

MANAGEMENT OF MENISCAL TEARS BY ARTHROSCOPIC PARTIAL MENISCECTOMY IN TRAUMATIC AND DEGENERATIVE CASES

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ABSTRACT

BACKGROUND

Once described as “functionless remnants of leg muscle origin” by Bland Sutton, 1897, the menisci are now considered crucial structures of the knee. They are a pair of semilunar fibro cartilaginous structures well recognized to contribute to the maintenance of normal knee function, facilitating joint stability by deepening the tibial articulation for convex femoral surface, protection of articular cartilage by load distribution and shock absorption, improving mobility and joint lubrication with smooth low friction gliding surface and resilient to compression.

MATERIALS AND METHODS

Prospective analysis of data in patients who underwent surgery for meniscal tear in single centre by a single surgeon.

RESULTS

This prospective series consisted of 20 (18 male, 2 female) patients. No patient loss occurred during follow-up in this series. The average age at the time of meniscal repair was 36 years (range, 15-60 years). The average follow-up period was 6 months. Seven (35%) meniscal tears were rated acute (injury-to-surgery interval <2 months), and 13 (65%) tears were rated chronic (injury-to-surgery interval >2 months). There were 10 (50%) isolated meniscal tears, and 10 (50%) tears were combined with arthroscopic ACL reconstruction. In total 20 patients (36 menisci repaired) most of the tears occurred in white-white zone.

CONCLUSION

1. The tears in medial 1/3 of the meniscus heal poorly.
2. The interval between the onset of symptoms and the timing of surgery has no difference in the outcome of surgery.
3. The gender of the patient has no effect on the outcome of the surgery.
4. The bucket handle tear is more symptomatic and has better out come after the surgery than other types of tears.
5. Horizontal tears have very bad prognosis of healing and poor outcome.
6. Radial, parrot beak tears have better out come with partial meniscectomy.
7. Partial meniscectomy is an option in medial 1/3rd or white-white zone, and in late presenting cases, and in low demand patients.

KEYWORDS

Arthroscopy, Meniscal Tear, Partial Meniscectomy.

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BACKGROUND

Once described as “functionless remnants of leg muscle origin”¹ by Bland Sutton, 1897, the menisci are now considered crucial structures of the knee. They are a pair of semilunar fibro cartilaginous structures well recognized to

contribute to the maintenance of normal knee function, facilitating joint stability by deepening the tibial articulation for convex femoral surface, protection of articular cartilage by load distribution and shock absorption, improving mobility and joint lubrication with smooth low friction gliding surface and resilience to compression.

The location and the extreme forces on the menisci make them frequently susceptible to injury. Meniscal injuries are 4 times common in males, mostly due to sports related injuries and road traffic accidents. 33% of patients with sports injuries are usually young adults, a second peak occurs in patients with non-sporting injuries owing to trivial trauma, and account for approximately 39% of cases. In chronic anterior cruciate ligament (ACL) injuries medial meniscus tear occurrence is 36%, lateral meniscus tear

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occurrence is 22% and both menisci tear occurrence is 16%.²

Patients with an indefinable injury account for about 29% of cases and approximately 2/3 of all cases occur in the medial meniscus.³ Associated ACL tears were found in 47% of the patients in sports injuries and in 13% of the non-sporting injuries.³ The peripheral 20% to 30% of the medial meniscus and the peripheral 10% to 25% of the lateral meniscus are vascular.⁴ The outer red-red zone, is well vascularized and has a good healing capacity, while the intermediate red-white zone and the innermost white-white zone have poor intrinsic healing owing to their avascular nature.

In the early years of meniscal surgery, it was the gold standard to entirely excise the injured meniscus. After recognising that a total or subtotal meniscectomy leads to development of osteoarthritis inevitably within 5-10 years after surgery.^{5,6}

Currently the meniscus is recognised as being vital for the normal biomechanics of knee and efforts are made to preserve the meniscus as much as possible to prevent degenerative arthritis. With the increased understanding of the structure, function, and biology of meniscus and development of new surgical methods, meniscal repair techniques have been improved and arthroscopic partial meniscectomy preferred over total meniscectomy. However not all meniscal tears can be repaired, and meniscectomy is unavoidable in many cases.

