



Return to sports after bucket handle medial meniscus tear repair using inside out technique in recreational sports players

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The main purpose of our study is to determine the outcomes of bucket handle medial meniscus tears repaired with the inside out technique in recreational sports players, and the return of these to pre-injury sports levels. 41 athletes with medial meniscus bucket handle tear were included in the study. 28 cases were associated with ACL tear while rest were isolated tears. Medial meniscus repair was done exclusively with arthroscopy assisted inside out technique. Lysholm score, IKDC score and Tegner staging were used to evaluate functional status of patients with minimum 1-year follow-up. Data was analyzed using Wilcoxon Matched pairs test, and Friedman test. All patients were examined clinically at regular intervals. Lysholm score and IKDC score showed significant increase in their values. Tegner staging showed no significant change compared to their preinjury game level. On VAS pain scale, there was significant decrease in their pain at regular follow up intervals. 2 patients had re-tears of the repaired medial meniscus. Repairing bucket handle tears of the medial meniscus in recreational sports players with the inside out technique yields good results in terms of clinical and functional outcomes. It successfully allows them to return to sports at 1 year.

Keywords : Return to sports; medial meniscus tear.

The authors declare no conflict of interest.

Level of evidence IV.

INTRODUCTION

Menisci are fibrocartilaginous semilunar structures present at the tibiofemoral interface. They have important functions in the knee joint, and help in load transmission, shock absorption, tibiofemoral congruency and joint stabilization (1,2).

Meniscal injuries are a common occurrence in sports. These injuries are commonly associated with anterior cruciate ligament (ACL) injuries (3).

Meniscal injuries are usually categorised on the basis of the morphology of tear (4). A common variant is a bucket handle tear. Bucket handle tears are peripheral or vertical longitudinal tears of menisci and account for 10% of all meniscal injuries (5,6).

A displaced bucket handle fragment of the meniscus presents as a locked knee. This, if neglected, can cause dysfunction and further

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chondral damage, which may lead to early onset arthritis.

Meniscectomy for a bucket handle tear leads to good short-term results in terms of recovery and return to sports but also causes an imbalance of load transmission and an increase in peak contact stress over a period, leading to potentially early arthritic changes in the knee joint (7-9).

A peripheral bucket handle tear in the red-red zone has a high chance of healing (10) and repairing it is a good indication. It helps in preserving the native joint and restores the natural joint loading and biomechanics (5,11). However, chronicity of the meniscal tear may also decide the outcome. In chronic cases, the meniscus may lose its contour and may not be amenable to repair (12).

Several methods have been described for the repair of meniscal tears including inside-out, outside in and all inside techniques and a combination of these are often used (13).

Most of our patients are non-professionals or recreational sports players, who had their injury during non-accustomed sports or leisure activities.

There have been established guidelines and studies for professional players, preferred meniscus repair technique, their rehabilitation and return to sports protocol. These players also invest considerable time to strictly follow the protocol.

But, when it comes to a recreational sports person, they are unable to invest sufficient time and are unable to follow proper rehabilitation protocols since they already have job/work commitments.

While there are studies that have described the results of meniscal tear repairs in professional athletes and their return to sports (14), studies focusing on recreational sports players are few.

The main purpose of this study is to determine the outcomes of medial meniscus bucket handle tears repaired with the inside out technique in recreational sports players, and their return to pre-injury sports levels. Outcomes were decided on the basis of clinical examination at follow-up after a minimum of one year and functional evaluation was done with Lysholm knee score, International Knee Documentation Committee (IKDC) score and Tegner activity staging, simultaneously (15).

MATERIALS AND METHODS

This study is a retrospective analysis of prospectively collected data. Patients operated between 2015 and 2018 have been included in the study.

The inclusion criteria were isolated medial meniscus bucket handle tears in the red red zone diagnosed on magnetic resonance imaging (MRI) and arthroscopy, and the patients were active in sports prior to injury. Professional athletes were not included in this study.

Patients who presented within 3 months of injury were selected for repair using the inside-out technique. For those presenting after three months, the meniscus was examined arthroscopically and depending on its viability and reducibility, it was either repaired or resected.

