



ISSN: 0976-3031

Available Online at <http://www.recentscientific.com>

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 10, Issue, 07(D), pp. 33562-33566, July, 2019

**International Journal of
Recent Scientific
Research**

DOI: 10.24327/IJRSR

Research Article

INCIDENCE AND MANAGEMENT OF RAMP LESIONS IN CASES OF ACL INJURY: PERSPECTIVES FROM A TERTIARY CARE CENTRE

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DOI: <http://dx.doi.org/10.24327/ijrsr.2019.1007.3694>

ARTICLE INFO

Article History:

Received 12th April, 2019
Received in revised form 23rd
May, 2019
Accepted 7th June, 2019
Published online 28th July, 2019

Key Words:

ACL injury, Ramp lesion, surgical repair,

ABSTRACT

Introduction: Meniscocapsular separation or Ramp lesions have been reported to be associated with ACL injuries however, no study has been conducted on an Indian population to find out its incidence and extent.

Aim: This study investigates the incidence of Ramp Lesions in Indian Patients with ACL injury; the extent of lesion and need for repair. We also attempt to assess the sensitivity of MRI in detecting these lesions.

Methods: This study was a prospective case series and all patients undergoing ACL reconstruction (ACLR) from Oct 2017- Oct 2018 were included. The patients' MRI were evaluated for signs of Ramp lesion. During arthroscopy the posteromedial compartment was visualized through the standard anterolateral portal using the trans notch maneuver. If a Ramp lesion was identified, it was classified based on extent and location. A postero medial portal was created to probe the extent of the lesion and repaired with fibre wire sutures, if required. A standard operating technique and postoperative rehab protocol was implemented in all the cases of ACLR with or without ramp lesions.

Results: Ramp lesion was identified in 10 patients (11.5%) during diagnostic arthroscopy (n= 87). MRI was only 30 % sensitive in identifying ramp lesions (3/10). 7 of the lesions were associated with separation of the meniscotibial ligament on probing and were repaired using fibre wire sutures. The rest 3 lesions were partial lesions with meniscotibial ligament not completely separated and were stable on probing, these weren't repaired.

Conclusions: MRI isn't reliable in diagnosing Ramp lesions preoperatively. All patients undergoing ACLR must have their posterior compartment visualized and a posteromedial portal is essential to probe and repair Ramp lesions. The presence of meniscotibial ligament separation can be used as a guide to decide which lesions to repair.

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INTRODUCTION

Anterior Cruciate Ligament (ACL) injuries are very common in Orthopaedic practice. These injuries are often associated with concomitant injuries to other ligaments of the knee and menisci. While the lateral meniscus is more frequently injured in isolation, with an ACL injury the chances of medial meniscus injury are higher [1]. One of the special variants of medial meniscal injury is the "ramp" lesion. It essentially entails a menisco-capsular separation of the posterior part of medial meniscus [2]. Originally described by Strobel in 1982 [3], it has since been reported by many researchers [2, 4, 5]. The incidence of ramp lesions has been variedly reported in literature ranging from 9.3-17 % of cases with ACL injuries [4,5].

One of the primary reasons for the variance has been the inability to visualise the lesion during routine diagnostic arthroscopy. With increasing awareness arthroscopy surgeons are now including man oeuvres to search for this lesion during diagnostic arthroscopy [6].

Pre-operative diagnosis mostly relies on MRI imaging as there are no clinical tests to elucidate the lesion. Even MRI have been shown to have a low diagnostic value for the ramp lesion adding to the diagnostic dilemma [7].

Medial meniscus is an important structure in the knee and supports the ACL in its role as stabilizer to prevent excessive translation of the tibia anteriorly [8]. The ramp lesion compromises this function of the medial meniscus. It has also been postulated in literature that as the ACL injury gets chronic the chances of having a ramp lesion increase. This has been

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ascribed to the increased stress on the medial meniscus during anterior tibial translation in absence of the ACL [9].

There is an increasing trend among surgeons to surgically repair ramp lesions although indications, the technique of repair and outcomes are still being investigated.

This study aims to examine the incidence, diagnosis and management of ramp lesions in Indian patients with ACL injury undergoing arthroscopic ACL reconstruction.

MATERIALS AND METHODS

This study was a prospective case series carried out at a tertiary care, academic institution. The study duration was from October 2017 -October 2018. All patients presenting to the orthopaedics OPD with ACL injuries were potential subjects for the study.

The clinical examination included a general physical examination followed by Lachman test, Anterior drawer Test and Pivot shift test to test for integrity of the ACL. Concomitant tests for meniscal injuries were performed as well. All patients with suspected ACL injuries underwent radiological investigations including a Plain AP and lateral radiograph of the Knee and MRI of the knee. The MRI was reviewed by the authors to look for signs of ligament and meniscal injuries including the ramp lesion.

