

ARTHROSCOPIC ANALYSIS OF PREVALENCE OF CHONDRAL DEFECT IN POST TRAUMATIC ANTERIOR CRUCIATE LIGAMENT DEFICIENT KNEES

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ABSTRACT

INTRODUCTION:

Anterior cruciate ligament injury is the most frequently injured ligament. Some studies have shown that meniscal and chondral injuries are well recognised in delayed ACL reconstruction. This study is done to know the prevalence of cartilage defect with respect to time of injury and time of surgery.

MATERIALS AND METHODS:

31 Patients with ACL tear who underwent arthroscopic ACL reconstruction were included from January 2019 to October 2020 fulfilling inclusion criteria. Cartilage defects were assessed at the time of diagnostic arthroscopy performed during Arthroscopic ACL reconstruction and were graded using Outerbridge classification. The duration of injury and grade of defects was assessed.

RESULTS:

Out of 31 patients, 80.64% were males, females were 19.36%. Right knee was most commonly injured (58.06%). Most patients were in age group of 20-25 years. Common mode of injury was RTA (54.83) followed by sports (35.48%). 64.51% of patients were operated before 6 months from injury whereas 35.48% were operated after 6 months from injury. Among the defects Grade 1 was more common which was 56.66% whereas Grade 3 was seen in two patients with duration of injury of 2 years and 4 years. Grade 4 was seen in one patient with 3 years of injury. Most common site involved is the medial femoral condyle (56.66%)

followed by medial tibial plateau (17%). Medial meniscal injury was found to be increasing with increase in duration of injury whereas lateral meniscal tears were more common in acute ACL tears . The grade of defects was found to be increasing with increase in the duration of injury as shown by the significant p value of 0.001.

CONCLUSION:

Incidence of cartilage defects is found to be increasing with the increase in the duration of injury with the most common site involved being medial femoral condyle. Early ACL reconstruction prevents secondary injury to other intra articular structures of the knee.

INTRODUCTION

Knee injuries are increasing and becoming more common due to the exponential rise in road traffic accident and sports related activity among common people. Anterior cruciate ligament [ACL] injury is the most frequently injured Ligament. Being one of the prime stabiliser of the knee, the role of ACL is to resist anterior translation of tibia on the femur. It has also been demonstrated that the ACL-deficient knee has increased internal tibial rotation compared with the ACL-intact knees. Some studies have shown that meniscal and chondral injury are well recognized in patients with delayed ACL reconstruction.¹ This occurs both at the time of index injury and also secondarily over time in ACL deficient knees. Articular cartilage is just 2-4 mm thick and is avascular, alymphatic and aneural². It has limited capacity for healing and there has been increasing use of cartilage repair techniques. The incidence of knee arthritis following ACL injury is also high which is explained by the fact that ACL deficient knees are at high risk of subsequent cartilage and meniscal damage³. So understanding the relationship between recurrent instability episodes and cartilage damage in patients with ACL injury has significant implications on acute treatment pathways in terms of the secondary prevention of OA after ACL injury⁴. The patients managed non operatively have been noted to develop increased radiological evidence of joint degeneration and corresponding increased disability^{5,6,7}. Arthroscopic reconstruction has become the surgery of choice for ACL tears. Diagnostic arthroscopy performed during the procedure helps to find the associated cartilage defect. In our population there are no adequate studies about the prevalence of cartilage defect in ACL deficient knee. Hence this study was

done to know the prevalence of the cartilage defect with respect to the time of injury and time of surgery.

AIM AND OBJECTIVES

AIM:

Arthroscopic Analysis Of Prevalence Of Chondral Defect In Post Traumatic Anterior Cruciate Ligament Deficient Knees.

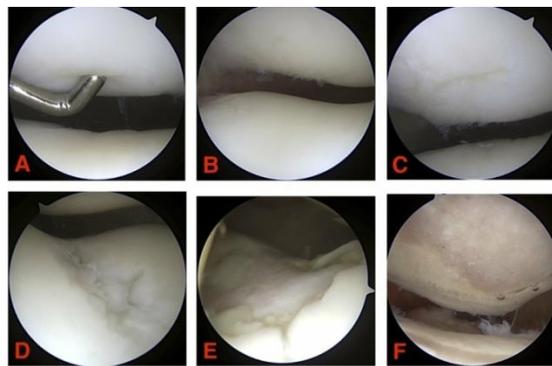
OBJECTIVES:

- To grade the Chondral Defect according to the Outerbridge Classification⁸
- To know the prevalence of cartilage injury with respect to time of injury and time of surgery.

