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Effects of neglected anterior cruciate ligament tears on medial and lateral meniscus

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ABSTRACT

Background: The effects of neglected anterior cruciate ligament (ACL) tears and its impact on the medial and lateral meniscus was evaluated in this study over a one-year time period patients were grouped on the basis of their injury to treatment time. The study emphasized the importance of early treatment of ACL injury to prevent damage to the meniscal tissue and secondary osteoarthritis.
Methods: Retrospective cohort study undertaken in the Department of Orthopaedics at Lourdes Hospital, Ernakulam, Kerala. Over a time period of one year starting from 2010 February. A total of 101 patients was analysed in whom Meniscal injury associated with ACL tear was noted. The patients were grouped into three based on the time from initial injury to the time of reconstruction. Acute injury (treated within 4 months of injury) sub-acute injury (treated between 4 and 8 months after injury) chronic injury (treated between 8 and 12 months after injury). The trend of meniscal injury based upon the injury to treatment time was analysed using appropriate statistical methods.
Results: Immediately following ACL injury lateral meniscal injuries were more common and was found in the acute phase. Lateral meniscus tears decreased as patients passed through the acute phase into the sub-acute phase, whereas medial meniscal tears began to increase and predominated in the chronic phase. Medial meniscal injuries were common in chronic ACL tears which were often complex tears not amenable to repair.
Conclusions: This study was able to demonstrate that the incidence of meniscal injury increased over time in ACL damaged knees.

Keywords: Anterior cruciate tear, ACL reconstruction, Meniscal tear, Medial meniscus, Lateral meniscus

INTRODUCTION

Neglected anterior cruciate ligament (ACL) tears are associated with meniscal or chondral injury when the timing of surgery is delayed.[1]

Numerous authors have reported instances as high as 55 to 65 percentage.[2] The ACL deficient patients develop articular cartilage damage and associated meniscal tears.[3,4] which predispose to secondary osteoarthritis of the knee.[5,6] compared with patients who addressed their injury early and underwent treatment preferably ACL reconstruction.[7,8] Pain swelling and instability manifests with ACL tears following unrestricted strenuous knee exertion.[9,10] In acute ACL injury there was a greater incidence of lateral meniscus tears than medial.[11,12] In chronic ACL deficiency tears more often impact the medial meniscus. The incidence of tears occurring in both menisci increased as the instability became chronic.[13] It has been reported that meniscal injury increases the rate of

osteoarthritis.[14,15] These associated intra-articular injuries affect the treatment outcomes and result in poor prognosis due to the higher incidence of osteoarthritis.[16]

Numerous studies have demonstrated that neglected ACL injury predisposed to significant increase of medial meniscus injuries after 6 months and cartilage lesions after 12 months.[17] Seon et al established that osteoarthritis was present in 52% of patients who had surgery after six months from the initial ACL injury.[18] 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 treatment than the patients with long standing ACL tears, but the post-operative increase was identical in both groups.[19]

Keays et al proposed that meniscal tears and OA was associated with delay in ACL treatment. Conservative treatment of ACL tears leads to osteoarthritic changes evaluated by radiographs in 60 % to 90 % of patients within fifteen years of injury.[20,21] Olympic sports players with ACL tear that was treated conservatively developed OA in 95% of cases as reported by Nebelung and Wuschech in a study with follow up of twenty.[22]

Few randomized control trials published to date differs in their opinion if surgery or conservative treatment for ACL tear provide better results. Nonetheless a trend has been observed towards ACL reconstruction as a better treatment modality. Some cross-sectional data has shown conservative treatment failure in 17.5% (±15.5%) of patients.[23] Conservative treatment has given way to ACL reconstruction as it is presumed to provide better stability and improves overall knee function.