The decision of whether to perform partial meniscectomy or meniscal repair must be made on individual basis, and characteristics of both patient and tear should be considered. Important patient characteristics include age, cartilage status, concomitant anterior cruciate ligament reconstruction, and compliance. Tear characteristics that influence healing ability include location, morphology, acuity and stability.

Retrospective analysis after open or arthroscopically assisted meniscectomy revealed restriction in sports to be between 2 and 50% and cessation of sports to be between 2 and 25%.⁷ Restoration of knee function after injury has heightened the interest in meniscus preservation. The approach to meniscal tears in the active individual emphasizes to early free of symptoms like pain, catching, locking, frequent swelling, by arthroscopic partial meniscectomy.

Arthroscopic guided partial meniscectomy has multiple advantages over open meniscectomy, such as smaller surgical incision, less post-operative pain, fewer adhesions and earlier mobilization.

The purpose of this study was to evaluate the short-term clinical outcome in patients who had undergone arthroscopic partial meniscectomy of medial or lateral meniscal tears, alone or in combination with anterior cruciate ligament (ACL) reconstruction.

MATERIALS AND METHODS

Type of Study- Prospective analysis of data in patients who underwent surgery for meniscal tear in single centre by a single surgeon.

Study Area- SVRRGGH Hospital, Tirupati.

Study Duration- One year.

Study Population- All the patients who underwent surgical management of meniscus during the duration of study.

Inclusion Criteria-

- Age between 16 to 60 years.
- Symptomatic tears.
- Deformed and non-repairable.
- Central red-white and white-white tears.
- Radial tears, horizontal tears, flap tears, chronic bucket handle tears.

Exclusion Criteria

- Nondeformed, repairable
- Peripheral, red zone
- Not given informed consent

Preoperative Evaluation

Patient's detailed history was taken including age, sex, medical history, and clinically evaluated by joint line tenderness, McMurray test, Thessaly test. Each patient was evaluated by using Lysholm and Gillquist scoring scale. Patients were also evaluated radiologically by plain radiographs of both knee joints antero-posterior view, lateral view and MRI of the involved knee. Preoperative investigations included haemoglobin, blood grouping, others tests depending on co-morbidity and to rule out infection, total leucocyte count, differential count, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) were done.

The study proforma consists of patient data in the form of Lysholm and Gilquist score (Table 1 and Table 2) and physical examination findings.

Postoperative Evaluation

All the patients were evaluated periodically at 3 weeks, 6 weeks, 3 months, 6 months and then yearly. The minimum period of follow up was 6 months.

At each follow-up clinical evaluation was done with Lysholm score questionnaire and Barrett's criteria.

Analysis of Results

Statistical analysis was conducted by an independent statistician who was not associated with the surgical team. A paired-t test was used for comparison of the preoperative and postoperative Lysholm score.

The study was approved by the local ethical committee and the patients gave their informed consent to participate.

Lysholm Knee Score		Pre-Op	3 Weeks	6 Weeks	3 Months	6 Months
Limp (5)						
None	(5)					
Slight / Periodical	(3)					
Severe & Constant	(0)					
Support (5)						
None	(5)					
Stick / Crutch	(2)					
Weight Bearing Impossible	(0)					
Instability (25)						
Never Giving Away	(25)					
Rarely During Athletics or Others	(20)					
Frequently During Athletics	(15)					
Occasionally in Daily Activities	(10)					
Often in Daily Activities	(5)					
Every Step	(0)					
Locking (15)						
No Locking / Catching	(15)					
Catching but Not Locking	(10)					
Locking Occasionally	(6)					
Frequently	(2)					
Locked Joint on Examination	(0)					
Pain (25)						
None	(25)					
Inconstant & Severe on Exertion	(20)					
Marked During Exertion	(15)					
Marked on or After Walking >2 KM	(10)					
Marked During or After Walking <2 KM	(5)					
Constant	(0)					
Swelling (10)						
None	(10)					
On Severe Exertion	(5)					
On Ordinary Exertion	(2)					
Constant	(0)					
Stairs Climbing (10)						
No Problem	(10)					
Slightly Impaired	(5)					
One Step at a Time	(2)					
Impossible	(0)					
Squatting (5)						
No Problem	(5)					
Slightly Impaired	(4)					
Not Beyond 90°	(2)					
Impossible	(0)					
Total	100					

