

Original Article

Clinical outcomes of arthroscopic partial meniscectomy at 10 years follow up - A retrospective cohort study

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ABSTRACT

Objectives: In recent times, the advent of newer meniscal repair systems and studies thereof seem to have implied that meniscectomy procedures should be abandoned or used only as a last resort procedure in most patients. This study was done to report the outcomes of partial meniscectomy done in indicated patients by a skilled arthroscopic surgeon at a long-term follow-up of 10 years. The indications and the appropriate strategy for performing this procedure are also described.

Materials and Methods: One hundred consecutive patients who underwent arthroscopic partial meniscectomy (APM) over one year were evaluated 10 years later for functional and clinical outcomes.

Results: A retrospective case series of 100 consecutive patients was conducted to study the clinical outcome of APM after 10 years. Their mean age was 41.23 ± 7.81 years. 70% of the selected patients were male. Medial meniscus involvement was the most common (73%). At their 10-year follow-up, the majority of cases were asymptomatic (72%), with a mean international knee documentation committee score of 86.90 ± 5.51 . Mean Tegner Lysholm Knee score was 90.05 ± 10.21 , the Western Ontario and McMaster Universities Arthritis Index score was 8.83 ± 6.19 , and the Western Ontario meniscal evaluation tool score was 85.54 ± 10.91 . The subjective assessment after surgery was “excellent” in the majority of patients (48%).

Conclusion: With proper patient selection and accurate decision-making, patients operated with APM for isolated meniscus tears can return to their daily routine activities and have good clinical and functional outcomes. The technique of performing arthroscopy and the skill set of the operating surgeon may perhaps also be an important criterion influencing the outcomes.

Keywords: Knee arthroscopy, Meniscectomy, Meniscal repair, Functional outcomes, Physiotherapy

INTRODUCTION

The menisci are fibrocartilaginous structures that play an important role in shock absorption and distributing loads throughout the knee joint. Pathology of the menisci is linked to early-onset osteoarthritis (OA) of the knee.^[1,2] Meniscal tears can be mechanically stable or unstable and be clinically symptomatic or asymptomatic.^[3-6] An arthroscopic partial meniscectomy (APM) is one of the most common surgeries performed worldwide for treating symptomatic meniscal tears.^[7]

Over the past few years, this intervention has been subjected to a lot of criticism, with some authors regarding this procedure as completely obsolete for meniscal pathologies.^[8,9] With the advent of newer systems of meniscus repair and investments of the implant company in product development and promotion of the same, the criticism has only grown.

Despite the criticism, many arthroscopic surgeons believe that there is still a role of partial meniscectomy in a subset of the population who have meniscal pathology, provided it is done with due diligence and appropriate surgical technique. It is also known that many times, the patient's symptoms may not solely be due to the meniscus tear but also due to an underlying degenerative process. Treating such patients for a meniscus tear would not yield satisfactory results. Thus, a few authors have stressed the importance of accurate patient selection to obtain better results from an APM.^[10,11] This study aimed to report the clinical and functional outcomes in 100 consecutive patients who had undergone APM 10 years back. The study also describes the importance of the appropriate patient selection and optimal surgical technique to obtain good clinical and functional outcomes.

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MATERIALS AND METHODS

Study design and patient selection

One hundred patients operated on with APM by a single surgeon in a tertiary health-care center between the years 2012 and 2013 who fit into pre-decided selection criteria were identified and assessed. Informed consent was obtained from all patients before surgery for evaluating their results over 10 years and the prospects of research to be undertaken in the future were explained to the patients in detail. No ethical committee approval was sought since it was a retrospective study evaluating outcomes.

Inclusion criteria

The following criteria were included in the study:

1. Age between 22 and 56 years
2. Knee pain for more than one month
3. Localized joint line tenderness
4. Adequate knee joint space on radiographs
5. Magnetic resonance imaging (MRI)-confirmed isolated meniscal tear
6. Arthroscopy confirmed white/white or red/white tears.