OUTERBRIDGE ARTHROSCOPIC GRADING SYSTEM:⁸

The cartilage defects are graded using outerbridge classification as follows:

- Grade 0-Normal Cartilage.
- Grade 1- softening and swelling.
- Grade2-Fragmentation and fissures in area less than 0.5 inch in diameter.
- Grade3-Fragmentation and fissures in area more than 0.5 inch in diameter.
- Grade 4-exposed subchondral bone.



Outerbridge classification

- A - Grade I
- B & C - Grade II
- D - Grade III
- E & F - Grade IV

METHODOLOGY:

This study is a observational cross sectional study . 31 patients with Anterior cruciate ligament tear who underwent ARTHROSCOPIC ACL RECONSTRUCTION during the period, January 2019 to October 2020 were selected from Mahatma Gandhi Medical College And Research Institute, Puducherry. Patient who came with complaints of knee pain, instability, difficulty in squatting and sitting crossed legs to our OPD and Emergency Department were assessed with proper history and clinical examination. Patients diagnosed to have ACL tear underwent arthroscopic ACL reconstruction. Patients who underwent procedure within 6 months of injury were taken as a group, whereas who underwent procedure after 6 months were pooled in another group All the patients were included with predefined inclusion and exclusion criteria in the present study.

INCLUSION CRITERIA

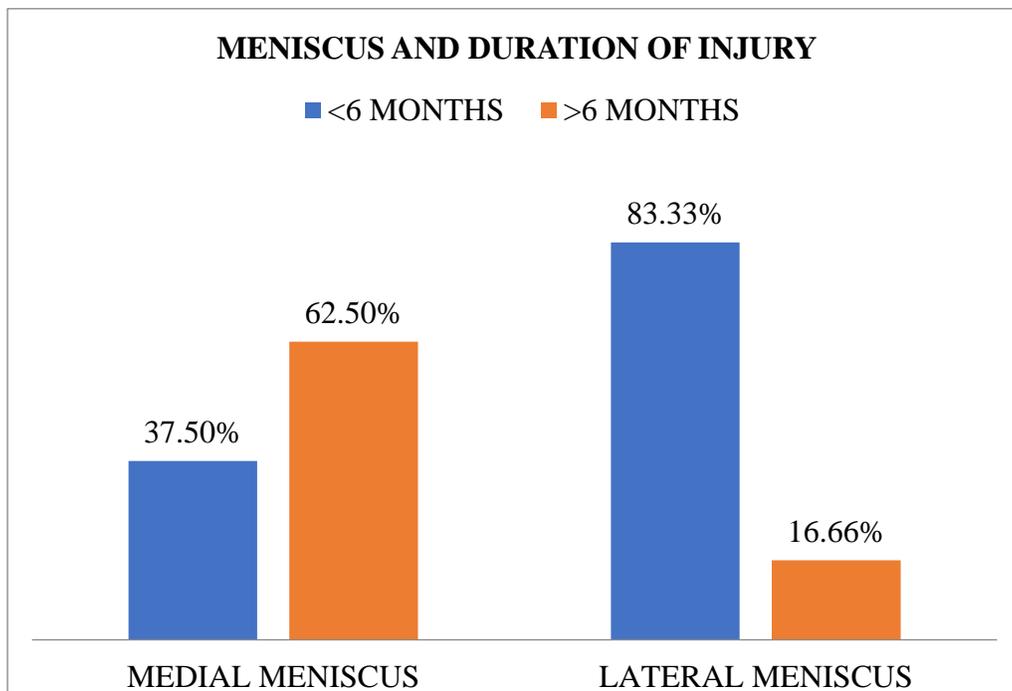
- Patients with Isolated Anterior cruciate ligament tear.
- Patients between 20-40 years of age.^{9\}

EXCLUSION CRITERIA:

- Patients with ligament injury other than anterior cruciate ligament.
- Patient with ipsilateral bony injury.
- Patients with associated osteoarthritis of knee.
- Patients not giving consent for surgery.