Table 1. Lysholm Knee Score Interpretation

95-100	Excellent
84-94	Good
65-83	Fair
<65	Poor

Table 2

RESULTS

This prospective series consisted of 20 (18 male, 2 female) patients. No patient loss occurred during follow-up in this series. The average age at the time of meniscal repair was 36 years (range, 15-60 years). The average follow-up period was 6 months. Seven (35%) meniscal tears were rated acute (injury-to-surgery interval <2 months), and 13(65%) tears were rated chronic (injury-to surgery interval >2 months). There were 10 (50%) isolated meniscal tears, and 10 (50%) tears were combined with arthroscopic ACL reconstruction. In total 20 patients (36 menisci repaired) most of the tears occurred in white-white zone.

In out of 20 patients 18 patients were had nondegenerative meniscus, and 2 patients had degenerative meniscus.

At the most recent follow-up, no symptoms of meniscal tears were observed in 20 cases. One patient reported tenderness on joint-line palpation, one patient had positive McMurray test during follow-up. No patient had exhibited any locking episodes. Overall, the Lysholm score increased to a mean value of 87 compared with the preoperative mean value of 64.7 (p <0.0001). (Table 3) The Lysholm score increased to a mean value of 88 compared with the preoperative mean value of 57 in bucket handle tears and 65 in flap tears, whereas the increase was from 62 to 83 in horizontal tears and 66 to 86 in radial tears. (Table 4).

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Preoperative	64.70	20	4.66	1.04
	Post-Operative	86.70	20	3.56	0.80

Table 3

Type of tear	Mean Pre-Op Score	Mean Post-Op Score
Radial	66	86
Horizontal	62	83
Bucket handle	57	88
Flap	65	88

Table 4

Case Photographs

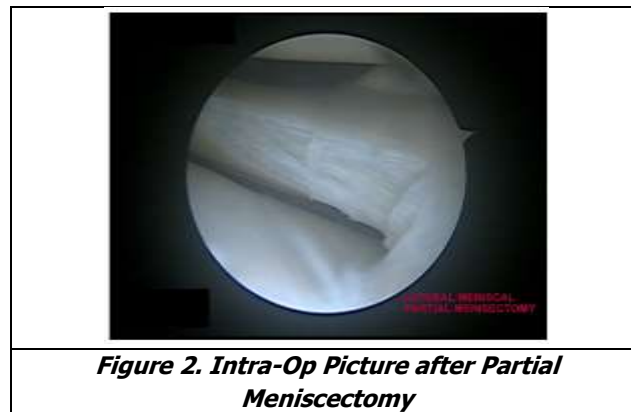




Figure 7. Post-Op Follow Up



Figure 8. Post-Op Clinical Image



Figure 9. Horizontal Tear Pre-Op and Post-Op



Figure 10. Post-Op Radiograph of ACLR



Figure 11. Post-Op Follow-Up



Figure 12. Post-Op Follow-Up

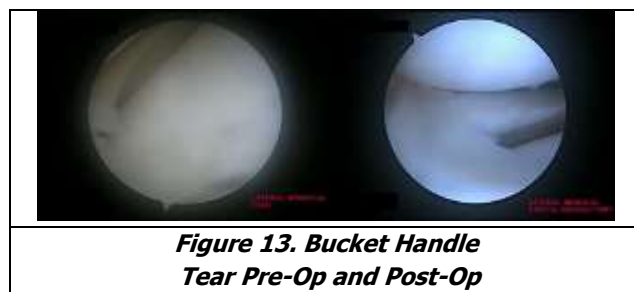


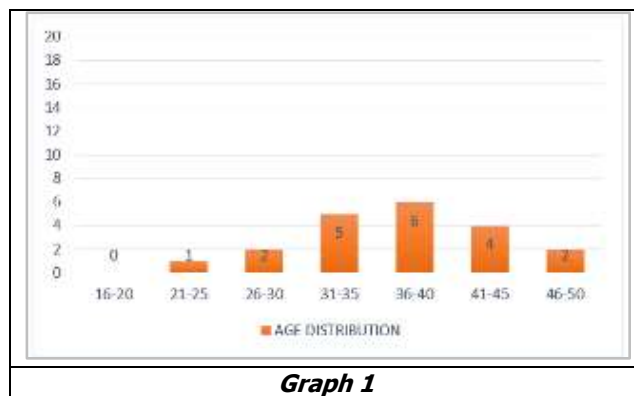
Figure 13. Bucket Handle Tear Pre-Op and Post-Op