Exclusion criteria

The following criteria were excluded from the study:

1. Prolonged episodes of inability to fully extend the knee (locked knee for more than a month)
2. High-energy/high-velocity knee trauma
3. Grade 3-4 OA on the Kellgren and Lawrence (KL) classification
4. Any form of knee-related surgery within the previous two years
5. There were 26 drop-outs whose results could not be evaluated and thus have been excluded from this study.

There was no randomization and the patients were not classified based on their age or any other factors. All patients fitting into the above-mentioned criteria were posted for APM purely based on their symptoms.

Pre-operative assessment and decision-making

All patients were assessed in the outpatient department. Those who fit into the above-mentioned selection criteria were scheduled for APM after a thorough clinical examination. Localized joint line tenderness was the key clinical factor and an MRI-confirmed meniscal tear extending to the articular surface with adequate joint space on a plain radiograph (KL grade 0-2) was identified as key radiological criteria which aided in our decision-making.

Surgical technique and post-operative rehabilitation

Standard arthroscopic evaluation of the knee was done for all patients under general anesthesia using a 2.9-mm arthroscope through the anterolateral and anteromedial

portals. The presence of intra-articular pathology (meniscal tears, loose bodies, and chondral lesions) was checked. During the APM, torn parts of the meniscus in the white/white or red/white areas were removed meticulously, using standard arthroscopic instruments, until healthy meniscal tissue was reached, with preservation of as much meniscus as possible.

All patients were operated on a day-care basis, being admitted in the morning of the day of surgery and discharged in the afternoon. They were all put on a similar physiotherapy regime of muscle strengthening, endurance, and flexibility and were followed up at regular intervals as per protocol.

Follow-up evaluation

The final evaluation for all patients was done 10 years after surgery in the form of a meticulously curated questionnaire. Functional assessment of all patients was done using the International Knee Documentation Committee (IKDC), Tegner Lysholm (TL) knee score, the Western Ontario and McMaster Universities Arthritis Index (WOMAC), and the Western Ontario Meniscal Evaluation Tool (WOMET) scores. These scores were compared with their respective pre-operative scores, recorded 10 years earlier.

Statistical analysis

The Statistical Package for the Social Sciences Version 26 (IBM®) was used for statistical analysis. The data distribution of each metric parameter was checked using the Kolmogorov-Smirnov test. If data showed no normal distribution, statistical evaluation was expressed as medians (with ranges). If the data showed a normal distribution, the results were presented as means \pm standard deviation. Discrete variables were expressed as numbers and percentages.

RESULTS

Demographic and patient characteristics

One hundred patients fulfilling the screening criteria were included in the study. The mean age was noted to be 41.23 ± 7.81 years, with the majority being in the 41–50 years age group. About 70% of patients were male. Medial meniscus involvement was more common (73%), with the left-side involvement being marginally more than the right-side. Our pre-operative mean baseline IKDC, TL, WOMAC, and WOMET scores were 38.52 ± 6.31 , 62.34 ± 8.11 , 47.61 ± 13.84 , and 58.49 ± 6.86 . With regard to our baseline radiographic KL grading, we had 11 patients with KL 0, 38 patients with KL 1, and 51 patients with KL 2 grade. The demographic and baseline details are shown in Table 1, Figures 1 and 2.

Outcome assessment of enrolled patients

The mean and median calculated values for IKDC score, TL knee score, WOMAC score, and WOMET score are shown in Table 2. The majority of cases were asymptomatic at their 10-year follow-up (72%). The subjective assessment after

Table 1: Demographic and baseline details in the study.

Parameter assessed	Calculated value
Mean age (years)	41.23±7.81
Median age in years (range)	43 (22-56)
Age group distribution (number of patients)	
18-30 years	12
31-40 years	29
41-50 years	58
>50 years	1
Gender distribution	
Number of males	70
Number of females	30
Affected meniscus (number of patients)	
Medial	73
Lateral	21
Medial±Lateral	5
Laterality of surgery (number of patients)	
Right	47
Left	52
Bilateral	1
Operating time (min)	
Mean time (min)	12.13±3.72
Median operating time (min) (Range)	12 (6-24)
Pre-operative scores	
IKDC	38.52±6.31
Tegner Lysholm	62.34±8.11
WOMAC	47.61±13.84
WOMET	58.49±6.86
OA status - KL classification	
KL 0	11
KL 1	38
KL 2	51

IKDC: International Knee Documentation Committee, KL: Kellgren and Lawrence, WOMAC: Western Ontario and McMaster Universities Arthritis Index, WOMET: The Western Ontario Meniscal Evaluation Tool, OA: Osteoarthritis

Table 2: Outcome assessment at 10-year follow-up for study participants.