RESULTS

31 patient who underwent arthroscopic ACL reconstruction in the period between January 2019 and October 2020 were included in the study. Male to female ratio was 4:1. The mean age was 29.58 years. Commonest mode of injury was RTA (51.72%) followed by sports (34.48%). The average time to surgery from injury was 10 months. 77.42% of patients had cartilage defects. 22.58% of patients did not have any defects. Among the sites involved medial femoral condyle cartilage was the most common which was 56.66% followed by medial tibia plateau cartilage which was 17%. There were 56.66% of grade 1 defects, 33.33% of grade 2 defects. There were 6.66% % of grade 3 defects and 3.33%% of grade 4 defects. Grade 1 defects were more common in the early surgery group whereas the Grade 2 was more common in late surgery group. Grade 3 and grade 4 defects were seen only in the late surgery group as shown in table 1. Grade of cartilage defects were found to be increasing with increase in the duration of ACL injury as shown by the significant p value of 0.001 as shown in table 2. Medial meniscus defects were increased in the late surgery group whereas the lateral meniscus defects were increased in the early surgery group.



Graph 1: Distribution of Meniscus tear and duration of injury

Table1: Distribution of defects with respect to time of injury

DURATION OF INJURY		NUMBER OF GRADE I DEFECTS	NUMBER OF GRADE II DEFECTS	NUMBER OF GRADE III DEFECTS	NUMBER OF GRADE IV DEFECTS	NO DEFECTS
<6 MONTHS	NUMBERS	10	3	0	0	7
	PERCENTAGE	33.33	10	0	0	18.91
>6 MONTHS	NUMBERS	7	7	2	1	-
	PERCENTAGE	23.33	23.33	6.66	3.33	0
TOTAL NUMBERS		17	10	2	1	0
PERCENTAGE		45.93	27.01	5.40	2.7	18.91

Table 2: Statistical Analysis

GRADE	DURATION OF INJURY (1- <6MONTHS 2- >6 MONTHS)		Total
	1.00	2.00	
0	7	0	7
	100.0%	0.0%	100.0%
1	10	7	17
	58.8%	41.2%	100.0%
2	3	7	10
	30.0%	70.0%	100.0%
3	0	2	2
	0.0%	100.0%	100.0%
4	0	1	1
	0.0%	100.0%	100.0%
Total	20	17	37
	54.1%	45.9%	100.0%
P value (chi-square test)	0.02		

Grade 2 is 30% in early surgery group whereas 70% in late surgery group. Grade 3 and Grade 4 defects are present only in the late surgery group. This trend is statistically significant as shown by the p value of 0.02.

	Spearman correlation r value	p value
DOI vs Grade	.531	0.001

For each unit increase in the duration, there is increase in grade of defect as shown by spearman correlation r value of 0.531.

CASE ILLUSTRATION:

GRADE -1



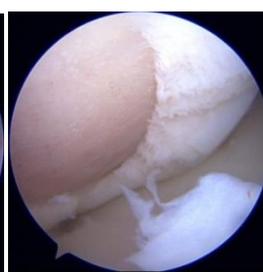
GRADE 2



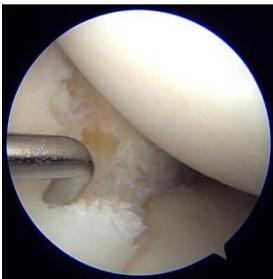
GRADE-3



GRADE-4



LATERAL MENISCAL DEFECT



MEDIAL MENISCAL DEFECT



DISCUSSION

Our findings shows a significant increase in the incidence of cartilage defects with the increase in the duration of the injury. The involvement of medial meniscal tears was more in the patients operated after 6 months of injury.

In our study we found that males were more commonly involved than the females. There were 79.31% males whereas the females involved were 20.68%. This may be due to male predominance in RTA and sports and more time spent in outdoor activities than females. It is similar to the study done by **Seyed Mohammed Tahamiet al¹⁰** where he showed that males were more commonly involved than the females with around 86.7% males and only 13.3 percent females in their group without defects and 93.3% males in the other group with cartilage defects.

