

# Incidence of Meniscal Tears in Cruciate Deficient Knee with Respect to Early and Delayed Reconstruction of ACL

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## ABSTRACT

**Introduction:** Descriptions of meniscus and articular cartilage lesions associated with anterior cruciate ligament injury have been reported by many authors. There are two schools of thought regarding reconstruction either Early reconstruction and structured rehabilitation or Structured rehabilitation with delayed reconstruction. The aim of this study was to identify the impact on the meniscus in early and delayed presentation of anterior cruciate ligament tears and to emphasize the importance of early reconstruction of anterior cruciate ligament to prevent further meniscal damage and articular cartilage lesions and subsequently preventing Osteoarthritis.

**Materials and methods:** The retrospective study was conducted at Lourdes Hospital, Ernakulam, Kerala. Patients who presented with anterior cruciate ligament tears were grouped into three based on their time of injury to reconstruction and the associated meniscal tears were noted. GROUP I included patients who had ACL Reconstruction within 2 months of injury, GROUP II within 2-6 months of injury and GROUP III within 6-12 Months of injury. Patients were further divided within the groups according to their age and grouped with a difference of ten years starting at less than 25 years of age to greater than 45 years of age. Location and incidence of tear was compared between the three groups

**Results:** Incidence of Meniscal injury increases over time in patients as they passed through the acute, sub-acute and chronic phases of ACL deficiency. Immediately following ACL Injury Lateral meniscal injuries were more common and was found in the acute phase (Group I). Lateral meniscus tears decreased as patients passed through the acute phase into the sub-acute phase (Group II), whereas medial meniscal tears began to increase and predominated in the chronic phase (Group III).

**Conclusion:** This study was able to demonstrate that the Incidence of Meniscal injury increased over time in ACL deficient knees. Lateral meniscal injuries were more common in acute ACL Tears. Medial meniscal injuries increased due to instability of the knee. Hence an early Acl reconstruction preferably within two months of injury is a good option for patients as it prevents further meniscal damage and decreases Incidence of Osteoarthritis.

**Keywords:** Anterior cruciate Tear, ACL Reconstruction, Meniscal Tear, ACL Reconstruction

is a matter of significant interest recently. Incidence of Meniscal injuries are seen in patients with ACL tears with authors reporting instances as high as 55 to 65 percentage.<sup>2</sup> With ACL injury the Tibia translates anteriorly with associated external rotation of femur entrapping the meniscus and also the tensile forces generated from the attachment with posterior capsular structures of the knee resulting in a meniscal tear.<sup>3</sup> ACL tear results in functional instability, which manifests as giving way symptoms, swelling of the knee and pain, especially during strenuous activity.<sup>4,5</sup> The ACL-deficient patients develop significant intra-articular damage with meniscal tears<sup>6,7</sup> and ultimately (OA)osteoarthritis of the knee.<sup>8,9</sup>

The incidence, location and pattern of meniscal injury are time dependent in relation to the injury. In acute ACL injury there was a greater incidence of lateral meniscus tears than medial.<sup>10,11</sup> In chronic ACL-deficiency, tears more often involve the medial meniscus. The incidence of tears occurring in both menisci increased as the instability became chronic<sup>12</sup>, and it has been reported that meniscal injury increases the rate of osteoarthritis in separate studies<sup>13,14</sup>

While surgery of an injured anterior cruciate (ACL) is an important procedure associated with knee injury the optimal time for reconstruction remains uncertain.<sup>15</sup> Surgeons prefer to wait for resolution of acute hemarthrosis and the restoration of normal range of movement before performing the procedure. The timing of surgery is of importance in counselling patients regarding the outcome of surgery. There are two schools of thought with regards to reconstruction<sup>16</sup>

1. Early reconstruction and structured rehabilitation
  2. Structured rehabilitation with delayed reconstruction
- Patients who undergo only Structured rehabilitation without reconstruction of may end up doing reconstruction later due to instability.<sup>17</sup>

