savings, and improved long-term functional outcome scores compared to partial meniscectomy. This study aimed to evaluate and compare the functional outcomes of meniscal repairs performed using the outside-in and all-inside techniques, utilizing the International Knee Documentation Committee (IKDC), Tegner Lysholm (TL) scores and comparing our results with previous studies.
Methods: This prospective study included 53 patients with traumatic meniscal tears and associated ligamentous injuries that underwent arthroscopic meniscal repair. Details of investigations were recorded, and knee functional assessment was performed using the 2000 IKDC score and TL scores.
Results: The mean age of the patients was 28±8.41 years, with 41 (77.36%) males and 12 (22.64%) females. At the final follow-up of 1 year, the IKDC scores in the all-inside group and outside in group were 93.26±4.45 and 94.31±2.63. The TL scores in the all-inside and outside in groups were 95.33±2.45 and 96±1.00. No statistically significant difference was noted between the two groups (p value >0.005).
Conclusions: Meniscal repairs in the two groups in our series demonstrated favourable clinical outcomes, as evidenced by significant improvements in IKDC score with averages increasing from 25.31 to 93.26 and from 25.91 to 94.31 in all-inside and outside-in groups respectively. The TL sores showed an improvement from 21.07 to 95.33 and from22.43 to 96.00 in all-inside and outside-in groups respectively. In conclusion, short-term results of traumatic meniscal tears with repair are promising, leading to significant improvements in knee function irrespective of concomitant injuries and the type of repair.

Keywords: Meniscal tear, Meniscal repair, Tegner Lysholm score, International knee documentation committee score

INTRODUCTION

Meniscus is a fibro-cartilaginous tissue that plays an important role in knee stability, load distribution, joint lubrication, joint nutrition and shock absorption.[1] The common cause of meniscal tear includes increased rotational forces on the knee, rapid stepping or squatting on an uneven surface and an unexpected, quick force which can lead the knee joint to flex too far back and tear the meniscus.[2]

Small, degenerative and asymptomatic tears are treated conservatively. Indications for surgical management include tears of length (1-4 mm), vertical tears, tears in the red-red or red-white zone, concurrent ACL tears, acute tears (<6 weeks) and in knees with good mechanical alignment.[3] The surgical option for symptomatic meniscal

tears is conventionally indicated for tears within the vascular region, while meniscectomy is indicated for the remaining degenerative tears and traumatic tears involving the avascular zone of meniscus.[3] However, meniscectomy has shown to increase the risk of arthritis, alter the gait mechanism, worsens the knee function and the long-term functional outcomes especially in young patients.[4] Compared to partial meniscectomy, meniscus repair has shown to result in better knee function, higher activity levels, less progression of osteoarthritis, cost saving and improved long-term functional outcome scores.[5,6]

The key to meniscal repair includes anatomic reduction, biologic augmentation, and circumferential compression across the tear site. Modern arthroscopic techniques of meniscus repair include inside-out, outside-in, and all-inside repair.[7]

The technique used for meniscus repair is usually dictated by the site of the lesion. All inside repairs are indicated for tears in the posterior one-thirds of meniscus, inside-out for tears in posterior and middle one –third and outside-in for anterior horn, anterior one-third and body of the meniscus respectively. Although the inside-out technique remains the gold standard of meniscal repair, the all-inside technique provides several benefits, including ease of use, preservation of knee blood supply, physiological mobility between the meniscus and surrounding tissues, avoidance of additional incisions, early introduction of exercises in passive range of motion and the high strength of the repair.[8,9]

While the outside in technique is a useful option for repairing the anterior horn or mid-body of the meniscus, radial tears, complex tears and reduction of bucket handle tear, it is difficult to obtain a perpendicular trajectory in the posterior third, favoring either an inside-out or all- inside repair.[10]

The associated cost with doing these procedure depends upon the number and configuration of sutures being used. Meniscal repairs associated with ligamentous injuries like an ACL or PCL tear requiring a simultaneous reconstruction have shown better outcomes owing to the biological effect of the healing response.