Forty-one consecutive patients were included in the study. Twenty-eight cases had an associated ACL tear and had a concurrent anterior cruciate ligament reconstruction (ACL R) while the rest were isolated tears.

Henning's technique (16) was used to enhance meniscal healing in the latter group.

Surgical technique

After clinical examination and confirmation of the tear on MRI scan, patients were considered for surgery. On arthroscopic evaluation, the meniscus tear was identified, and the bed rasped to freshen the edges.

Criteria taken into consideration for repair were age of the patient, reducibility of the tear, and an absence of a secondary tear.

Repair was done by arthroscopy assisted inside out technique (Figure 1).

A 3 to 4 cm incision was made on the posteromedial aspect of the knee to retrieve the sutures of meniscal repair. The superficial Medial Collateral Ligament (sMCL) and posterior oblique ligament (POL) were identified, and an interval was made between them to expose the capsule. Blunt dissection was performed to open up extra capsular space posteriorly (Figure 2).

Table I. – Demographic and Surgical Details of Patients at the time of surgery

Parameters assessed	Value
Number of Males	32 (82.05%)
Number of Females	7 (17.95%)
Mean age of patients (years)	23.10 ± 7.75
Mean number of weeks since injury	4.08 (Median: 3, Range: (0.5-52))
Mean number of sutures	7.17 (Median: 7, Range: (5-16))

through the instrument portal, a cannula was placed on the reduced meniscus and inside out preloaded 2-0 fiberwire needles were passed in a vertical, oblique or transverse fashion depending upon the tear geometry. After an adequate number of sutures were passed for the repair, ACL reconstruction was done with autologous semitendinosus grafts in cases with ACL associated rupture. After the ACL reconstruction, all meniscal sutures were fixed and seated on the posteromedial capsule. The interval and wound were closed in layers.

Henning's technique was used to enhance healing of the wound (16).

All patients were kept in rigid knee braces with padding under the knee to keep it in slight flexion



Fig. 1. – Arthroscopic view of the repaired tear.

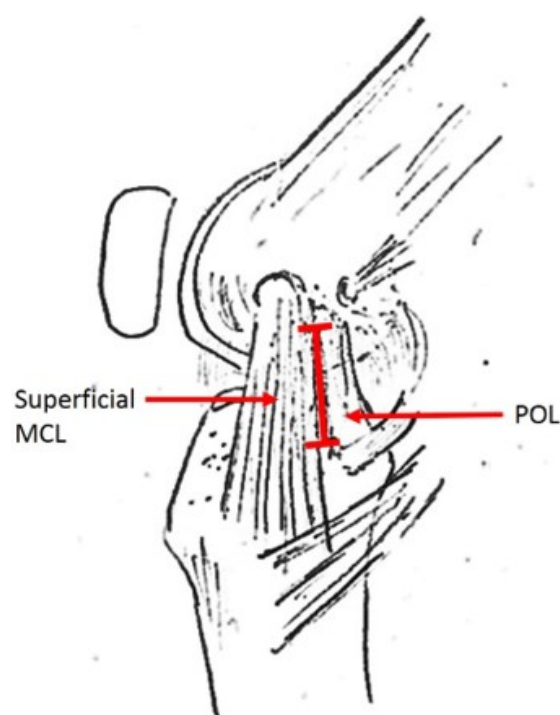


Fig. 2. – Site of incision.

for 3 weeks. Patient were kept non-weight bearing for 4 weeks. Weight bearing was started at 4 weeks. The rigid knee braces were removed, and a hinged knee brace was worn by the patient for 3 months.

Knee range of motion was started at two weeks out of the rigid knee brace. Deep flexion beyond 90 deg was avoided for 6 weeks (to prevent the doorknob effect on the meniscus). Weight bearing in flexion was avoided for 12 weeks. Return to sports was advised after 9 months.

In patients with ACL reconstruction, quadriceps muscle strengthening was supplemented.

Post operative evaluations were done at 3 months, 6 months and 1 year. The healing status of the meniscus was evaluated by criteria given by Barrett et al (17), i.e, symptoms of swelling, knee pain, locking and examination findings of joint line tenderness or clinical evaluation. Also, the Lachman's test was evaluated in patients with ACL reconstruction. Post-operative MRI was not done unless the patient had any complain of pain, fresh trauma, or inability to achieve an expected range of motion as per rehabilitation.