Age Distribution

The average age at the time of meniscectomy was 36 years (range, 16-60 years). (Table 5)

Age Group of Patients	Partial Meniscectomy
16-20	0(0.0%)
21-25	1(5.0%)
26-30	2 (10.0%)
31-35	5(25.0%)
36-40	6 (30.0%)
41-45	4 (20.0%)
46-50	2 (10.0%)

Table 5



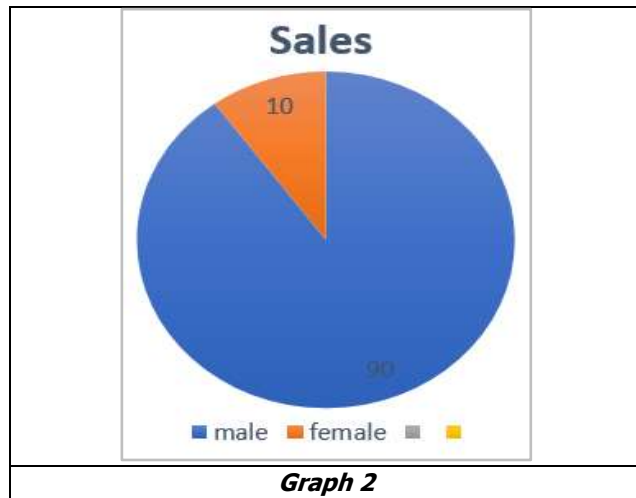
Graph 1

Gender Distribution

Out of 20 patients of meniscal repair, 18 were male and 2 were female. (Table 6)

Gender	Number of Patients (%)
Male	18 (90%)
Female	2(10%)

Table 6

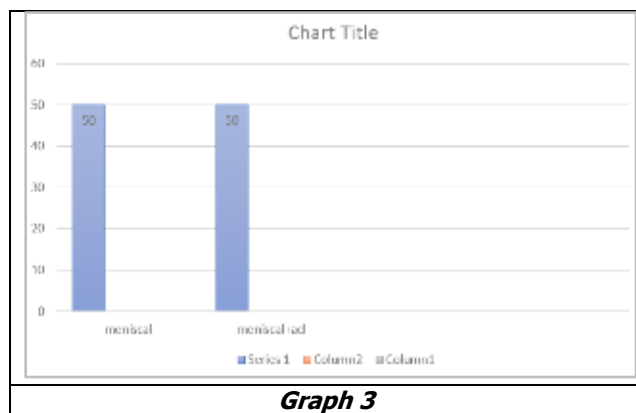


Diagnosis

Out of 20 cases, isolated meniscal involvement seen in 10(50%) patients & associated ACL injury in 10(50%) patients. (Table 7)

Diagnosis	Number of Patients (%)
Meniscal Injury	10(50%)
Meniscal + ACL Injury	10(50%)

Table 7

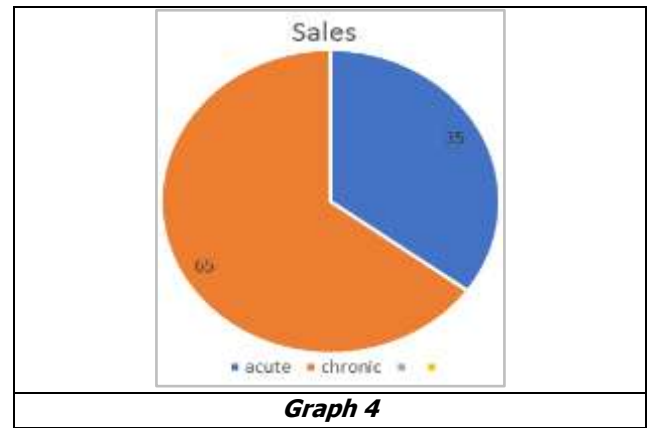


Timing of Surgery

Duration from an episode of injury to repair <3 weeks were considered as acute cases. Duration exceeded >3 weeks were taken as chronic cases. (Table 8)