In this study, we evaluated and compared the functional outcome of meniscal repairs done via the outside in and all inside meniscal repair techniques using the International Knee Documentation Committee (IKDC) and Tegner Lysholm scores.

Purpose

The primary aim of the study was to compare the functional outcome of the knee following arthroscopic meniscal repair using the all-inside and outside-in techniques. The secondary aim was to compare our results with that in the literature including the epidemiology, physical examination and functional outcomes (IKDC, Lysholm, VAS scores, swelling, stiffness, squatting, climbing stairs, locking and instability scores).

METHODS

This was a prospective study including 53 patients with traumatic meniscal tear with associated ligamentous injuries who underwent arthroscopic meniscal repair at the Department of Orthopaedics, Sant Parmanand Hospital, Civil lines, Delhi from August 2020 to August 2022 (24 months). The study was undertaken after getting clearance from the ethical committee of our hospital.

Inclusion criteria

Patients of all ages with traumatic meniscal tear and associated ligament injuries that underwent meniscal repair were included.

Exclusion criteria

Patients with degenerative meniscal tears, knees with malalignment, arthritic joints, muscular disease, tears more than 6 months older, tears involving the white-white zone, complex, horizontal cleavage tears and radial tears, and body mass index (BMI) >25 were excluded.

From August 2020 to August 2022, all patients who underwent arthroscopic knee meniscal repair at our institute were included in the study after informed consent. Demographic data, history, clinical examination (Lachman test, McMurray's and Thessaly's test) and diagnosis was confirmed by magnetic resonance imaging (MRI) of knee joint. Details of investigations were recorded in the study performa. Routine pre-operative investigations were done. Knee functional assessment was done using 2000 IKDC score and Tegner Lysholm (TL) scores. Grading of TL was <60 (poor), 60-76 (fair), 77-90 (good) and 91 (excellent).

After surgery, follow up was done at 6 weeks, 12 weeks, 6 months, 1 year and patient were assessed on the basis of wound healing, VAS score, swelling, locking, climbing stairs, squatting, IKDC 2000 and TL scores.

Statistical analysis

The data was summarized in terms of frequency distributions and aided by appropriate graphs. Test of proportion was used to find the standard normal deviate (Z) to compare the difference proportions and Chi-square (χ^2) test was performed to find the associations. Quantitative variables were expressed as mean±SD, compared between groups using unpaired t test and across follow-ups using paired t test. A p value <0.05 was considered statistically significant. The data was stored in Microsoft excel spread sheet and statistical analysis performed using IBM statistical package for social sciences (SPSS) version 20.0.

Surgical technique

Pre-operative period

A single dose of a third-generation cephalosporin (ceftriaxone; 1 gm) was administered intravenous about ½ hr prior to procedure. The affected limb was marked pre-operatively.

Patient preparation

After giving the anaesthesia (spinal, epidural or general) patient was placed in supine position on the operating table with the non-operative limb positioned in neutral position on the operating table. The affected knee was examined under anaesthesia to confirm anterior cruciate ligament deficiency. Pneumatic tourniquet was applied to the operative leg after the limb was exsanguinated. The affected leg was then supported with lateral thigh post, which allowed movement from full extension to full flexion; the foot was secured and supported with already fixed sandbag. Tibial tubercle, patella, the medial and lateral borders of the patellar tendon and the medial and lateral joint lines were identified and marked.

The knee was examined with an arthroscope. With the knee flexed at about 90 degrees, a high anterolateral portal (viewing portal) was made using no. 11 blade at the level of inferior pole of patella, just lateral to patellar tendon. The scope was introduced and knee was examined systematically in the 'W' sequence, starting from the suprapatellar pouch, then the patellofemoral joint, medial gutter, medial meniscus, intercondylar notch, lateral meniscus and lateral gutter. Once all the pathologies were recorded a second anteromedial portal (working portal) was made just medial to patellar tendon using the outside-in technique. Diagnostic arthroscopy was performed to locate the site and type of tear. Only the tears which were in the red-red or red-white zone were considered for repair.