Authors have demonstrated that early reconstruction of ACL reduces the incidence of meniscal injury and subsequent Osteoarthritis when compared with delayed

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reconstruction.<sup>18,19</sup> There have been several reports on the increasing incidence of meniscal and articular injuries with delay in ACL reconstruction.<sup>20,21,22,23</sup> with higher incidences being reported in patients who did not undergo reconstruction but continued unrestricted activities.<sup>24</sup> These associated intraarticular injuries affect the treatment outcomes and result in poor prognosis as there is a significant higher incidence of osteoarthritis.<sup>25</sup> These observations have led to different time limits being proposed for carrying out the reconstructive procedure but there is no uniformly accepted consensus on these recommendations.<sup>26,27</sup>

Keays and colleagues emphasised that a delay between Acl tear and reconstruction may be an indicator for Meniscal tears and subsequent Osteoarthritis.<sup>28</sup> Seon and colleagues established that Osteoarthritis was present in 52% of patients who had surgery greater than 6 mths after initial ACL injury.<sup>29</sup> Kullmer and colleagues reviewed 77 radiographs of patients with Acl injury and found that patients had a lower incidence of Osteoarthritis on the day of reconstruction compared to the patients with long standing Acl tears, but the postoperative increase was identical in both groups.<sup>30</sup>

Treatment of meniscal tears are Conservative, meniscectomy or Repair. Some studies indicate that conservative treatment could be a good alternative in lower-demand populations with acute ACL injury and some of these patients are even able to participate in low-risk pivoting sports.<sup>31,32</sup>

Conservative treatment of ACL tears leads to osteoarthritis changes evaluated by radiographs in 60% to 90% of patients within 10 to 15 years after injury.<sup>33,34</sup> Olympic athletes who returned to sports after an ACL tear that was treated conservatively developed OA in 95% of cases as reported by Nebelung and Wuschech<sup>35</sup> (2005) in a study with 20 years of follow up.

Meniscectomy is associated with development of secondary osteoarthritis, even if partial meniscectomy is performed.<sup>36</sup> Multiple studies have reported that meniscal injury, meniscus surgery, or meniscectomy at the time of ACL repair or reconstruction increases OA risk.<sup>37</sup> This observation has led to preserve as much meniscal tissue as possible, and meniscus repair combined with ACL reconstruction is increasingly preferred over meniscectomy where ever possible.<sup>38</sup>

The prevalence of osteoarthritic changes in radiographs of ACL reconstructed knees has been reported to be between 35% and 80%.<sup>39</sup> There is currently not enough evidence of a possible protective role of ACL reconstruction with regard to long-term osteoarthritic development in the injured knee.<sup>40</sup> ACL reconstruction might be able to reduce additional operations, especially with young patients.<sup>41</sup>

As the aim of ACL reconstruction is to prevent secondary meniscal or chondral injuries, many authors emphasis that ACL surgery should not be delayed unnecessarily<sup>42,43</sup>

The purpose of this study was to document the incidence and distribution of meniscal lesions accompanying Acl tear based on injury to reconstruction time and to ascertain pattern of meniscal injury in the Acute (Reconstruction within 2 months of injury), Subacute (Reconstruction within 2-6 months of injury), Chronic (Reconstruction within 6-

12 Months of injury) phases. We also hypothesised that meniscal lesions would be significantly more in patients who had a prolonged time from injury.

## MATERIAL AND METHODS

The study was retrospective undertaken during a three-year period in the department of orthopaedics at Lourdes hospital, Ernakulam, Kerala starting from March 2008 to February 2011 a total of 150 patients with ACL tears who required surgical intervention were treated in this institution. Appropriate consent was obtained from the institutional ethical committee and the patients included in the study.

Data regarding preoperative physical examination, Operative technique, and subjective reports of pain dysfunction or limp were gathered from chart reviews. Diagnosis was confirmed with an MRI in all Patients and also included patients in whom the diagnosis was made by arthroscopy. The age at diagnosis, gender, presenting complaints with duration and symptoms, the side involved, the presence or absence of meniscal tear, type and location of meniscal tear, Duration between ACL rupture and reconstruction and also family history was collected.