After obtaining Informed consent the patients undergoing arthroscopic ACL reconstruction were included in the study. All patients with ACL injury undergoing primary ACL reconstruction were included in the study. Patients requiring revision ACL surgeries and patients with Multi ligamentous injuries were excluded from this study.

Surgical technique: All patients underwent Arthroscopic ACL reconstruction using quadruple hamstring tendons as graft. The first step involved a diagnostic arthroscopy using the standard Anterolateral portal as the viewing portal and the anteromedial portal for instrumentation. During the course of the diagnostic arthroscopy, the posteromedial compartment was visualised using the transnotch manoeuvre[10]. This involves advancing the scope medial to the PCL and between the lateral wall of the medial femoral condyle. Flexing the knee and external rotation during the process helps visualize the posteromedial zone.

If a ramp lesion was identified at this stage, the next step involved the creation of a standard posteromedial portal. With the knee in 90 degrees of flexion a needle is introduced in to the postero- medial part of the joint. The point of needle entry is about 10-12 mm posteriorly along the knee joint line on the medial side. The needle is visualised arthroscopically and then the portal is made under direct visualization. A cannula was placed to ease the passage of instruments. A probe was then advanced through the posteromedial portal, over a cannula to define the extent of the lesion and to look for separation of the menisco tibial ligament.

In cases requiring repair, the ramp lesion was repaired through the posteromedial portal.

The tear was debrided using a shaver gently prior to the repair. The repair was in the form of vertical sutures using fiberwire sutures. A 25-degree curved suture hook (Suture Lasso, Arthrex, Naples, FL) was utilised to pass the sutures through the postero-medial portal. The sutures were applied lateral to

medial to allow full repair of the lesion. Once the ramp lesion was completely sutured, the ACL was reconstructed in a standard single bundle anatomic reconstruction. The ACL graft was fixed in the tibial tunnel using a bio interference screw (Arthrex, Naples, FL) and on the femoral side using ACL tight rope (RT, double loaded passing sutures – Arthrex, Naples, FL) Post op protocol: All patients were allowed full weight bearing mobilization on day 1 following ACL reconstruction with brace. They were also started on ROM exercises and closed chain Kinematic exercises. This protocol was followed till about 8 weeks following which Open chain exercises and quadriceps strengthening exercises were started. Proprioception exercises and strengthening exercises were progressively added to the regime and the entire rehab lasted for 6 months. Patients were advised to start jogging at 12-14 weeks, pivoting activities were only allowed after the end of the rehab program and return to sports was usually allowed 1-year post surgery. Patients underwent suture removal at 12-14 days postoperatively. They were followed up in the OPD at 2, 6 and 16 weeks postoperatively. Patients with Ramp lesion repair were allowed ROM exercises restricted to 90 degrees of flexion for the first 3 weeks and gradually progressing to full knee ROM by 6-8 weeks. The rest of the rehabilitation program was exactly similar to Patients with ACL reconstruction alone. All the data generated was tabulated and analysed.

RESULTS

A total of 87 patients were included in the study. The mean age of the patients was 26.2 years (range 15-49 years). The most common mode of injury was injuries during sporting activities (39 patients) accounting for 44.8 % closely followed by road traffic accidents (36 patients, 41.4%)

The duration from injury to presentation was variable with 24 patients (27.6 %) presenting acutely after the injury i.e. within 6 weeks of the injury and 35 patients (40.2%) presenting with chronic instability i.e. at least 6 months following the injury. The mean duration of injury among the patients with chronic instability was 33.7 months (range 6-126 months) The descriptive data is tabulated in Table 1.

Table 1 Descriptive data of the study participants.

S.NO.	Parameter	No. of cases (n=87)	Percentage
1.	Mode of injury:		
	Sports injury	39	44.8
	RTA	36	41.4
2.	Others	12	13.8
	Duration of Injury:		
	Acute (<6 weeks)	24	27.6
	6 weeks – 6 months	28	32.2
	Chronic (> 6 months)	35	40.2
	Side of injury		
	Left	42	48.3
	Right	45	51.7

On diagnostic arthroscopy 10 patients were found to have ramp lesions which amounted to 11.5% incidence of this injury in cases with ACL injury. During arthroscopic probing to define the extent of lesion 7 were associated with meniscotibial ligament separation and required surgical repair. The rest three lesions were classified as partial lesions as they were found to be stable on probing and did not demonstrate complete

separation of the meniscotibial ligament. These cases did not undergo repair of the lesion.

Pre-operatively only 3 of the 10 lesions were identified on the MRI, and was 30% sensitive in identifying the ramp lesion in this study. No false positive ramp lesions were identified during review of the MRI films and reports.