Parameter assessed	Calculated value
Symptom status (number of patients)	
Symptomatic	28
Asymptomatic	72
IKDC score	
Mean score	86.90±5.51
Median score (range)	87.40 (76.2-94.3)
TL knee score	
Mean score	90.05±10.21
Median score (range)	90 (42-100)
WOMAC score	
Mean score	8.83±6.19
Median score (range)	8 (0-60)
WOMET score	
Mean score	85.54±10.91
Median score (range)	88 (43.13-100)

IKDC: International Knee Documentation Committee, WOMAC: Western Ontario and McMaster Universities Arthritis Index, WOMET: The Western Ontario Meniscal Evaluation Tool

Table 3: Key for subjective assessment after surgery.

The knee has markedly improved and I have returned to all activities	(Excellent)
The knee has improved but there is still occasional discomfort or problem in sports activities	(Good)
The knee has improved but I am still unable to return to sports activities	(Fair)
The knee is not better or worse than before surgery	(Poor)

surgery [Table 3] was found satisfactory and the majority of the patients returned to their pre-injury activities [Figure 3].

Post-operative radiographs and radiological progression assessment

Radiographs were taken postoperatively only when the patient had any complaints of knee pain, swelling, or discomfort. A radiograph of a 58-year-old male at his final 10-year follow-up, who complained of knee pain and discomfort while performing strenuous activities is shown in Figure 4. The rest of the assessment over 10 years was mainly clinical. Any progression on the radiographs was documented.

Need for 2nd surgery

None of the patients needed a second surgery over 10 years, with 96% of the patients returning to their pre-injury activities [Figure 3].

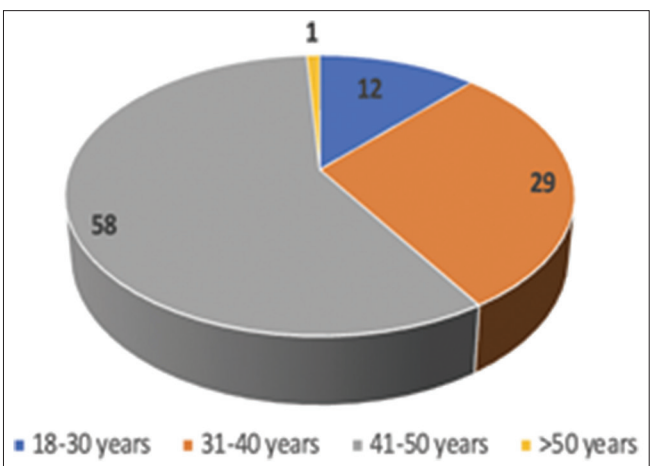


Figure 1: Age distribution of enrolled patients.

DISCUSSION

In recent times, with the advent of newer technology and the concept of “preservation of meniscus” being in vogue, there

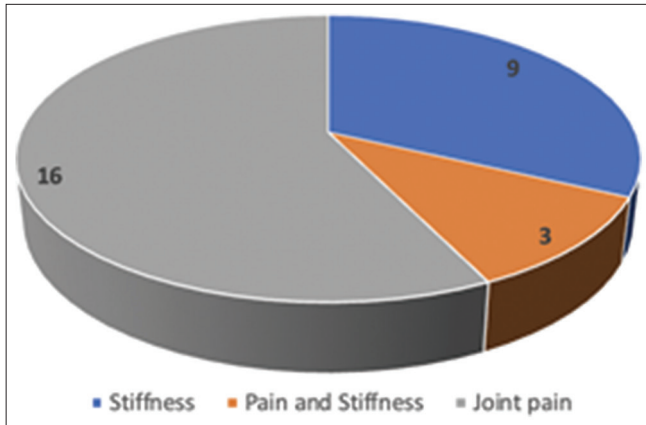


Figure 2: Symptoms noted in study participants.