The method of meniscal repair depended upon the site and extent of the tear. The tear was freshened with meniscal rasp or needling technique to get bleeding margins.

Tears in the posterior one-third were repaired with all inside technique using various all-inside repair devices. Tears in middle one-third were considered to be repaired by inside-out technique and the tears in anterior one-third were repaired by outside-in technique. In extensive tears combination of techniques was considered.

All-inside technique consists of an implant system (TRUESPAN) with two anchors connected with a preformed knot. The torn meniscus was reduced and the implant was inserted either through anteromedial or anterolateral portal to fix the tear.

Outside-in repair was performed with special outside-in repair kits to pierce the overlying capsule and here also 2.0 non-absorbable sutures were used to fix the torn meniscus over the capsule. The suture was used in either horizontal or vertical configuration depending on the nature of the tear (Figure 1).

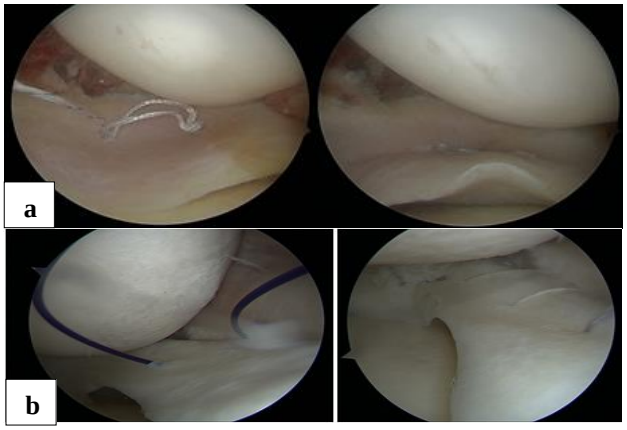

Figure 1: (a) Techniques of arthroscopic all inside meniscus repair, and (b) technique of outside in meniscus repair.

Patients were given a single dose of intravenous antibiotics post-operatively. Wound inspection was done on the 1st postoperative day and the patient was discharged on the 1st or 2nd post-operative day. On the 14th day stitch removal was done. Post-operatively the tear was protected with a knee brace with articulated range of motion and non-weight bearing ambulation. The weight bearing was commenced from 3 weeks onwards with the aim to achieve full weight bearing and full range of motion by 8-12 weeks.

RESULTS

In our study of 53 patients mean age of the patients was 28±8.41 years (Table 1). Majority of the patients in the study were males (77.36%) (Table 2). Maximum patients suffered twisting injury to the knee (66.04%) (Figure 2a). Most of the patients had a positive Lachman test preoperatively (84.9%) (Figure 2b). McMurray's test was found to be positive in 79.25% patients preoperatively (Figure 2c). 73.58% patients had positive Thessaly's test preoperatively and 5.66% patients had positive valgus stress test preoperatively.

Table 1: Distribution of age group.

Age (years)	N	%
≤20	13	24.53
21–30	21	39.62
31–40	15	28.30
41–50	4	7.55
Total	53	100

14 (26.41%) patients were diagnosed with lateral meniscus tear, 28 (52.83%) patients were diagnosed with medial meniscus tear and 11 (20.75%) patients were diagnosed with combined lateral and medial meniscus tear (Figure

2d). In our study of 53 patients having a total of 68 different locations of meniscal tear. 5 (9.43%) had tear in anterior one-third. 56 (88.68%) tears were involving posterior one- third. In 3 (3.77%) body was involved, in 2 tear (1.89%) ramp lesion was seen and in 2 the tear (1.89%) was seen at the capsular attachment (Figure 3a). Many patients had combined injuries to the medial and lateral meniscus, especially posterior horn tears of both the medial and lateral meniscus were seen in 9 patients. In few patients the tear was located at more than one location within the same meniscus.