Mode of injury was documented and Road traffic accidents constituted more than 53% of the injury. Another 36% of the patients had a history of contact sports and in the remaining 20% the cause could not be ascertained but were included in the study as they satisfied the inclusion criteria

The patients were selected based on the following inclusion criteria which included males and females between 16 and 60 years who underwent primary Acl Reconstruction with or without associated meniscal injury. Patients with Collateral ligament injury's, posterior cruciate injuries or revision ACL surgeries were excluded

Of the 150 patients 49 patients were excluded from the study as they did not fit the inclusion criteria and the injury date could not be properly estimated, the remaining 101 patients were assessed.

The diagnosis was confirmed in the operating room by examination under anaesthesia and by arthroscopy. Acl Tears and the associated meniscal injury was identified by the operating surgeon. Meniscal injury location and grade of injury was noted. All patients were treated with Arthroscopic ACL Reconstruction and Grade II and III meniscal tears were treated with meniscotomy or repair.

The impact of age on meniscal tears was also taken into consideration and was one of the variables that was statistically analysed in addition to the duration between ACL rupture and reconstruction. The patients were grouped into three based on the time from initial injury to the time of reconstruction. GROUP I included patients who underwent ACL Reconstruction within 2 months of injury, GROUP II within 2-6 months of injury and GROUP III within 6-12 Months of injury. Patients were further divided within the groups based on their age and grouped with a difference of ten years starting at less than 25 years of age to greater than 45 years of age. Frequency of meniscal tear and location of tear were compared between three groups.

### STATISTICAL ANALYSIS

The ratio of the patients in the three groups whose data was compared was done using the chi square test. And proportion of patients in each age group distributed across the three groups were verified using Kolmogrov-Smirnov test. The average age of the patients was verified Using the F test and the ratio of patients who sustained Medial meniscus to Lateral meniscus and No meniscal injury was verified Using the chi square test.

### RESULTS

A total of 101 patients were available for follow up. The patients were divided into three groups based on their time of injury to ACL reconstruction.as depicted in fig 1. GROUP I included 21 patients in the acute phase who underwent reconstruction within 2 months of injury, GROUP II with 45 patients in the subacute phase who had surgery within 2-6 months and GROUP III included 35 chronic cases who underwent Reconstruction late within 6-12 Months of injury. The ratio of patient in Group1, Group2 and Group3 is 1:2:2 and it is verified using chi square test as chi square  $\chi^2=1.2772$  with p value= $0.5280 > 0.05$ . The study Population included 91 male and 10 female patients. Group1 included 16 male and 5 female patients, Group II 43 male and 2

female and Group III with 32 male and 3 females as shown in table 1.

Males constituted 90% of all the patients with injuries and the remaining 10% females. In group I 76% were male and 23% female, in group II 95% were male and 5% female and in Group III 91% were male and 9% female (Table -1).

Patients were Distributed across the three groups based on their age as shown in the table 2.

There were 27 patients whose age was less than 25 years, 29 patients between 25 and 35 years,30 patients between 35 and 45 years and 15 patients above 45 years of age.

The proportion of patients in each age group distributed across the three groups were also equal and is verified using Kolmogrov-Smirnov test as  $d=0.1238$  less than maximum allowable value = 0.15

The mean and standard deviation of the age in the three groups as shown in table 3 were analyzed to study the impact of meniscal tears with advancing age in the study groups and it was found that there was no significant difference between the average age of patients in group I II & III. Using F test this can be verified as  $F=1.5401$  with P value = $0.2191 > 0.05$ . The Impact of ACL injury on meniscal tears was not affected

Sex	Group I	Group II	Group III	Total
Male	16	43	32	91
Female	5	2	3	10
Total	21	45	35	101
Male%	76	95	91	90
Female%	23	5	9	10