Timing	Number of Patients (%)
Acute	7 (35%)
Chronic	13 (65%)

Table 8

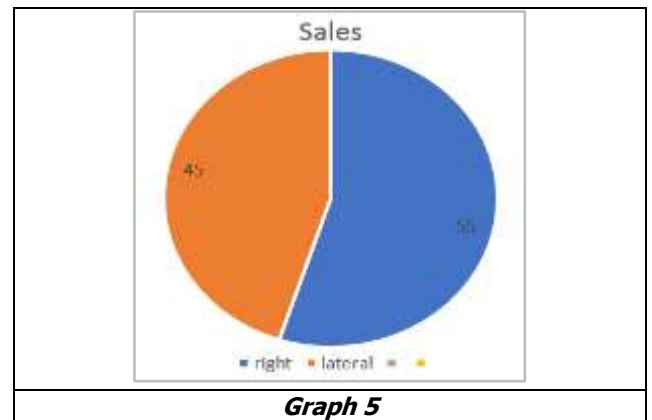


Laterality

Right knee meniscal injury observed in 11 patients and left knee involved in 9 patients among the 20 cases. (Table 9)

Meniscus Injured Knee	Number of Patients (%)
Right	11 (55%)
Left	9 (45%)

Table 9

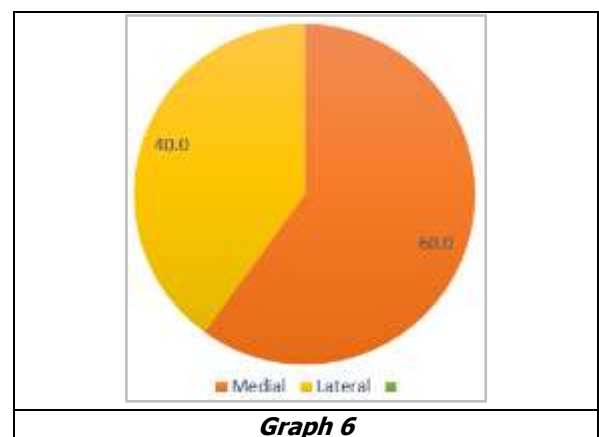


Involved Meniscus

Injury to medial meniscus is seen in 12 patients, and 8 had lateral meniscal injury. (Table 10)

Meniscal Injury	Number of Patients (%)
Medial Meniscus	12(60%)
Lateral Meniscus	8(40%)

Table 10

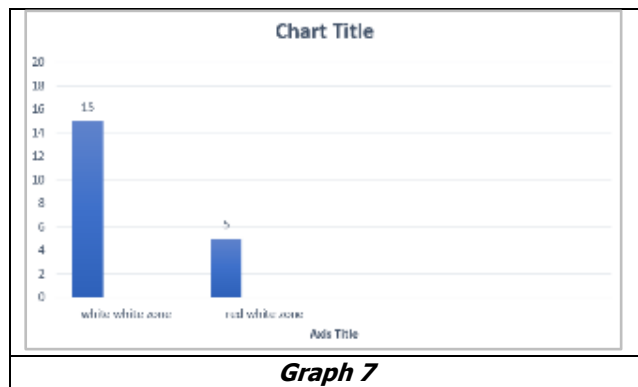


Tear Location

In 20 patients, 15 patients had tears in white zone of meniscus and 5 patients had tears in red-white zone. (Table 11)

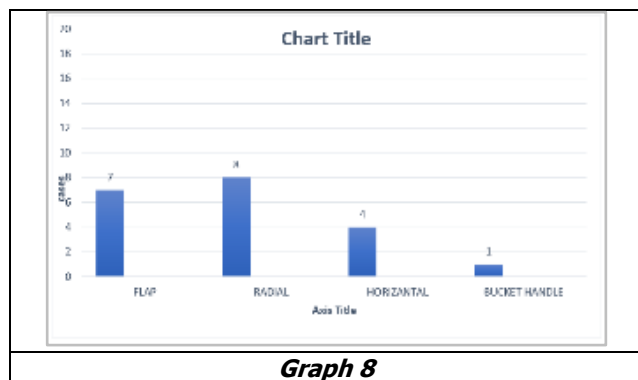
Involved Zone	Number of Patients (%)
White-White	15(75%)
Red-White	5(25%)