Treatment of ACL tears preferably by reconstruction reduces the risk of meniscal tissue damage and secondary OA knee thereby reducing the need for further surgical procedures in younger patients.[24] The protective role of ACL reconstruction in long term osteoarthritis is presumed to be doubtful with authors reporting instances of osteoarthritis in radiographs as high as 80% probably due to persistent antero-posterior instability in up to 50% cases after reconstruction. Conservatively managed ACL tears had antero-posterior instability in up to 90% of cases.[25]

The purpose of this study was to document the evolution of meniscal injury following an ACL tear over a one-year time period. Patients were grouped into 3 based on the time of injury to treatment. Acute injury (treated within 4 months of injury) sub-acute injury (treated between 4 and 8 months after injury) chronic injury (treated between 8 and 12 months after injury).

METHODS

This was a retrospective cohort study conducted in the Department of Orthopaedics at Lourdes Hospital, Ernakulam, Kerala over a time period of one year starting from 2010 February to 2011 February. After appropriate consent was obtained from the institutional ethical committee and written informed consent from the patients a total of 101 patients was analysed. Data regarding preoperative physical examination, operative technique, and subjective reports of pain dysfunction or limp were gathered from chart reviews.

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. Diagnosis was confirmed with an MRI in all patients and also included patients in whom the diagnosis was made by arthroscopy. The patients were selected based on the following inclusion criteria which included males and females between 16 and 60 years who were diagnosed with a primary ACL tear with or without associated meniscal injury. Patients with Collateral ligament injury's, posterior cruciate injuries or revision ACL surgeries were excluded. Patients who did not fit the grouping criteria irrespective of their ACL tears were excluded.

ACL tears and the associated meniscal injury were 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 menisctomy or repair.

The patients were grouped into three based on the time from initial injury to the time of reconstruction. Acute injury (treated within 4 months of injury) sub-acute injury (treated between 4 and 8 months after injury) chronic injury (treated between 8 and 12 months after injury).

Statistical methods

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. Acute group included 21 patients who underwent reconstruction within 4 months of injury, sub-acute group with 45 patients who had surgery within 4 to 8 months and chronic group included 35 patients who underwent reconstruction late within 8-12 months of injury. The ratio of patient in acute group, sub-acute group and chronic group is 1:2:2 and it is verified using chi square test as chi square χ^2=1.2772 with p value=0.5280>0.05. The study population included 91 male and 10 female patients. Acute group included 16

male and 5 female patients, sub-acute group 43 male and 2 female and chronic group with 32 male and 3 females as shown in (Table 1).

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

Sex	Acute	Sub-acute	Chronic	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

Males constituted 90% of all the patients with injuries and the remaining 10% females. In the acute group 76% were male and 23% female, in sub-acute group 95% were male and 5% female and in chronic group 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).

Table 2: Patient distribution across the three groups based on their age.

Age in years	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

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.

Table 3: Age of patients.

Groups	Mean age (in years)	SD
Group I	33.85	11.13
Group II	33.88	11.56
Group III	30.05	8.14

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 acute, sub-acute and chronic group. 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 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 of the population of 101 patients 9 patients in acute group, 11 patients in sub-acute group and 12 patients in chronic group reported meniscal injury. In acute group of the 9 patient 3 presented with medial, 5 with lateral and one with injury to both menisci. In the sub-acute group 9 presented with medial one with lateral and one with injury to both menisci whereas in chronic group all the 12 patients presented with injury to the medial meniscus. The pattern of distribution of meniscal injury is shown in (Figure 1). And the distribution of cases of meniscal injury with percentage is tabulated in (Table 4)