No neuro vascular complications were recorded intraoperatively or in the postoperative period. None of the patients had any wound complications. All of the patients with ramp lesions had progressed through the ACL Rehab program alongside those without these lesions and no delay or discomfort was observed during the follow-up period.

Preoperative imaging for ACL injuries usually involves an MRI scan. In this study all patients underwent an MRI; however only 3 out of 10 lesions were identified in the pre-operative MRIs. This accounted for a poor sensitivity of 30 % (95% CI 6.7-65.2) however it was very specific and no false positives were reported. This is in line with studies reporting sensitivity from 0-77%[4,5,12]. The authors of this study feel that the reason for such a wide variation lies in the fact that most MRIs are done in supine position leading a reduction of the menisco capsular separation, a view shared by Bollen *et al* [4]and the radiologists also aren't sensitized enough to look for the lesions leading to underreporting of the lesions.

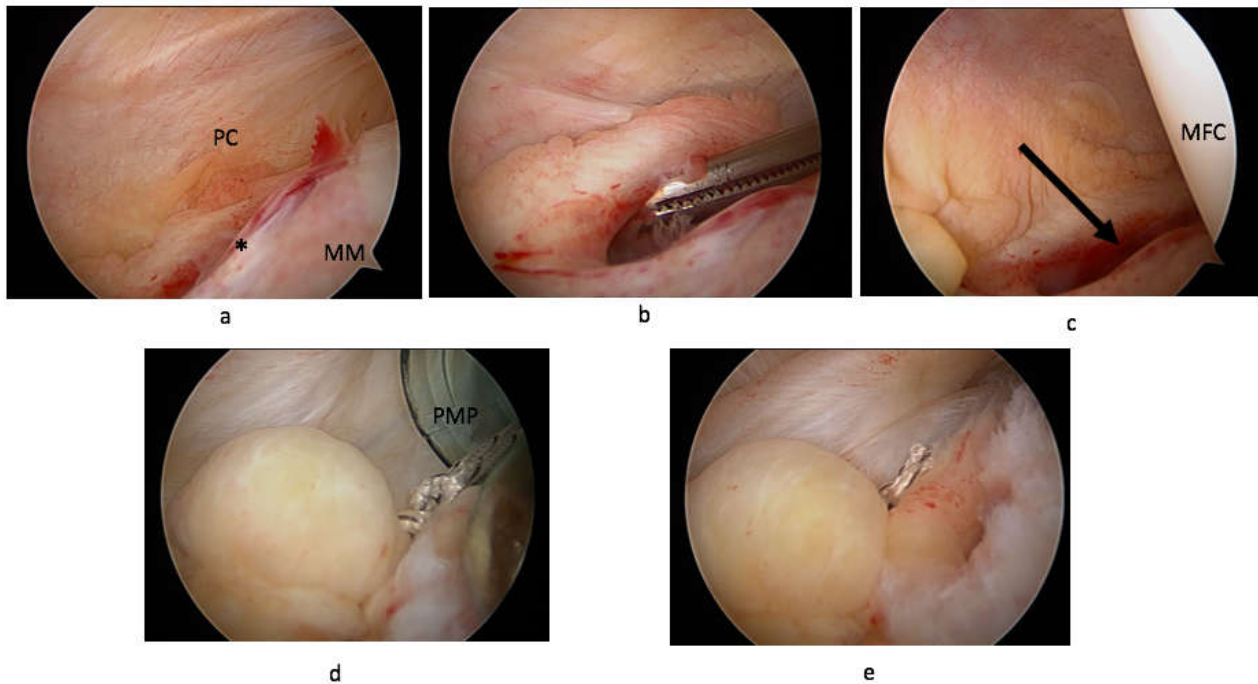


Figure 1 Arthroscopic images of ramp lesion and its repair

Figure legends: PC= posterior capsule, *= ramp lesion, PMP= posteromedial portal, MFC= medial femoral condyle

- a) Transnotch view showing ramp lesion
- b) Probing and debridement of ramp lesion through posteromedial portal
- c) Final appearance of the lesion, black arrow
- d) Ramp lesion being repaired with suture through Posteromedial portal
- e) Final appearance of all inside suture showing complete closure of ramp lesion

DISCUSSION

Incidence of ramp lesions in this study was 11.5 %. This figure is within the range reported previously in literature, with a study by Bollen [4] reporting an incidence of 9.3%, while Liu *et al* [5]reporting 16.6 % of cases having a ramp lesion. The difference can be accounted for by the difference in sample size, ours being a much smaller series compared to Liu *et al* (n=868). The presence of ramp lesion is now being consistently reported in literature and warrants a closer look during management of ACL injuries. There has been a common trait reported in literature that the incidence of Ramp lesions increases with chronicity of the injury[5,11] In this study the no. of ramp lesions was higher in chronic ACL injury cases; 6 cases compared to 4 lesions in acute ACL injury cases. However, the low sample size precludes any analysis of this facet.