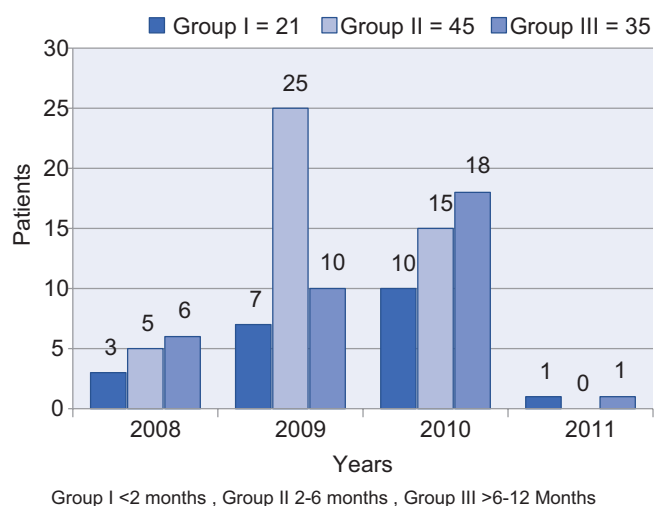
**Table-1:** Distribution of patients based on gender across three groups

Age	Group I	Group II	Group III	Total
<25	6	11	10	27
25-34	3	12	14	29
35-44	8	13	9	30
>45	4	9	2	15
Total	21	45	35	101

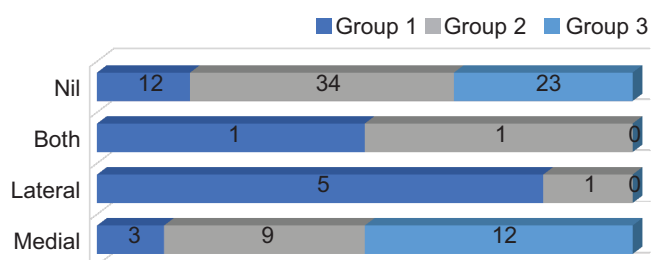
**Table-2:** Patient Distribution across the three groups based on their age

Age	Mean	SD	Mean-SD	Mean + SD
Group I	33.85	11.13	22.72	44.98
Group II	33.88	11.56	22.32	45.44
Group III	30.05	8.14	21.91	38.19

**Table -3:** Mean and Standard Deviation of Age of patients



**Figure-1:** Patients grouped based on time of injury to treatment



**Figure-2:** Meniscal Injury Distribution across the three groups

	Meniscal Injury				Total	Meniscal Injury%			
	Medial	Lateral	Both	Nil		Medial	Lateral	Both	Nil
Group 1	3	5	1	12	21	14	24	5	57
Group 2	9	1	1	34	45	20	2	2	76
Group 3	12	0	0	23	35	34	0	0	66
Total	24	6	2	69	101	24	6	2	69

**Table-4:** Number of cases with meniscal injury with injury percentage per group



by the advancing age of the patients within the age bracket that was analyzed.

#### Pattern of Meniscal Injury associated with ACL Tear

In the study population of 101 patients 9 patients in Group I, 11 patients in Group II and 12 patients in Group III reported meniscal injury. In Group I of the 9 patient 3 presented with medial, 5 with lateral and one with injury to both menisci. in Group II 9 presented with medial one with lateral and one with injury to both menisci whereas in Group III all the 12 patients presented with injury to the medial meniscus. The pattern of distribution of meniscal injury is shown in fig 2. And the Distribution of cases of meniscal injury with percentage is tabulated in table 4.

Incidence of Meniscal injury was found to be higher in Group I (> 2/5 patient) compared with Group II and III of which Lateral meniscal injury predominated. Rate of Meniscal injury was less in Group II (about 1/4 patient) compared with Group I of which medial meniscal injury predominated. In Group III medial meniscal injury was significantly high. (1/3 patient), there were no cases of lateral meniscal injury. In the study population 70% of patients were not affected by meniscal injury. Pattern of distribution showed that of 20 patients in the study population five had medial and one lateral meniscal injury. The ratio of Medial meniscus: Lateral meniscus: No meniscal injury = 5:1:14 Using chi square test, chi square  $\chi^2 = 0.8563$  with p value =  $0.6517 > 0.05$ .