Table 11



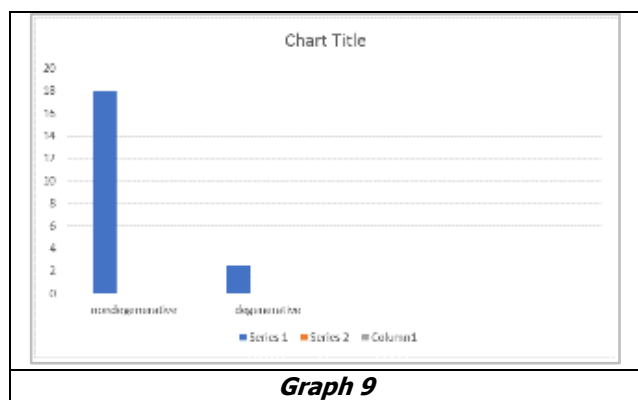
Type of Tears

Out of 20 patients, 8 patients had radial tears, 7 had flap tears, 4 had horizontal tears, 1 had bucket handle tears.



Degeneration

In out of 20 patients 18 patients have nondegenerative meniscus, 2 patients have degenerative meniscus.



The results were followed with Lysholm scoring. Excellent to good results were obtained in 17 patients (85%), Fair results in 3 (15%). The average Lysholm scored increased from 64.7 to 86.7 (Table 12 & 13)

Surgery	Average Score Pre-Operative	Post-Operative / Average Follow-Up
Excellent (95-100)	0 (0%)	1 (5%)
Good (84-94)	0(0%)	16(80%)
Fair (65-83)	7 (35%)	3 (15%)
Poor (<65)	13 65(%)	0 (0%)
Mean ± SD	64 ± 4	86 ± 3

Table 12

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Preoperative	64.70	20	4.66	1.04
	Post-Operative	86.70	20	3.56	0.80

Table 13

Pre-operative and post-operative scores were compared with paired-t test showed, p-value 0.0001 (value <0.05 considered significant).

Significant improvement in Lysholm knee score seen after 6 months of follow-up.

DISCUSSION

Meniscal healing is mainly dependent on the blood supply to the meniscus. The peripheral 20-30% of the medial meniscus and the peripheral 10-25% of the lateral meniscus make up the vascular zone. However, the inner 1/3 of each meniscus lies in the avascular zone and is nourished by diffusion of synovial fluid. The middle 1/3 zone obtains nourishment from both the blood and synovial fluid. The inner 1/3 zone is avascular and obtains nourishment by synovial fluid.

Currently the meniscus is recognised as being vital for the normal biomechanics of knee and efforts are made to preserve the meniscus as much as possible to prevent degenerative arthritis. With the increased understanding of the structure, function, and biology of meniscus and development of new surgical methods, meniscal repair techniques have been improved. All meniscal tears cannot be repaired, and partial meniscectomy preferred in few cases and arthroscopic partial meniscectomy preferred over total meniscectomy.

The decision of whether to perform partial meniscectomy or meniscal repair must be made on individual basis, and characteristics of both patient and tear should be considered. Important patient characteristics include age, cartilage status, concomitant anterior cruciate ligament reconstruction, and compliance. Tear characteristics that influence healing ability include location, morphology, acuity

and stability. To analyse the factors associated with a satisfactory or an unsatisfactory clinical result, we looked at the patients age, duration of symptoms, type of meniscal lesion, articular cartilage status.

The arthroscopic partial meniscectomy has the advantages of less surgical time and ease of performance.

The white-white zone, as there was no direct blood supply, considered to be non-healing area, where repair in this area has the less success rate and treated by partial meniscectomy. Patients were graded with functional knee score (Lysholm) before surgery and at follow-up

Prognosis is graded by Lysholm score as excellent (95-100), good (84-94), fair (65-83), poor (<64). In our study 90% patients showed good results in Lysholm score postoperatively.

Bolano⁸ et al reported that mean Lysholm score was 82 post operatively in arthroscopic partial meniscectomy, in our study mean Lysholm score is 84 in average follow-up of 6 months.

Bolano⁸ et al reported that Patients were classified by age into two groups, those less than 40 years of age and those more than 40 years and older. Patients less than 40 had significantly higher functional scores and percentage of satisfactory results compared with those patients in the 40 and older age.

