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Effect of concomitant meniscus injury on the outcome of anterior cruciate ligament reconstruction

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Abstract
Background: People with Anterior Cruciate ligament Injury have been observed to have associated Meniscus Injury. At the time of Anterior Cruciate Ligament reconstruction the concomitant Meniscus injuries are also treated. Meniscus surgery is performed to save the meniscus, if not physically, at least functionally. Tears with a high probability of healing with surgical intervention are repaired, whereas those tears which are not repairable are resected, preserving as much normal meniscus as possible. This study determines the relationship between (medial / lateral / combined) Meniscus injury present at the time of Anterior Cruciate Ligament (ACL) reconstruction and their effect on the outcome of Anterior Cruciate Ligament reconstruction surgery.
Materials and Methods: A prospective Cohort study of 70 patients with Anterior Cruciate Ligament and concomitant Meniscus injuries was carried out. These patients were followed up periodically, for a duration of one year. At the time of periodic review the outcome of surgery was assessed with physician administered Tegner Lysholm Knee Score and International Knee Documentation committee subjective score.
Results: Individuals with combined (both medial and lateral) Meniscus injuries had significant lower outcome scores than those with either medial or lateral Meniscus injuries as determined by analysis of variance (ANNOVA).
Conclusion: The patients with both Medial and Lateral Meniscus injury undergoing Anterior Cruciate Ligament reconstruction had poorer outcome than those with only one of the Meniscus torn.

Keywords: Anterior cruciate ligament (ACL), meniscus tear, international knee documentation committee subjective score, tegner lysholm knee score

Introduction
The knee joint is the largest synovial joint in the body comprising of the patella, the distal femoral condyles, and the proximal tibial plateaus or condyles. There are intra-articular and extra-articular stabilizers of the knee joint. The extra-articular stabilizers comprise of synovium, capsule, collateral ligaments, and musculo-tendinous units that span the joint. The intra-articular stabilizers are the medial and lateral Meniscus and the Anterior and Posterior Cruciate Ligaments [1].
The Anterior Cruciate Ligament (ACL) can be torn due to a contact or non-contact injury, which are common among those involved in contact sports and in motor vehicle accidents involving motorcycles. Contact injury occurs as a consequence of valgus stress, hyperextension or twisting force on the knee joint. Non-contact injury to the ACL occurs due to a sudden deceleration force with rotational component acting on the knee joint. Injury to the ACL results in an unstable knee. This disrupts the activities of daily living. For an athlete this injury can mean a premature end to a career in sports [2].
Frequently, ACL injury is associated with Meniscus injury. The Meniscus are also vital to the knee joint as they serve to disperse the stresses on the articular surfaces thereby protecting them and also function as secondary stabilizers of the knee joint. Damage to these structures can per se cause instability of the knee joint and in the long run cause osteoarthrosis due to altered joint biomechanics [3].
Meniscus injury must be treated at the time of ACL reconstruction surgery to avoid a bad prognosis to the knee joint. The presence of a concomitant Meniscus injury in an ACL deficient knee can undermine the successful outcome of ACL reconstruction surgery [4].

Thus, it is necessary to understand the relationship between the Meniscus injury on knee function following ACL reconstruction.

Materials and Methods

The study was performed with approval of the Manipal University Ethical committee. 70 Patients with ACL tear and concomitant Meniscus injury were included in the study after taking their informed consent. People with intact menisci, inflammatory joint disease, fractures, cartilage injuries, revision ACL surgery and other ligament injuries were excluded from the study.

These patients were divided into three groups preoperatively based on the side of meniscus injury. These groups were, ACL tear with medial Meniscus injury (Group 1); ACL tear with lateral Meniscus injury (Group 2); ACL tear with both medial and lateral Meniscus injury (Group 3), following the principles of prospective cohort study. Pre-operative Knee function was assessed with physician administered Tegner Lysholm Knee Score (TLKS) [5, 6] and International Knee Documentation committee (IKDC) subjective score [7].

These patients underwent ACL reconstruction using Hamstring graft and partial menisectomy for the Meniscus injury. The ACL was reconstructed with Quadrupled Hamstring Graft, harvested from the ipsilateral knee. Trans-tibial technique was used in graft placement. Anchorage of the graft was done using bio-absorbable interference screws at tibial side and femoral side. Meniscal tears were treated with partial meniscectomy.