Incidence of Meniscal injury increases over time in patients as they passed through the acute, sub-acute and chronic phases of ACL deficiency. Immediately following ACL Injury Lateral meniscal injuries were more common and was found in the acute phase (Group I). Lateral meniscus tears decreased as patients passed through the acute phase into the sub-acute phase (Group II), whereas medial meniscal tears began to increase and predominated in the chronic phase (Group III). Medial meniscal injuries were common in chronic Acl tears which were often complex tears not amenable to repair.

## DISCUSSION

#### Incidence of Meniscal injury in ACL deficient knees

In our study we were able to demonstrated that following an anterior cruciate injury the risk of meniscal tears increased with delay in reconstruction. Despite age-related changes inducing meniscal tissue vulnerability leading to meniscal dysfunction and tears<sup>1</sup> as shown by tsujji and Nakumura Et al we were not able to demonstrate an association between age and meniscal tears probably due to the short assessment period of one year in chronic cases. Meniscal tears were identified in patients in group I, II and group III.

The incidence of meniscal tears increased over time in ACL-deficient knees as shown by Papastergiou et al.<sup>2</sup> Medial meniscal injury was found to be significantly higher than lateral meniscus injury.

In the 21 patients operated in the acute stage (Group I), the lateral meniscus was found torn in 24% and in majority of patients it was partially torn and was predominantly a Grade 1 tear and hence left without any intervention. Medial

meniscal injury accounted for only 14% which were often grade II or III and often required Meniscectomy or repair.

The 45 knees operated on in the sub-acute stage (Group II) showed a similar pattern only 2.22% of the lateral menisci was torn, which was left untreated. Medial meniscal injury accounted for 20% and patients required a partial Meniscectomy or repair. At this stage it was possible to observe the recovery of knee range of motion, resolution of the hemarthrosis was complete and advanced process of healing of the tears of the lateral meniscus, if present.

The chronic stage, (Group III) instead, presented different pattern of the associated lesions, while in the selected sample the lateral meniscus was intact in all patients. The medial meniscus was involved in 34%, of which majority required a subtotal Meniscectomy for complex tears. It could be sutured in only 5.7% with a less favourable prognosis.

In the acute group there was a greater incidence of lateral meniscus tears than medial. The incidence of tears occurring in both menisci increased as the instability became chronic<sup>3</sup>, it has been shown that meniscal injury increases the rate of osteoarthritis in separate studies done by Aglietti<sup>4</sup> et al, Beynon<sup>5</sup> et al, Cohen<sup>6</sup> et al 2007, Jomha<sup>7</sup> et al. ACL reconstruction decreases the risk of secondary meniscal tears but may not decrease the likelihood of suffering posttraumatic osteoarthritis as shown by Lohmander & Roos<sup>8</sup>, Lohmander et al.<sup>9</sup>

The present study being retrospective depends on the data that was collected from chart reviews and also the time of injury to surgery as presented by the patient may have flaws. Nonetheless the data points to the fact that early reconstruction of ACL tears should be a better option than to expose the patient to meniscal tears and secondary osteoarthritis. Patient preferences should be taken into consideration and also the functional level of the individual assessed and the possibility of meniscal tear and subsequent osteoarthritis explained.

## CONCLUSION

This study was able to demonstrate that the Incidence of Meniscal injury increased over time in ACL deficient knees. Lateral meniscal injuries were more common in acute ACL Tears and as patients passed through the acute and sub-acute phase the proportion of medial meniscal injuries increased due to instability of the knee. Hence an early Acl reconstruction within two months of injury followed by structured rehabilitation was a good option for patients as it prevented further meniscal damage.

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