Lysholm score, IKDC score and Tegner staging system were used to evaluate the functional status of the patients (15). Their post injury sports activity level was assessed using Tegner scoring. The mean baseline preoperative score was compared to the post-operative mean values, measured at 1 year post-operatively.

All patients were assessed for pain using the visual analogue scale (VAS) at 2 weeks, 3 months, 6 months and one year following the surgery. The progression of pain was compared and evaluated for relief in pain over time.

RESULTS

36 patients were male (82.05%), while 5 were female (17.95%). The mean age of all patients was 23.71 ± 7.75 years. The mean period since injury at the time of surgery was 4.08 weeks, with a median of 3 weeks. The mean number of sutures taken in a patient in this study was found to be 7.18, with a median number of 7 (range: 5-16).

The meniscal injury was sports related in all cases. The bucket-handle tear was located in the posterior horn of the meniscus in 6 cases, whereas it involved the body and posterior horn of the meniscus in 35 cases. No tears were found isolated in the anterior horn or middle third of the medial meniscus. All tears were displaced in the intercondylar notch, and all could be reduced and re-dislocated on arthroscopic evaluation.

All patients were examined clinically for criteria as described by Barrett et al (17) for healing of the meniscus. Healing was achieved in 39 of 41 cases (95%).

On comparing the mean Lysholm score and the mean IKDC score post-operatively with the mean baseline values, there were significant increases

in the mean scores for both the parameters ($p < 0.05$). However, for the Tegner score, the post-operative score decreased but it was insignificant as compared to the mean Tegner score measured pre-operatively. The comparison was done by using Wilcoxon Matched Pairs test as the data was found to be not normally distributed. Figures 3, 4 and 5 give a graphical representation of the various functional scores assessed while Table II represents all the mean score values.

On evaluating pain by VAS score post-operatively at 2 weeks, 3 months, 6 months and 1 year post-operatively, there was a significant decrease in the pain scores at all time periods, which was assessed using the Friedman test due to non-normal data distribution. Figure 6 and table III give the graphical and numerical representation of the mean values.

Two patients who had undergone isolated meniscal repairs had re-tears of the repaired medial meniscus. Both were young males (21 years, 17 years) who played football. The failure occurred after 24 months and 15 months, respectively.

DISCUSSION

The menisci are semilunar structures which provide joint stabilization, shock absorbing function and congruence at the tibiofemoral interface (18). The amount of meniscus removed is directly proportional to the degenerative changes in the joint (19,20). Thus, repair of the meniscus should be considered as treatment of choice whenever indicated.

The standard available techniques for meniscal repair include all-inside, inside out and outside in varieties.

Table II. – Parameters assessed to evaluate the post-operative outcome of Inside-out operative technique

Parameters	Mean Baseline value	Mean Postoperative value	P value
Lysholm score	33.36 ± 11.5	95.89 ± 4.35	$<0.0001^*$
IKDC score	39.07 ± 6.99	92.77 ± 5.31	$<0.0001^*$
Tegner score	6.02 ± 1.08	5.71 ± 1.11	0.13
*p-value <0.05 considered significant by Wilcoxon Matched Pairs Test			

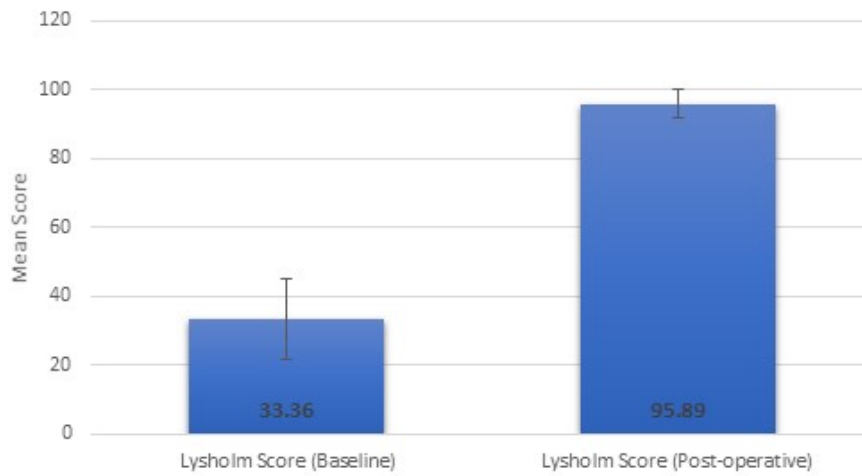


Fig. 3. – Mean Lysholm Score (Baseline vs Post-operative).