Even in our study, less than 40 years age group showed good functional scores (mean 84) compared to more than 40 years (mean 87).

Ferkel⁹ et al categorised chronic cases by duration of symptoms more than 2 months, and Bolano⁸ et al placed patients with more than 12 months of symptoms in the chronic group. Our study is for one year, so we placed patients with more than 2 months of symptoms in the chronic group.

The studies reported that patients with chronic symptoms had a poor prognosis, but the delay between onset of symptoms and surgery does not adversely affect the results of arthroscopic partial meniscectomy. In our study, patients with acute symptoms (less than 2 months) had consistently better results, but tear type and age were considered be the most important factors.

Aglettei¹⁰ et al, Ferkel⁹ et al, and Friedman et al all looked at the factors associated with satisfactory and unsatisfactory results after arthroscopic partial meniscectomy at minimum follow up of 1 to 2 years. They looked at the type of meniscal lesions, the grade of chondromalacia, age, and the duration of symptoms. In these studies, lesions that resulted in more favourable results include bucket-handle, parrot beak, and radial tears. Lesions with unfavourable results include horizontal tears, degenerative and complex tears. These recent studies also showed that patients greater than grade II chondromalacia have poorer results. Our results agree with the literature with respect to meniscal and articular cartilage abnormalities. Patients with minimal chondromalacia and bucket handle, flap, and radial tears had an excellent prognosis.

McGintn¹¹ et al reported that bucket handle tears had good outcome compared to other tears.

Hamberg¹² et al Patients with bucket-handle tears had a significantly lower score (52 ± 17) than others (p <0.011, owing to greater problems of catching, pain, and in general more extensive mechanical derangement of the knee compared to other tears. At follow-up after operation there were no significant differences in score between different types of tears. In our study also bucket handle tear had lowest preoperative score (57) than others.

Recent studies showed poor outcome for horizontal tears compared other tears and bucket handle tears had poor preoperative score and good prognosis.

There was no significant difference in functional score between men and women.

Bolano⁸ et al reported that arthroscopic partial meniscectomy at decreased morbidity, early return to normal work and function, and short-term results of arthroscopic partial meniscectomy have been excellent or good in 80 to 95%. In our study also, short term results were good compared to long term results.

Lysholm and Gillquist¹³ et al reported that earlier results after arthroscopic operation of lateral meniscus lesions were apparently less favourable than those of medial meniscectomy. This is not substantiated in the present study.

There was no significant difference in score between medial meniscus and lateral meniscus in our study.

Excellent and Good Results of Arthroscopic Partial Meniscectomy in Patients with Isolated meniscal lesion.

Burks, et al.¹⁴ studied 146 patients after 14.7 years. In 88% of cases, excellent and good clinical results were available at stable knee joints. Of 57 patients who were examined 12 years after partial medial meniscectomy, 95% were satisfied with the result.

Menetrey et al compared two groups of patients with either traumatic or degenerative meniscal damage. The patients' average age at surgery what 60 years. At the 6-year follow-up examination 91% of patients with traumatic damage had a very good or good outcome. By comparison, only 15% of patients with degenerative alterations Showed a very good or good result. So, there are other factors did are important for a good clinical outcome. In our study also 2 patients showed degenerative alterations which had a poorer score and result by comparing with non-degenerative meniscus. Our study is comparable with the other studies. (Table 14)

Gillquist et al. ¹³	3 years	87%			
Jackson and Rouse ¹⁵	2.5 years	95%			
Bergstro m et al. ¹⁶		93%			
Schimmer et al (12 y) ¹⁷	12 years	94.8%			
Present Study	1 years	88%			
Table 14. Comparison with Other Studies					

CONCLUSION

1. The tears in medial 1/3 of the meniscus heal poorly.
2. The interval between the onset of symptoms and the timing of surgery has no difference in the outcome of surgery.
3. The gender of the patient has no effect on the outcome of the surgery.
4. The bucket handle tear is more symptomatic and has better out come after the surgery than other types of tears.
5. Horizontal tears have very bad prognosis of healing and poor outcome.
6. Radial, parrot beak tears have better out come with partial meniscectomy.
7. Partial meniscectomy is an option in medial 1/3rd or white-white zone, and in late presenting cases, and in low demand patients.

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