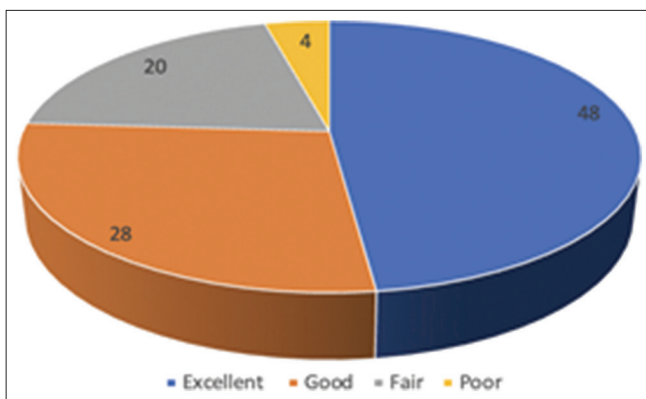


Figure 3: Subjective assessment post-surgery noted in study participants.



Figure 4: Plain radiograph of a 58-year-old male at his final 10-year follow-up after arthroscopic partial meniscectomy, showing well preserved joint space as compared to the non-operated knee (a) Operated knee, (b) Non-operated knee).

has been a rapid decline in meniscectomy being the treatment of choice for meniscal tears. The very idea of “removal” of the meniscus has instilled a sense of apprehension among

the patients due to which they are also inclined toward a meniscal preserving procedure. This makes pre-operative decision-making a very important factor in providing optimum post-surgical results. By definition, more than two-thirds of the meniscus is preserved in an APM, thus, obviating the need for a subtotal or total meniscectomy.^[12] Therefore, in a white-white or red-white tear, when meniscal repair is known to have comparatively poor results, meniscectomy still prevails as a treatment of choice.^[13] In our study, we have undertaken “selective” partial meniscectomies by accurately identifying the population of patients that would benefit from the procedure as per our selection criteria. With a combination of accurate pre-operative patient selection, adequate intraoperative precautions like reduced surgical time, and early post-operative mobilization, satisfactory long-term results can be achieved.

It is often difficult to determine if the presenting symptoms are secondary to the meniscus pathology alone, due to degenerative disease, or due to some traumatic event leading to chondral/ligament damage. We excluded such a possibility by our robust inclusion criteria for this study based on history, and clinical and radiological findings. Meniscal tears in young adults are mainly traumatic and those in the middle-aged are mostly due to a degenerative process.^[3] We, therefore, kept our inclusion criteria reserved to the young adult and middle-aged population with knee radiographs having KL 2 or lower, where the cause of knee pain is mainly due to the meniscus and not due to an ongoing degenerative process. We do not recommend APM in the presence of advanced OA (KL 3–4) as the knee pain in these cases most likely depends on the severity of OA changes.

The anatomical location of the tear is one of the major factors that decide the surgical outcome after an APM. Those in the white-white zone are avascular and less amenable to repair.^[14] The 30-day complication rate after meniscal repair (1.2%) is higher as compared with meniscectomy (0.82%).^[15] We did not encounter any noteworthy complications in our study. Some complications associated with meniscectomy are due to prolonged operating time. Complications such as surgical site infections, nerve injury, cardiopulmonary complications, and sepsis may arise as a result of increased surgical time. All our surgeries had a mean operating time duration of 12.13 ± 3.72 min, thus, helping us get optimal results.