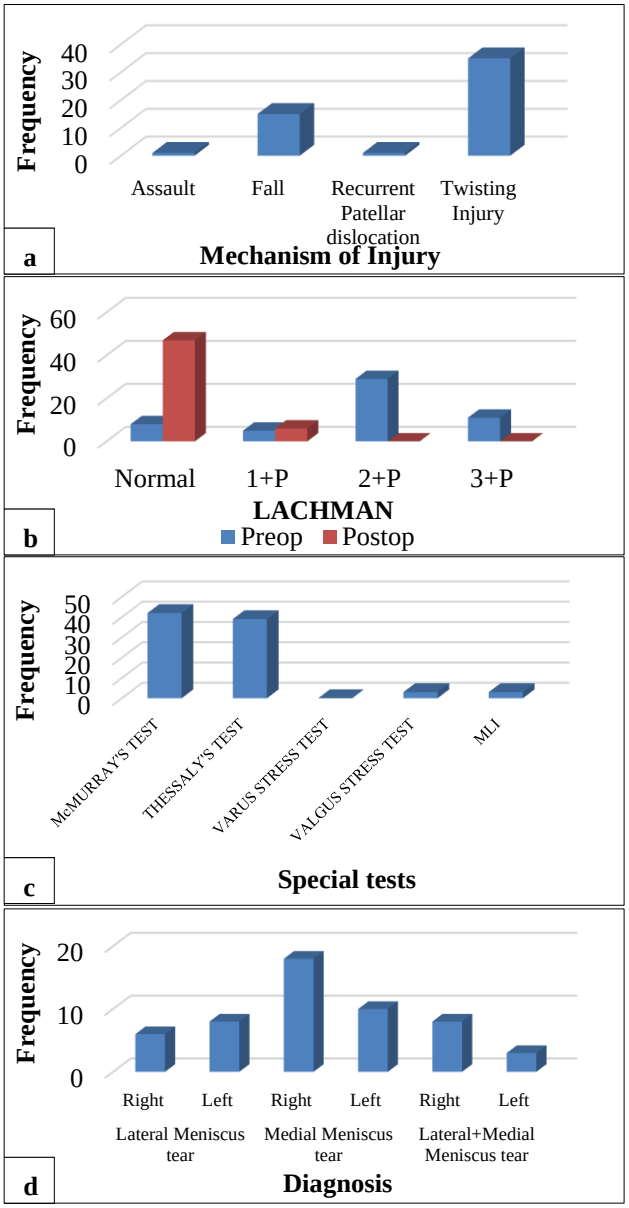

Figure 2: Distribution based on (a) mechanism of injury, (b) Lachman test, (c) special test, and (d) diagnosis.

In our study 11 patients (20.75%) had a bucket handle tear and 41 patients (77.36%) had a longitudinal tear in the meniscus when seen on diagnostic arthroscopy. One patient (1.89%) among them had bucket handle tear in the body and longitudinal tear in the posterior horn of the medial meniscus (Figure 3b). In our study of 53 patients, a total of 56 meniscal repairs were done as some patients had combined injuries to the medial and lateral meniscus. 49 all inside repair and 7 outside in repair was done in our study. Hybrid repair (all inside + outside in) was done in 3 patients (Figure 3c).

Table 2: Distribution based on gender.

