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ORIGINAL ARTICLE

Comparison of Anterior-Cruciate Ligament Tear in Adults and Adolescent Patients

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ABSTRACT

Objective: To compare the anterior-cruciate ligament tear in adults and adolescent patients.
Study Design: Retrospective study
Place and Duration of Study: Department of Orthopaedics, Pak Red Crescent Medical & Dental College, Dina Nath from 1st January 2020 to 31st December 2021.
Methodology: One hundred patients were enrolled and they divided into two groups, each having 50 patients. Group I had patients within the age group 12-20 years while in Group II had patients within the age of >20 years. Demographic details of each patient and their clinical history was recorded. A radiological information system applied for imaging interpretation with neutral-rotation of knee up to 10-15º flexion.
Results: The mean age of group I patients was 17.5±1.5 years and group II patients was 31.2±2.1 years with more males between both groups than females. There were 19 right and 31 left knees in group I and 21 right and 29 left knees in group II respectively. The tibial-internal rotation had a comparatively significant degree increase in group II in comparison with group I.
Conclusion: In adults the tibial-internal rotation had a comparatively significant degree increase than adolescents.
Keywords: Anterior-cruciate ligament, Knee, Tibial rotation

INTRODUCTION

Anterior tibia bone translations and internal-rotation in relation to femur is contributed by a structure known as anterior-cruciate ligament (ACL).[1-6] There have been various factors associated with ACL tears including its own integrity, internal-tibial rotation lateral notch sign of the femur as well as translation of anterior tibia. This could be identified through magnetic resonance imagining technique. Bone contusion osculation can also result into ACL tears.[7-11]

The MRI findings of ACL deficient knee has elaborated the fact that static instability has been noticed in such cases with higher level of translation of anterior tibia.[12] A cut off value as been defined for partial and complete ACL tear as 3.5 mm for partial and 5.5mm for complete ACL tear.[8]

There has been scarcity of the data which could compare the ACL deficient know MRO imaging and identify the major factors for the ACL tear within adults and adolescent patients. The present study was therefore conducted for targeting the competitive analysis of ACL in adolescent and adult patient population. The hypothesis of this study was that a variance exists in the internal tibia rotation magnitude in ACL deficient knee of adults than adolescents.

MATERIALS AND METHODS

This retrospective study was conducted at Department of Orthopaedics, Pak Red Crescent Medical & Dental College, Dina Nath from 1st January 2020 to 31st December 2021. One hundred patients were enrolled and they divided into two groups each having 50 patients. Group I had patients within the age group 12-20 years while in Group II had patients within the age of >20 years. Each patient's was given a written informed consent for signature and proper acceptance of being a study participant with complete permission. Those patients who had incomplete data information, poor MRI image quality with thickness of slice as >3mm, ACL surgical history, concomitant fractures or having injuries to the knee ligaments were excluded from the study. Demographic details of each patient and their clinical history was recorded. INFINITT PACS was the radiological information system applied for imaging interpretation with neutral-rotation of knee up to 10-15º flexion. The tibial-translation was measured in accordance to the standard protocol. Imaging using proton density weight (sagittal plane) and lateral-formal condyle (mid-sagittal plane) was determined with assisting of coronal imaging. Two vertical-lines were made posteriorly to the subchondral-bone of the lateral-formal condyle as well as lateral tibial-condyle. Tibial translation was considered through shortest distance presented between two vertical lines. Positive value was presented in anterior-translation while negative value was presented in cases of posterior-translation. The rotation of the femur was measured through the image revealing most obvious point on posterior-femoral condyle and tibial rotation through axial imaging. The statistical analysis was performed using SPSS version 26.0 with using Chi square and p value <0.05 for significance.

RESULTS

The mean age of group I patients was 17.5±1.5 years and group II patients was 31.2±2.1 years. There were more males in both groups with 68% in group I where as 70% in group II respectively (Table 1). There were 19 right and 31 left knees in group I and 21 right and 29 left knee in group II respectively. However there was no significant (P=0.106) difference among both groups (Table 2).

The group I for anterior tibial translation showed an increase in measurement than Group II but with no significant difference while the tibial-internal rotation had a comparatively significant degree increase in group II in comparison with Group I. The ICC data measured showed excellent reliance within the anterior tibial-translation and tibial-internal rotation respectively (Table 3).

Table 1: Distribution of age and gender in group I and group II (n=100)

Variable	Group I		Group II	
	No.	%	No.	%
Age in years				
12-15	13	26.0	-	-
16-20	37	64.0	-	-
21-35	-	-	15	30.0
36-40	-	-	25	50.0
41-45	-	-	10	20.0
Gender				
Male	29	68.0	35	70.0
Females	21	42.0	15	30.0

Table 2: Comparison of laterality between group I and II

Group	Left Knee	Right Knee	P value
I	19	31	0.106
II	21	29	
Total	40	60	

Table 3: Comparison of tibial translation and internal rotation in group I and II

Group	Anterior tibial-translation	Tibial-internal rotation	P value
Group I	5.1±4.2mm	4.1±5.5º	0.075
Group II	4.7±4.3mm	5.7±5.1º	0.031
ICC reliability	0.965	0.962	--

DISCUSSION

Anterior tibial translation as well as internal tibial rotation have been studied in literature and proven for their association with the ACL tear secondary clinical signs and ACL knee deficient conditions.[8] Their presentation between adults and adolescent has however not been clearly reported in previous studies. The current study as some other available literature supported that the adults have higher tibial internal rotation in comparison to the adolescent groups.[13]

Indirect ACL tear sign has been observed through anterior-tibial translation where studies have shown that increased tibial translation in patients with ACL complete tear than those with intact ACL.[12] The ACL deficient follow up studies have also shown increased anterior translation in comparison to the intact ACL as also mentioned earlier.[4] In the present study anterior tibial translation magnitude was found to be similar within adults and adolescent groups with ACL deficient knees referring to the fact that cut off determined for adults in this context could also be applied for the adolescent groups.

A femoro-tibial angle within the range of 4.9-5.5 degree is indicated as complete ACL tear in previous literature.[6] It has been observed that adult patients having ACL tears presents higher tibial-internal rotation which might attribute to the fact that affiliated injuries to the knee are more common in the adults.[14,15] Due to variance in internal tibial rotation a clinician should take required precaution for establishing cut off ranges for the ACL tear diagnostics between adult populations in comparison to the adolescents.[16,17]

CONCLUSION

Adults have higher tibial internal rotation in comparison to the adolescent groups. Outstanding reliance within the anterior tibial-translation and tibial-internal rotation was observed by ICC data.

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