Post-surgery, accelerated post ACL reconstruction rehabilitation protocol exercises were started from post-op day one. Following discharge, the patients were reviewed regularly at intervals of one, three, six and twelve months after the day of surgery. At follow-up, all subjects underwent physical knee examination and were assessed using the IKDC Subjective Evaluation form and Tegner Lysholm Knee Score.

The data collected was analysed using the Software "Statistical Package For Social Sciences Version 16". The average TLKS and IKDC scores of each group of study were compared at 1, 3, 6, and 12 months follow up. The difference between the three groups was considered significant if the p value was less than 0.05.

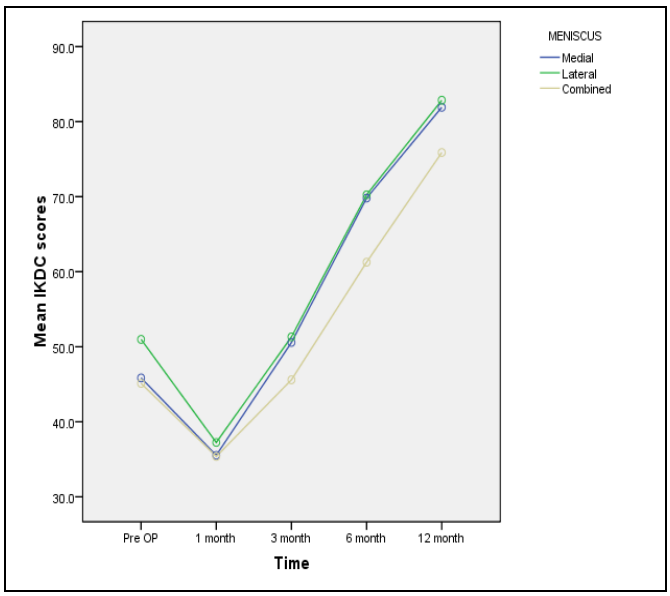
Results

70 patients were included in the study were recorded during the period of study from August 2009 to August 2010. The age of the patients treated, ranged between 16 and 52 years and the average being 28.6 years. The gender distribution of cases was eccentric, with eighty-seven percent (n=61) males, and a mere thirteen percent (n=9) females in the study.

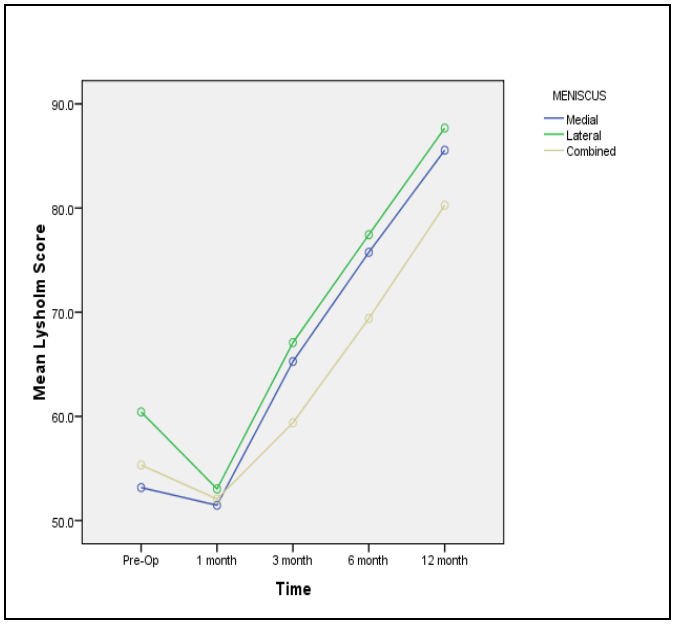
There was nearly equal number of cases representing both knees ensuring comparability, (right knee n=36 and left knee n=34). With regards to the meniscus injury the patients were grouped as medial, lateral and combined. Medial meniscus injury (Group 1) was the most common (n=30) followed by (Group 2) lateral meniscus (n=25) and the least was (Group 3) combined injuries (n=15).

Mean IKDC and TLKS Scores

The Mean IKDC and TLKS scores at Pre-Operation, 1st month, 3rd month, 6th month and 1year follow-up for the three meniscal groups were determined and the results are depicted in Graph 1 & 2.