Gender	N	%
Male	41	77.36
Female	12	22.64
Total	53	100

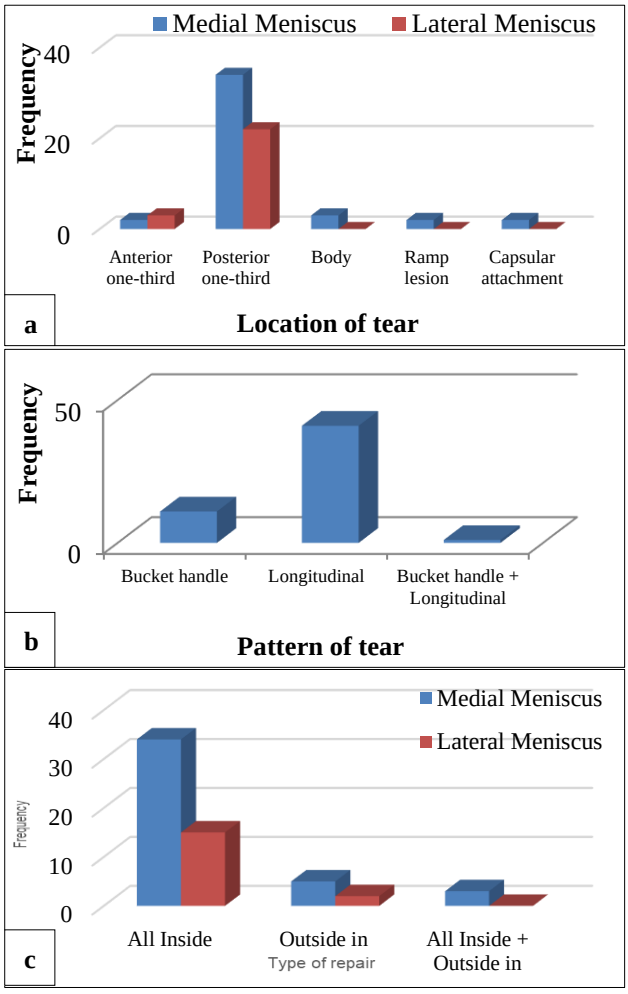

Figure 3: Distribution based on (a) location of tear, (b) pattern of tear, and (c) type of repair.

The IKDC and Tegner Lysholm score in the male group at final follow up of 1 year was 93.09±4.68 and 95.34±2.46 respectively. The IKDC and Tegner Lysholm score in the female group at final follow up of 1 year was 94.5±1.67 and 95.66±1.78 respectively. There was no statistically significant difference noted in the 2 groups as assessed by the unpaired t test ($p>0.005$). Therefore, irrespective of patient's gender all subjects had excellent results with same treatment protocol. The mean IKDC score was 76.32

and 93.26 at 6 months and 1 year in the all-inside meniscal repair group. The mean IKDC score was 76.97 and 94.31 at 6 months and 1 year in the outside in meniscus repair group (Table 3). There was no statistically significant difference noted in the 2 groups as assessed by the unpaired t test (p>0.005). The mean Tegner Lysholm score was 85.57 and 95.33 at 6 months and 1year in the all-inside meniscal repair group. The mean Tegner Lysholm score was 88.29 and 96.00 at 6 months and 1 year in the outside in meniscus repair group (Table 4). There was no statistically significant difference noted in the 2 groups as assessed by the unpaired t test (p value >0.005). The mean IKDC score was 76.33 and 93.11 at 6 months and 1 year respectively in those where an ACL reconstruction was done along with meniscal repair. The mean IKDC score was 76.79 and 94.81 in the group where isolated meniscus repair was done. There was no statistically significant difference noted in the 2 groups as assessed by the unpaired t test (p value >0.005). Most of the patients showed good clinical outcomes with acceptable range of motion at the final follow up (Figure 4).

Table 3: Comparing IKDC scores off all-inside and outside-in repair groups.

Type of repair	IKDC score	Pre-op	6 weeks	12 weeks	6 months	1 year
All inside	Mean±SD	25.31±3.61	22.18±3.64	57.49±5.46	76.32±3.46	93.26±4.45
Outside in	Mean±SD	25.91±4.92	22.54±4.29	56.40±3.19	76.97±2.9	94.31±2.63
P value		0.694	0.831	0.611	0.640	0.545

Table 4: Comparing Tegner Lysholm scores of all-inside and outside-in repair groups.