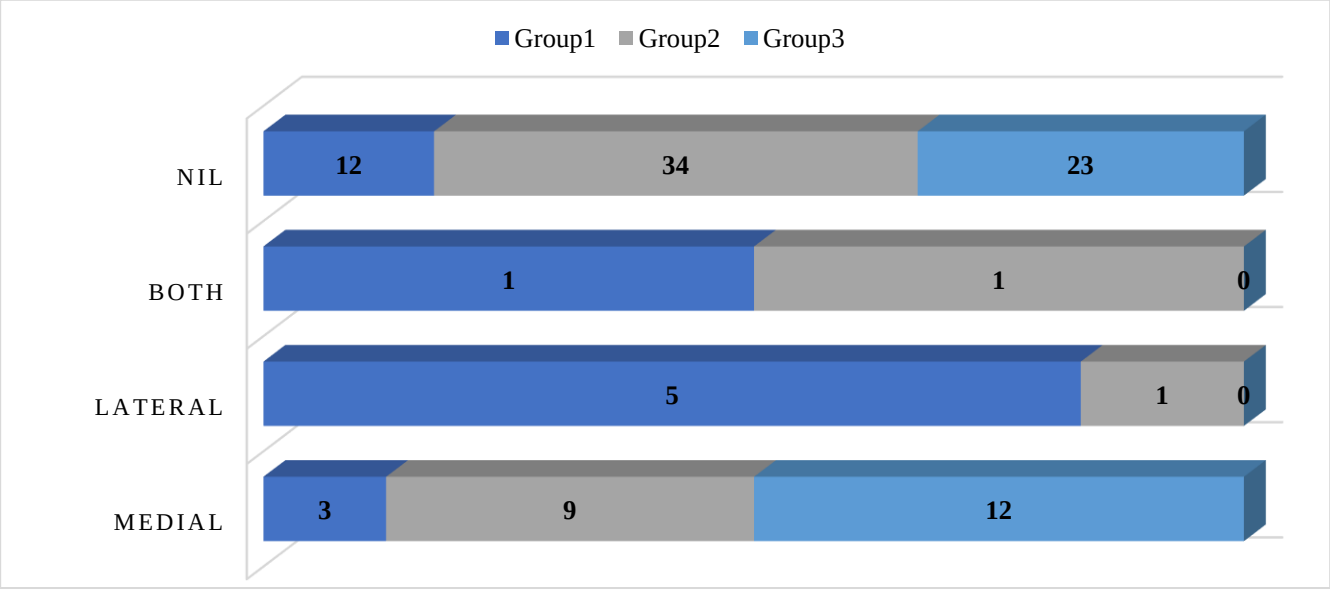

Figure 1: Meniscal injury distribution across the three groups.

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

Variables	Meniscal injury					Meniscal injury (%)			
	Medial	Lateral	Both	Nil	Total	Medial	Lateral	Both	Nil
Acute	3	5	1	12	21	14	24	5	57
Sub-acute	9	1	1	34	45	20	2	2	76
Chronic	12	0	0	23	35	34	0	0	66
Total	24	6	2	69	101	24	6	2	69

Incidence of meniscal injury was found to be higher in acute group (>2/5 patient) compared with sub-acute group and chronic group of which lateral meniscal injury predominated. Rate of meniscal injury was less in sub-acute group (about1/4 patient) compared with acute group of which medial meniscal injury predominated. In chronic group medial meniscal injury was significantly high. 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 5 has medial and 1 had lateral meniscal injury. The ratio of medial meniscus: lateral meniscus: no meniscal injury was 5:1:14. Using chi square test, chi square χ^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. Lateral meniscus tears decreased as patients passed through the acute phase into the sub-acute phase, whereas medial meniscal tears began to increase and predominated in the chronic phase. Medial meniscal injuries were common in chronic ACL tears which were often complex tears not amenable to repair.

DISCUSSION

The current study 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 as shown by Tsujji and Nakumura et al.[26] 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 acute, sub-acute and chronic group.

The incidence of meniscal tears increased over time in ACL deficient knees as shown by Papastergiou et al.[27] Medial meniscal injury was found to be higher than lateral meniscus injury.

In the 21 patients operated in the acute stage, 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 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 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 and it has been shown that a meniscal injury increases the rate of osteoarthritis in separate studies done by Aglietti et al, Beynnon et al, Cohen et al and Jomha et al.[28-32] ACL reconstruction decreases the risk of secondary meniscal tears but may not decrease the likelihood of suffering post traumatic osteoarthritis as shown by Lohmander et al.[33,34]

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 meniscal injury increased over time in ACL damaged 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. There was significant resolution of hemarthrosis and almost normal range of motion at the time of surgery.

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