All patients were operated on a day-care basis, with every patient being allowed protected full weight-bearing walking immediately 2 h after surgery. Due to a much shorter recovery time, patients were able to get back to routine activities much earlier as compared to repairs. Thus, APM was the first choice in high-demand patients, especially athletes.^[16] Home-based physiotherapy was started for every patient in the form of quadriceps and hamstring strengthening along with knee range of motion exercises, which were initiated two days after surgery. Further, follow-up of physiotherapy was done by tele- and internet-based means. This approach was found

to be similar to in-person physical therapy (PT) in terms of pain, function, and quality of life but had the advantage of being cost-effective, reducing traveling time, costs, and work absenteeism associated with face-to-face appointments.^[17-20]

There have been many controversies amongst orthopedic surgeons regarding the indications and benefits of APM. Numerous landmark multicenter randomized controlled trials (RCTs) in the past have criticized this procedure for showing no substantial results as compared to sham surgeries, conservative management, or even no intervention at all.^[14] These most notably include the 2013 Meniscal Tear in Osteoarthritis Research (MeTeOR) Trial, the 2018 Evaluation Study of Congestive Heart Failure and Pulmonary Artery Catheterization Effectiveness (ESCAPE) trial, and the sham surgery-controlled Finnish Degenerative Meniscal Lesion Study (FIDELITY).^[21]

In our study, we treated 100 patients with APM, with their mean age being 41.23 ± 7.81 years, with 70% of patients being males. All our pre-operative baseline characteristics were comparable with those of the aforementioned trials.^[9,22,23]

Our outcomes at the 10-year follow-up were assessed by the IKDC, TL, WOMAC, and WOMET scores as well, and a subjective assessment was done for all patients, based on which, we proved that with proper patient selection, intraoperative precautions, and an optimum post-operative rehabilitation protocol, APM can have good long-term results. The MeTeOR trial of 2013 by Katz *et al.* concluded that the results of APM followed by a good physiotherapy regime were as good as those of patients who were randomly assigned to a physiotherapy regime alone. In this trial, 161 patients were assigned to the APM group and 169, to the PT group. At the one-year follow-up, the mean WOMAC score was 13.7 and 14.5 for the APM and PT group, respectively.^[22] Our mean WOMAC score at a 10-year follow-up was 8.83, which proved to be significantly better.

The ESCAPE RCT in 2018 compared the effects of PT versus early surgery (APM) among patients with non-obstructive meniscal tears. They assessed 158 patients in the APM group and 161 patients in the PT group for 24 months and found the IKDC scores to be 71.5 ± 26.2 and 67.7 ± 20.4 , respectively.^[23] Multiple other studies also showed similar outcomes and found PT to have similar results as compared to APM, thus, proving that APM can be avoided.^[24-26] On the contrary, our mean IKDC score of 100 patients at 10 years was 86.90 ± 5.51 which was significantly better, thus proving how APM was beneficial in the long term.

The FIDELITY trial in 2020 compared the results of APM and placebo/sham surgery. In their trial of 70 patients undergoing APM and 76 undergoing a placebo surgery over 5 years, they concluded that APM causes knee OA in the long run and offers no clinically relevant benefits in the middle-aged and elderly population having knee pain. Their WOMET and TL scores at the end of 5 years were 81.0 ± 4.9

and 82.2 ± 3.7 , respectively, in the case of APM and 79.9 ± 4.8 and 83.4 ± 3.1 in the case of placebo surgery which were almost similar, thus strengthening their case.^[9] The WOMET and TL scores in our study at the 10-year follow-up were 85.54 ± 10.91 and 90.05 ± 10.21 which were far superior.

Only one trial has shown improved results post-APM for degenerative meniscal tears. Gauffin *et al.*, in 2017, proved that middle-aged patients who had symptomatic meniscus tears for more than three months had better results with APM as compared to PT only.^[13] However, these findings were not sustained over the long term, and any additional benefit due to APM was not noted. Abram *et al.*, in 2020, found that when compared to PT only, APM may improve knee function and pain in patients without evidence of underlying OA preoperatively.^[21] The subjective assessment after surgery in our study indicated that only four patients out of 100 had poor results, whereas the remaining 96 were satisfied with APM, out of which 48 declared their 10-year status as “excellent” [Figure 3 and Table 3].