Type of repair	Tegner Lysholm score	Pre-op	6 weeks	12 weeks	6 months	1 year
All inside	Mean±SD	21.07±5.44	19.57±4.11	70.17±7.23	85.57±5.68	95.33±2.45
Outside in	Mean±SD	22.43±2.76	21.00±1.29	70.71±6.32	88.29±1.6	96.00±1
P value		0.694	0.521	0.075	0.853	0.217

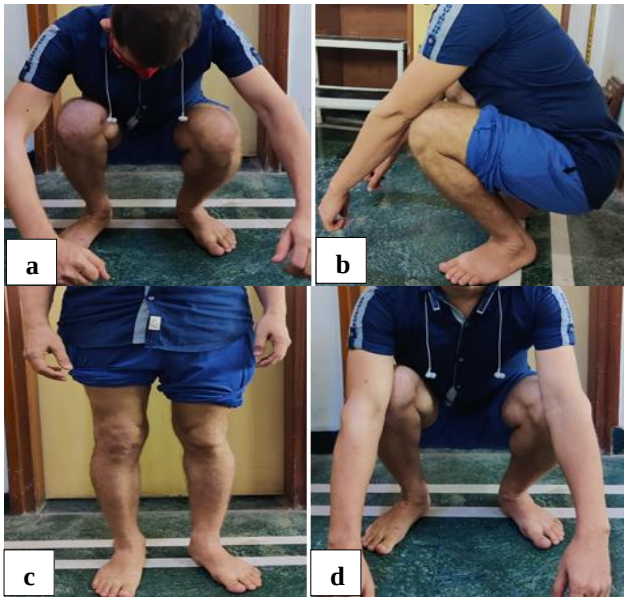

Figure 4 (a-d): Showing clinical outcome and knee range of motion at final follow.

In our study the pain score (VAS score) reduced significantly from a mean value of 8.17 preoperatively to a score of 6.64, 2.34 and 0.51 postoperatively at 6 weeks, 12 weeks and 6 months, showing a significant improvement (p<0.005). The pain control was found to be better among the patients who underwent an outside in repair compared to the all inside group. Our study shows that there is a significant difference between the mean swelling, stiffness, squatting, climbing stairs, locking and instability scores obtained at each follow-up when compared with the pre-op score (p<0.005).

Complications in the study recorded two cases (3.77%) with knee stiffness among which one patient had undergone arthroscopic arthrolysis with mobilization under anaesthesia and the other patient was treated with physiotherapy, following which the stiffness settled. Four cases (7.55%) developed knee effusion out of which one patient was managed with arthroscopic lavage and rest of the three patients got knee aspiration done, following which the effusion settled. One case (1.89%) in which medial meniscus outside in repair was done, developed a symptomatic neuroma at the portal site postoperatively, which was managed conservatively.

DISCUSSION

The incidence of meniscus injury among males has been reported to be 2.5 to 4 times higher when compared with females.[11] In the present study, there was no statistically significant difference noted in the 2 groups. Therefore, irrespective of patient's gender all subjects had excellent results with same treatment protocol. In our institution the total number of patients with meniscus tear were more in males as compared to females and most of the patients were in the age group of 21-30 years. Our results were in concurrence with a 5 year follow up study on elite athletes by Logan et al which included 29 males and 13 females.[12] All patients in the present study sustained a traumatic tear. These findings were in concordance with a study by

Tengrootenhuyen et al in which majority of patients had traumatic tear.[13]

Benjamin et al in their study showed that McMurray's was positive in 61% of patients presenting with a meniscal tear and Thessaly was positive in 75% of patients.[14] In our study more patients had a positive Mcmurray's test as it was a prospective study and we included only traumatic tears whereas the study by Benjamin et al was a systematic review and meta-analysis including the degenerative tears.[14]

In the present study of 53 patients, a total of 56 meniscal repairs were done as some patients had combined injuries to the medial and lateral meniscus. All inside repair was done in 49 (92.45%) tears and outside in repair was done in 7 (13.21%) tears. Hybrid repair (all inside with outside in repair) was done in 3 tears (5.67%) having multiple tears at different locations within the same meniscus. Similarly, in a study by Pathak et al an all-inside technique alone was used to treat most of the medial meniscal tears, followed by a combination of all-inside and outside-in techniques.[15]