Graph 1: Mean IKDC scores of the Meniscus Groups



Graph 2: Mean TLKS scores of the Meniscus Groups

Pre-Op mean scores of the lateral Meniscus Group (Group 2) was better than the rest of the groups. However, at the end of first month all the groups had similar low mean scores. This could be due to restriction on ambulation and graded rehabilitation protocols. In the subsequent reviews the both medial and lateral meniscus groups show similar mean scores. However, the combined group (Group 3) had the lowest score during the entire course of review.

Analysis of Variance (ANNOVA)

To find out whether there was significant difference in the Outcome of the three Meniscus groups at one-year post surgery, ANNOVA was applied. The results are given in Table 1.

Table 1: Annova

Score	Meniscus	Meniscus	Mean Difference (1-2)	Std. Error	Significance	95% Confidence Interval	
						Lower Bound	Upper Bound
IKDC 12 month	Medial	Lateral	-.9460	1.0987	.667	-3.579	1.687
		Combined	6.0233*	1.2830	<.05	2.948	9.098
	Lateral	Medial	.9460	1.0987	.667	-1.687	3.579
		Combined	6.9693*	1.3251	<.05	3.793	10.145
	Combined	Medial	-6.0233*	1.2830	<.05	-9.098	-2.948
		Lateral	-6.9693*	1.3251	<.05	-10.145	-3.793
TLKS 12 month	Medial	Lateral	-2.1300	.9945	.089	-4.514	.254
		Combined	5.2833*	1.1613	<.05	2.500	8.067
	Lateral	Medial	2.1300	.9945	.089	-.254	4.514
		Combined	7.4133*	1.1994	<.05	4.539	10.288
	Combined	Medial	-5.2833*	1.1613	<.05	-8.067	-2.500
		Lateral	-7.4133*	1.1994	<.05	-10.288	-4.539
*. The mean difference is significant at the 0.05 level.							

Significant difference in outcome was noticed between Medial meniscus (Group 1) and combined groups (Group 3) and also between the lateral meniscus (Group 2) and combined groups (Group 3). Thus individual with combined medial and lateral meniscus injuries had significant lower outcome than those with either medial or lateral meniscus injuries.

Discussion

There are numerous causes implicated in bringing out a poor outcome in ACL reconstruction surgery. They include concomitant other injuries, failure of graft, failure of fixation, non- compliance of rehabilitation protocol and so forth. While the problems with surgical technique and rehabilitation are clearly evident, it is the associated injuries like meniscal tears, concomitant ligament injuries, fractures and chondral injuries that remain silent initially but give rise to morbidity in the long run. This study was an attempt to establish a relationship between side of meniscal injury with the outcome of ACL reconstruction.

The mean age of the cases was 28.6 years, with majority of the patients in the 25-40 years age group. In this group the commonest meniscus involved was the medial meniscus.

Gender has been implicated as a factor contributing to injury of the ACL, with women being more prone to ACL injury [8]. Considering this, the number of women with ACL injuries should be high. But only 9 women were present in the study. This can be explained on the basis of lower rates of road traffic accidents among females and lesser participation in sports. Social factors play a role in this regard as Indian women rarely venture out or participate in sports unlike the western world.

Palmer proposed that the side to side difference in the occurrence of meniscal tears associated with ACLs was due to the different mobility of the two menisci [9]. The increased mobility of the lateral meniscus makes it prone for tear in acute injuries. The medial meniscus being tightly attached to the tibia is exposed to different set of forces and therefore is more commonly associated with chronic tears. In the present study, the majority of the meniscus involved was medial which was quite contradictory. This was, however, due to the fact that many cases involving the lateral meniscus also had other associated injuries and thereby excluded from the study

Robert T. Burks *et al.*, [10] reported that partial medial Menisectomy had slightly better result than partial lateral Menisectomy but this was found to be not statistically significant in this study.

On comparing, the final TLKS and IKDC scores of medial (Group 1), lateral (Group2) and combined (Group3) groups in the present study, it was found that the combined group had the lowest score. Then, this difference in the final average score was analysed using ANNOVA and the result was significant ($p<0.05$). Thus, it is worthwhile to conclude that in a single Meniscus tear, the side (either medial or lateral) of concomitant Meniscus injury does not affect the outcome of ACL reconstruction. Nevertheless, if both Menisci are involved in the same knee undergoing ACL reconstruction, the outcome is poor.

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