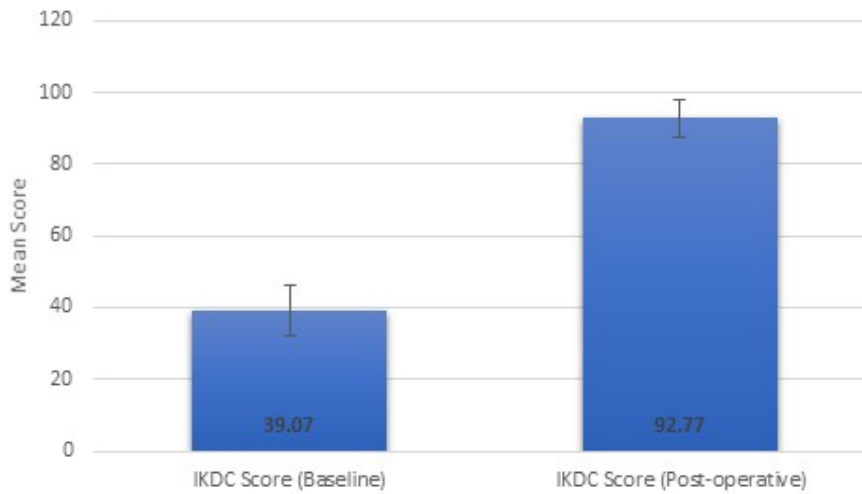


Fig. 4. – Mean IKDC Score (Baseline vs Post-operative).

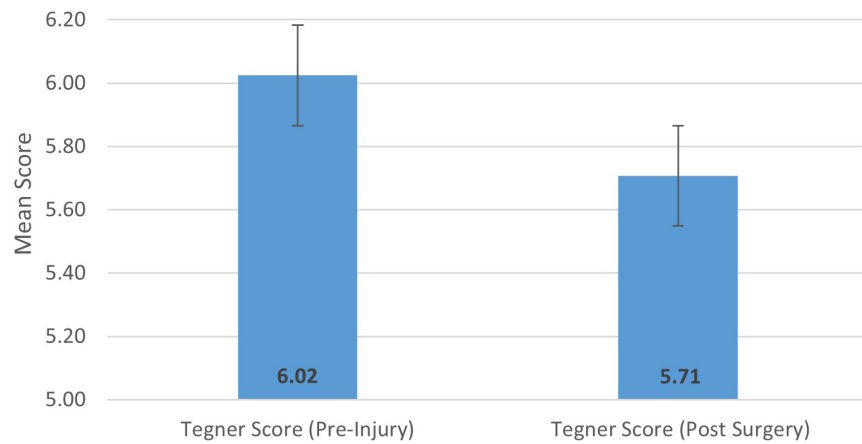


Fig. 5. – Mean Tegner Score (Pre and Post-operative).

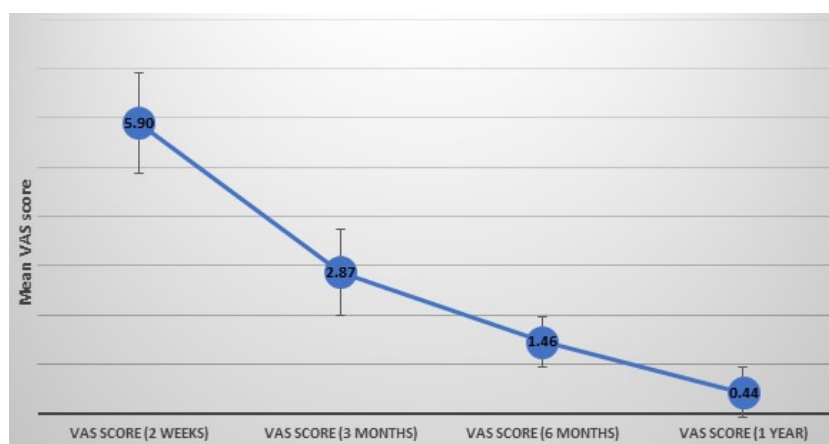


Fig. 6. – Post operative VAS Scores.