In our study the pain score (VAS score) reduced significantly from a mean value of 8.17 preoperatively to a score of 6.64, 2.34 and 0.51 postoperatively at 6 weeks, 12 weeks and 6 months, showing a significant improvement ($p<0.005$). The pain control was found to be better among the patients who underwent an outside in repair compared to the all inside group. Pathak et al showed in their study that the mean VAS score decreased significantly from 7.3 preoperatively to 2 postoperatively ($p<0.001$). However, their study did not make a comparison between the different techniques of repair.[15] Our study shows that there is a significant difference between the mean swelling, stiffness, squatting, climbing stairs, locking and instability scores obtained at each follow-up when compared with the pre-op score ($p<0.005$). The improvement in each score was comparable to the findings of Skou et al.[17]

The mean IKDC and Tegner Lysholm scores in the two groups (all-inside versus outside-in) showed no significant difference ($p>0.05$). Our results were comparable to findings of Rathawa et al in their study which showed that all meniscus repair techniques outside in, inside out, and all inside technique combination of all yields comparative clinical and functional outcome.[19]

The mean Tegner Lysholm score gradually progressed over the period of follow up and at the final follow up at 6 months and 1year post-operatively all 53 patients had excellent result. The mean Tegner Lysholm score was 85.92 and 95.42 at 6month and 1 year postoperatively respectively. These scores were comparable to studies by Logan et al and Singh et al (Table 3).[12,20] Singh et al in their study had complications such as numbness, which was seen in 3 (10.5%) patients, 2 (7%) had pain and 1 (3.5%) had effusion.[20] Similarly, Austin et al reported numbness in 7% patients, effusion in 2% and infection in 1% patients.[21] Stone et al described neuropraxia in 28% patients.[22] We encountered fewer complications such as stiffness, knee effusion, neuroma as compared to the above studies.

Limitations

Limitations of current study were; this study was conducted at a single center and had a relatively small sample size. Additionally, the study was conducted over a short period. There was lack of radiological evaluation of meniscal healing in our study. Therefore, the findings may not fully represent the comprehensive scenario across the entire country.

CONCLUSION

In our series, both the all-inside and outside-in groups exhibited positive clinical outcomes in meniscal repairs, as indicated by notable enhancements in IKDC scores. Specifically, the averages rose from 25.31 to 93.26 in the all-inside group and from 25.91 to 94.31 in the outside-in group at 1 year follow up. Additionally, Tegner Lysholm scores improved from 21.07 to 95.33 in the all-inside group and from 22.43 to 96.00 in the outside-in group at 1 year follow up. In conclusion, short term results of traumatic meniscal tears with repair is good leading to significant improvement in knee function irrespective of type of repair and concomitant injuries. We recommend further long-term studies which look into the long-term functional outcomes of meniscal repair along with arthroscopic and radiological evaluation to see the biological and healing response of meniscal repair.

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REFERENCES

1. Makris EA, Hadidi P, Athanasiou KA. The knee meniscus: structure–function, pathophysiology, current repair techniques, and prospects for regeneration. Biomaterials. 2011;32(30):7411-31.
2. Bhan K. Meniscal tears: current understanding, diagnosis, and management. Cureus. 2020;12(6).
3. Nakayama H, Kanto R, Kambara S, Kurosaka K, Onishi S, Yoshiya S, et al. Clinical outcome of meniscus repair for isolated meniscus tear in athletes. Asia Pac J Sports Med Arthrosc Rehabil Technol. 2017;10:4-7.
4. Fox AJ, Bedi A, Rodeo SA. The basic science of human knee menisci: structure, composition, and function. Sports Health. 2012;4(4):340-51.
5. Xu C, Zhao J. A meta-analysis comparing meniscal repair with meniscectomy in the treatment of meniscal tears: the more meniscus, the better outcome? Knee Surg Sports Traumatol Arthrosc. 2015;23(1):164-70.