The authors also found that the T2 weighted sagittal view showing fluid signal between the posterior meniscus and capsule is the best sign to visualize this lesion, this thought is in concurrence with reported literature [13].Despite this the authors feel that a thorough diagnostic arthroscopy is the best diagnostic tool for ramp lesions.

Due to the nature of the lesion it is obvious that a special effort has to be made to identify this lesion during diagnostic arthroscopy. A full visualization of the postero medial quadrant of the knee joint is a prerequisite to ensure optimal diagnosis of ramp lesions. The technique involved in this study was the transnotch view. In this the scope is advanced through the anterolateral portal between the PCL and the lateral aspect of medial femoral condyle. The knee is placed in flexion and a valgus force is applied to ease the passing of scope into the posterior quadrant. This view is also called the Gilchrist view [6].

This view has been recommended in the literature [7,10] and the authors of this study concur that this needs to be a part of the routine diagnostic arthroscopy of the knee to avoid missing ramp lesions. Some authors [6, 14] routinely advise the creation of Posteromedial portal for diagnostic arthroscopy. We differ in our view and feel that an adequate visualization of the ramp area is possible through the transnotch view and posteromedial portal can be reserved for probing and repair of the ramp lesion once identified.

The treatment of ramp lesions hasn't been standardised yet. This is consequent to the fact that the natural history of these lesions isn't clearly elucidated and biomechanical studies are few in number [2]. Some authors suggest that being a peripheral lesion it has good healing potential and doesn't require repair [15]. However, of late more research is suggesting that repair of the lesion is indicated in chronic ACL instability. [7]. Of the ten lesions identified in this study an attempt was made to classify the extent of the lesion and test the stability of the lesion to ascertain whether repair was indicated. Seven of the lesions were found to be unstable on probing and had meniscotibial ligament separation. These were chosen for surgical repair. While an extensive classification system for ramp lesions has been reported by Thounat *et al*[10], we graded the lesions as complete if the meniscotibial separation was there and they were unstable, other lesions were graded as partial[16]. Unstable complete lesions were repaired, this is in accordance with a study published by Phillipot *et al*. [17] where they surveyed surgeons and found that majority of them used the extent of the lesion (89%) and the stability of lesion on probing (81 %) to decide when to repair.

The ramp lesions were repaired using an all inside suture through the postero medial portal. This allowed as to visualize the entire lesion through the Anterolateral portal and the repair could be performed using a 25-degree suture hook and fiber wire sutures. While technically demanding we found this technique to provide complete access for repair and a good quality of repair and obviated the need for expensive suture devices. This has also been proven in many studies with most authors reporting the all inside vertical suture to provide the most reliable repair [6,10,17,18] although Chahla *et al* [2] and Liu *et al* [5] report similar outcomes with either repair technique.

The rehabilitation regime following ramp lesions doesn't have any consensus. We treated it like a peripheral meniscal repair and restricted flexion beyond 90 degrees in the early post-operative period to allow for adequate healing of the repair and avoid excessive shear and pressure on the posterior horn of the medial meniscus. This agrees with the observations made by previous studies [6,10]. All of our patients progressed through the rehabilitation program as expected and didn't show any delay and discomfort during progression through various stages.

This study is the first study of its kind in Indian patients. It is a prospective case series and one of the strengths of the study is that we had virtually no loss of cases from recruitment to last follow up.

One of the limitations of the study is its small sample size and hence inability to statistically analyse the outcome data.

CONCLUSIONS AND FUTURE DIRECTIONS

The findings of the study indicate that ramp lesions are associated with ACL injuries. MRI scans in the current scenario aren't particularly sensitive in picking up these injuries pre-operatively. Visualization of the posterior quadrant of the knee joint is an essential part of the diagnostic arthroscopy during ACLR. The extent and stability of the lesion is a useful guide to decide if repair is warranted, especially the integrity of the menisco tibial ligament. If an unstable ramp lesion is detected, surgical repair is indicated.

Further larger prospective studies are required to further delineate the extent and natural course of the lesions alongside determining the biomechanical effect of the lesion and its subsequent repair on the functional outcome following treatment of these injuries.

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How to cite this article:

Banerjee S *et al.*, Incidence And Management of Ramp Lesions In Cases of ACL Injury: Perspectives From A Tertiary Care Centre. *Int J Recent Sci Res.* 10(07), pp. 33562-33566. DOI: <http://dx.doi.org/10.24327/ijrsr.2019.1007.3694>