The Mean age involved in our study was 29 years with more patients in age group between 20-25 years. In the study done by **George A.C Murrell et al¹¹**, the mean age of the patients in the study was 26 years. In the study done by **S.Church et al¹²**, the mean age in the study were 25,27,28 and 30 among the groups that were in the study.

In our study we found that the grade 1 was the commonest defect in patients operated before 6 months from injury whereas grade 2 defects have doubled in the patients operated 6 months after injury. Grade 3 and Grade 4 defects were seen only in patients operated after 6 months from injury. **S.Church et al¹²** in their study found that incidence of cartilage injury of grades 1,2,3 and 4(French Society of Arthroscopy Grade of Degenerative changes) was higher in the delayed ACL surgery group(operated after 12 months) compared with the early group(surgery before 12 months). The incidence of grade 2,3,4 were tripled in the delayed group whereas the grade 1 defects were doubled in the delayed group. **Kluczynski MA et al¹³** in their study showed delay in ACL reconstruction of greater than 1 year resulted in increased number, size and grade of the chondral defects.

In our study the medial femoral condyle articular cartilage was most commonly affected which was 56.66%. The next most common site was the medial tibial plateau articular cartilage which was 17%. This is similar to the study done by **Shreyase Amin et al¹⁴** with a study

population of 265 osteoarthritis patients in which he came to the conclusion that the patients with complete ACL tear increases the risk for cartilage loss at the medial tibiofemoral compartment.

Our findings showed that 62.5% of medial meniscus tears in patients operated after 6 months of injury with 37.5% of tears in patients operated before 6 months of injury. These findings are similar to a study where it was shown that medial meniscal tears are more common in the late surgery group (operated after 12 months of injury) whereas incidence of lateral meniscal tears remained relatively unchanged with time¹⁵

In acute injuries, lateral meniscal tears were more common (83.33% vs 37.5%) whereas in chronic ACL tears, medial meniscus was more commonly involved (62.5% vs 16.66%). These findings support the views of Fowler, Woods and Chapman¹⁶ who stated that lateral meniscus injury occurs more frequently in acute ACL tears while incidence of medial meniscus injury increases with the time. Medial meniscus is less mobile due its secure attachment to the tibial surface. The lateral meniscus is more mobile and able to translate more freely playing less significant role in stabilising ACL deficient knees.

Some patients had both cartilage and meniscal defects. 2 patients with medial meniscus tear were found to have grade 3 defects and 1 patient with lateral meniscus tear was found to have grade 1 defect. The menisci play an important role in the normal functioning of the knee joint by increasing the joint congruency and surface area, thereby reducing the articular cartilage stress, increases joint stability and increasing shock absorbance. Meniscal loss can reduce the total contact area of the tibial plateau by 50-75% resulting in increased stress on tibial plateau¹⁷ and femoral condyle¹⁸ of the affected compartment.

Kannus and Jarvinen¹⁹ reported in 1987 with a population of 49 patients with ACL insufficiency treated non operatively and examined at an average of 8 years after injury. Post traumatic arthritis was evident in 34(70%) of the patients, in the eminence of tibia and in the medial condyles of the femur and tibia, as well as narrowing of the medial and lateral joint spaces.

In 1994, Drongowski et al²⁰ reviewed the condition of 99 patients with ACL insufficiency with a mean follow up of 4 years and found those with associated cartilage injury is more likely

to do poorly in a non operative rehabilitation program stressing physical therapy than those without cartilage injury.

LIMITATION

- As the study was limited to only 31 patients, it would have been better if the study was done in a larger group.
- The follow up of the patients was not a part of the study. It would have helped to know the status of cartilage defects after reconstruction.

CONCLUSION

- The incidence of Cartilage defects was found to be increasing with the delay in the ACL reconstruction as shown by the significant p value.
- The articular cartilage at the medial femoral condyle is most common involved site for cartilage loss after ACL injury.
- Medial meniscus tears increases with increase in duration of injury whereas the lateral meniscal tears were observed to have torn along with the ACL tear as seen in the early group
- Earlier ACL reconstruction helps in prevention of secondary injury to the intraarticular structures in the knee.

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