6. Feeley BT, Liu S, Garner AM, Zhang AL, Pietzsch JB. The cost-effectiveness of meniscal repair versus partial meniscectomy: A model-based projection for the United States. The Knee. 2016;23(4):674-80.
7. Woodmass JM, LaPrade RF, Sgaglione NA, Nakamura N, Krych AJ. Meniscal repair: reconsidering indications, techniques, and biologic augmentation. JBJS. 2017;99(14):1222-31.
8. Cuéllar A, Cuéllar R, Heredia JD, Cuéllar A, García-Alonso I, Ruiz-Ibán MA. The all-inside meniscal repair technique has less risk of injury to the lateral geniculate artery than the inside-out repair technique when suturing the lateral meniscus. Knee Surg Sports Traumatol Arthrosc. 2018;26(3):793-8.
9. Chen NC, Martin SD, Gill TJ. Risk to the lateral geniculate artery during arthroscopic lateral meniscal suture passage. Arthroscopy. 2007;23(6):642-6.
10. Cho JH. A modified outside-in suture technique for repair of the middle segment of the meniscus using a spinal needle. Knee Surg Relat Res. 2014;26(1):43-7.
11. Snoeker BA, Bakker EW, Kegel CA, Lucas C. Risk factors for meniscal tears: a systematic review including meta-analysis. J Orthop Sports Physical Therapy. 2013;43(6):352-67.
12. Logan M, Watts M, Owen J, Myers P. Meniscal repair in the elite athlete: results of 45 repairs with a minimum 5-year follow-up. Am J Sports Med. 2009;37(6):1131-4.
13. Tengrootenhuysen M, Meermans G, Pittoors K, Van Riet R, Victor J. Long-term outcome after meniscal repair. Knee Surg Sports Traumatol Arthrosc. 2011;19(2):236-41.
14. Smith BE, Thacker D, Crewesmith A, Hall M. Special tests for assessing meniscal tears within the knee: a systematic review and meta-analysis. BMJ Evid-Based Med. 2015;20(3):88-97.
15. Pathak S, Bharadwaj A, Patil P, Raut S, Srikanth RV. Functional outcomes of arthroscopic combined anterior cruciate ligament reconstruction and meniscal repair: a retrospective analysis. Arthrosc Sports Med Rehab. 2020;2(2):e71-6.
16. Khajotia BL, Chauhan S, Sethia R, Chopra BL. Functional outcome of arthroscopic reconstruction of anterior cruciate ligament tear using peroneus longus tendon autograft. Int J Res Orthop. 2018;4(6):898-903.
17. Skou ST, Pihl K, Nissen N, Jørgensen U, Thorlund JB. Patient-reported symptoms and changes up to 1 year after meniscal surgery: An observational cohort study of 641 adult patients with a meniscal tear. Acta Orthopaedica. 2018;89(3):336-44.
18. Elmallah R, Jones LC, Malloch L, Barrett GR. A meta-analysis of arthroscopic meniscal repair: inside-out versus outside-in versus all-inside techniques. J Knee Surg. 2019;32(08):750-7.
19. Rathava DP, Maru DN, Patel DK. Clinical and functional outcome of different modalities of meniscus repair. Int J Orthop Sci. 2021;7(4):42-5.
20. Singh SP, Singh M, Singh PV, Singh S, Arif M. Functional outcome of arthroscopic meniscal repair in meniscal tears: a prospective study in tertiary care hospital in North India. Int J Res Orthop. 2021;7(4):816-9.
21. Austin KS, Sherman OH. Complications of arthroscopic meniscal repair. Am J Sports Med. 1990;21:864-9.
22. Stone RG, Frewin PR, Gonzales S. Long-term assessment of arthroscopic meniscus repair: a two-to six-year follow-up study. Arthroscopy. 1990;6(2):73-8.

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