Table III. – Post-operative VAS scores at various time points

Time of assessment	Mean Baseline value
2 weeks	5.89 ± 1.02
3 months	2.87 ± 0.86
6 months	1.46 ± 0.5
1-year	0.43 ± 0.5
p-value	<0.0001*
*p-value <0.05 considered significant by Friedman test	

This study has shown that 95% of the cases of medial meniscus bucket handle tears repaired with the arthroscopic assisted inside out technique showed good healing with return to sports. The healing potential of the meniscus has been found to be more when there is concomitant ACL reconstruction (21). For isolated cases, we performed fibrin clot augmentation. Bone marrow aspirate concentrate (BMAC), platelet rich plasma (PRP) and other biological options are also available (22).

The 2 cases which failed in this study were isolated meniscus repairs, and the failure may be attributed to a lack of growth factors and healing environment.

All-inside technique uses pre-loaded devices with fiberwire suture. The implants rest against the capsule and, thus, need good meniscocapsular rims for successful repairs (22). However, there may be various complications to the meniscus.

This study has focused on patients for whom sports is a secondary activity. These patients have been shown to return to their pre-injury sports level by the end of one year post operatively.

The 39 patients (2 failed repairs not included in the results) with a mean follow-up of 26.5 months (12 to 42 months) had a Lysholm score of 95.8 ± 4.35, IKDC score of 92.8 ± 5.31. The mean Tegner staging (depicting the functional outcome) was 6.02 ± 1.08 pre-op vs 5.71 ± 1.11 post-op. Moatshe et al(23) studied 38 patients with bucket handle meniscal tears repaired with the inside out technique and reported good outcomes with the mean Lysholm score 84.6 and Tegner staging 5.5, post operatively and our scores are better than this study.

A recent study done by Cetinkaya et al (24) had 26 patients with bucket handle tears of the medial meniscus. They reported a mean Lysholm score of 85, a mean IKDC score of 84.5 and a mean Tegner score of 6.6 post operatively, which was comparable to the outcomes of this study. However, he used a hybrid technique, i.e inside out with all-inside technique. A similar study by Wu et al (25) in 2018 showed good results of bucket handle meniscus tear repairs with a mean IKDC score of 93.1 and mean Tegner scoring of 6.6. But they used the inside out repair in some patients and the hybrid method in rest.

There are only a few studies showing outcomes of the bucket handle tear of the medial meniscus, repaired exclusively with an inside out technique in athletes. They show a failure rate of 5 to 40% (14,26).

However, this study shows that patients who are involved in recreational sports have a lesser failure rate. They are more successful in returning to their pre-injury routine sports activity after repairing the meniscus.

This study shows that comparable results can be achieved via the inside-out technique versus the all-inside technique in a more economical fashion.

The reported complications of the inside out repair include prominent knots, scar pain, patch of paresthesia, medial laxity and capsular contracture (27). None of these were reported in the patients of this study.

The inside out technique has given variable results in professional athletes. However, this study has focused on patients for whom sports is a secondary activity. These patients have been shown to return to their pre-injury sports level by the end of one year post operatively.

This study has its own set of limitations. Firstly, an MRI was not performed postoperatively in patients to evaluate the meniscal healing. Since only clinical functional assessment was performed, asymptomatic failed repairs may be missed. Secondly, we compared our results with existing studies on all-inside and inside-out closed techniques. Thirdly, this study has a small sample size (n=41) for a short follow-up (minimum of 1 year in each case).

The strength of this study is that all cases were operated by a single senior surgeon at a single sports medicine center.

CONCLUSION

Repairing bucket handle tears of the medial meniscus in recreational sports players with the arthroscopic inside out technique yields good results in terms of clinical and functional outcomes. It successfully allows them to return to sports after 1 year.

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