It has been stated that following meniscectomy, patients can have decreased strength and range of motion, as well as altered proprioception and abnormalities in gait.^[27] Numerous studies have shown how APM has been associated with an increased risk of developing degenerative OA and chondral loss in the long run, some even stating that there is an increased risk of getting a knee replacement as compared to the patients treated with meniscus-sparing procedures.^[28-30] Despite these shortcomings, we feel that with proper pre-, intra-, and post-operative protocols, these long-term complications can be avoided. In this study, the maximum patients returned to their respective lifestyles with only 4% having complications [Table 3 and Figure 3]

Meniscal repair has been proven to be the treatment of choice for meniscus tears. Concomitant anterior cruciate ligament reconstruction at the time of meniscal repair improves healing rates of the repaired meniscus.^[31,32] However, the reoperation rate is found to be higher in the case of isolated repairs.^[33,34] A failure rate of approximately 11-23% has been reported in recent systematic reviews.^[35] APM has ultimately proven to be the treatment of choice for a failed meniscal repair.^[31,36] Therefore, we incline our study toward having better outcomes for isolated meniscus tears by treating them with primary APM and avoiding chances of a second surgery, which can have a physical, economic, and emotional toll on the patient.

The study does have its limitations, first and foremost is the fact that this is a retrospective study and did not have a control group for comparison. However, since the endpoints are clear, a determined evaluation of the success and shortcomings of the procedure could be assessed in the long term. We also did not classify the meniscus tears based on zones of vascularity but did mention the intraoperative findings that included the fact that the majority were in the red-white and white-white zones.

Table 4: Comparison with previous RCTs.

	MeTeOR trial (2013)	ESCAPE RCT (2018)	FIDELITY trial (2020)	Our study
Mean age	59.9±7.9	57.6±6.5	52±7	41.23±7.81
Gender				
Male	71	80	42	70
Female	90	78	28	30
KL grading				
0	-	18	35	11
1	-	81	35	38
2	-	45	0	51
3	-	6	0	0
4	-	0	0	0
Baseline scores				
IKDC	-	44.8±16.6	-	38.52±6.31
TL	-	-	60.2±14.7	62.34±8.11
WOMAC	37.1±17.9	-	-	47.61±13.84
WOMET	-	-	56.4±17.3	58.49±6.86
Duration of study	1 year	2 years	5 years	10 years
Scores at 10-year follow-up				
IKDC	-	71.5±26.2	-	86.90±5.51
Lysholm	-	-	82.2±3.7	90.05±10.21
WOMAC	13.7	-	-	8.83±6.19
WOMET	-	-	81.0±4.9	85.54±10.91

IKDC: International Knee Documentation Committee, KL: Kellgren and Lawrence, WOMAC: Western Ontario and McMaster Universities Arthritis Index, WOMET: The Western Ontario Meniscal Evaluation Tool, RCT: Randomized Controlled Trials, MeTeOR: Meniscal Tear in Osteoarthritis Research, ESCAPE: Evaluation Study of Congestive Heart Failure and Pulmonary Artery Catheterization Effectiveness, FIDELITY: Finnish Degenerative Meniscal Lesion Study, TL: Tegner Lysholm

The surgery can also be criticized in that there was no second-look arthroscopy or MRI that was done postoperatively. While that would have been ideal, we believed that the return to pre-injury activity level and the need for a second surgery were more important functional indicators than the diagnostic objectivity of the process. We also lost 26 patients to follow-up, and thus, they were not included in the study. Finally, follow-up radiographs were not taken for all patients and were only reserved for patients who had symptoms anytime in the 10-year period after surgery [Figure 4].

CONCLUSION

With this study, we prove that with precise decision-making in the form of accurate patient selection, successful execution, and a satisfactory rehabilitation program, isolated meniscal tears can be treated with APM and can have good long-term results. Our results of APM were found to be far superior to PT only or to sham surgeries in patients below 50 years of age, with non-traumatic isolated meniscus tears and minimal or no OA as compared to significant trials done in the previous years [Table 4], thus, making APM a treatment of choice for ideal patients with isolated meniscal tears.

Authors' contributions

AJ performed all the surgeries as chief surgeon. SU and BS were the assisting surgeons and generated the idea behind the

study. AS and PS participated in the design of the study and performed the statistical analysis. AS and VB helped to draft the manuscript. All authors read and approved the final script.

Ethical approval

The Institutional Review Board approval is not required since it was a retrospective study evaluating outcomes.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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