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Research paper

Role of posterior tibial slope in ACL deficient Indian population

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ABSTRACT

Purpose: Posterior tibial slope (PTS) is a bony factor contributing to the anteroposterior stability of knee. It is believed that increased PTS has been associated with ACL injury. The aim of this study is to identify an increased posterior tibial slope as a possible risk factor for ACL injury in Indian population.

Methods: Prospective case control study was conducted in Bajaj orthopaedic sports clinic, Delhi. 55 patients were included, in which 27 patients with ACL tear were included in case group "A" and remaining 28 patients with intact ACL in control group "B". Inclusion criteria: Age – 15–55 years, group "A" – patient diagnosed with ACL tear clinically and radiologically on MRI knee and presented within 3 months of injury, group "B" – patient with intact ACL and got their MRI knee done for other knee pathologies. Exclusion criteria: Age >55 years, poor quality MRI, advanced osteoarthritis classified as >grade 2 in Outerbridge classification, multiple ligamentous instability, non-Indian and Patient with ACL tear presenting >3 months after injury. Using MRI, PTS was calculated and compared individually for medial and lateral tibial condyle.

Results: The average PTS in case group was 3.95 and 4.74 for medial and lateral tibial condyle respectively. PTS in control group was less than case group with mean value of 0.03 and −0.38 for medial and lateral condyle respectively with statistically significant outcomes (p value <0.05) both for medial and lateral slope.

Conclusion: In Indian population, increased PTS can be concluded as a significant risk factor in ACL injury. Though, posterior tibial slope cannot be considered as an isolated risk factor.

1. Introduction

The incidence of anterior cruciate ligament (ACL) injuries has increased in last few decades.[1,2] Multiple predisposing factors have been quoted in the pathophysiology of ACL tear. Anatomical factors like inter-condylar notch index, body mass index, anatomic alignment etc. are included in intrinsic factors along with hormonal, neuromuscular and familial. Factors like playing surface, shoe type, weather condition, and type of sport are included in extrinsic risk factors.[3–7] Identifying the mechanism of injury and the risk factors involved may help prevent the occurrence of ACL injury.[8–10] Recently, posterior tibial slope (PTS) has been considered as an important risk factor. PTS is a bony factor which contributes to the anteroposterior stability of knee.[11,12] It is believed that the PTS directly affects the loading of the ACL during compressive axial force and therefore increased PTS has been associated with increased strain on ACL which may contribute to the propensity of the ACL to rupture. The medial and lateral PTS are different with reported difference of as much as 27 degrees. A recent study found greater lateral plateau slope in patients with ACL rupture.[13,14] Yet, there is currently no published data investigating the relationship of medial and lateral posterior tibial slope and ACL tear in Indian population. The aim of this study is to identify an increased posterior tibial slope as a possible risk factor for ACL injury in Indian population.

2. Material and methods

A prospective case control study was conducted from January 2014 to December 2014. A total of 55 patients were included in this study, in which 27 patients with ACL tear were included in group "A" i.e. case group and remaining 28 patients with intact ACL were included in group "B" i.e. control group.

Inclusion criteria:-

1. Age – 15–55 years

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2. Group "A" – patient diagnosed with ACL tear clinically and radiologically on MRI knee and presented within 3 months of injury.
3. Group "B" – patient who got their MRI knee done for other knee pathologies but with intact ACL.

Exclusion criteria:-

1. Age > 55 years
2. Poor quality MRI scan
3. Advanced Osteoarthritis classified as > grade 2 on Outerbridge classification.
4. Multiple ligamentous instability
5. Patient with ACL tear presenting >3 months after injury
6. Non Indian (foreigners)

Informed written consent was taken from each patient regarding participation in this study and future publication of this study. Technique opted for measuring PTS was same as described by Hudek et al.15 MRI knee of all patients were done using 1.5 Tesla MRI scan with slice thickness of 3 mm. All the MRI's were done at the same centre. Patient was placed in same position during MRI which was achieved by fixation of hip and determination of points on tibia. Intermediate weighted sagittal sections were used for each patient. The MRI sagittal slices were set manually by radiologist orthogonal to a line connecting the posterior femoral condyles. Measurement of bony PTS was done following 3 steps. In first step, central sagittal image was chosen, which was determined by the concave shape of tibial attachment of PCL, inter-condylar eminence and the anterior and the posterior tibial cortex. Secondly, two circles were made, one cranial and one caudal in tibial head. The cranial circle was made such that it touches the anterior, posterior and cranial tibial cortex. The caudal circle had to touch the anterior and posterior cortex border. Moreover caudal circle was placed such that its circumference lied at the centre of cranial circle. Finally the longitudinal axis was drawn using two circles (Fig. 1). Orthogonal to the longitudinal axis was made; simultaneously the tangent was drawn to lateral and medial tibial plateau. Then, the posterior tibial slope of medial and lateral tibial plateau was measured independently by two observers twice (Fig. 2). Mean of their values were recorded as final readings. Results were analysed comparing posterior tibial slope between two groups i.e. ACL injured and ACL intact.

3. Results

SPSS SOFTWARE 20.0 was used to analyse the results, using independent student *t*-test as a statistics tool.

In group "A", 17 patients were male out of 27. Mean age of males was 35.7 years (range 18–51 years). Ten patients were females with mean age of 35.8 years (range 16–51 years). The cause of ACL tear was road traffic accident in 8 patients, playing soccer in 10 patients, playing basketball in 5 patients and other causes in remaining 5 patients (Table 1). Mechanism of injury in 20 patients (except RTA) was non-contact type of ACL injury.

In group "B" also 13 patients were male with mean age of 36.6 years (range 24-52 years) and 15 were female patients with an average age of 39.1 years (range 19-50 years). They were either found to have isolated meniscal injuries, or no pathology (Table 2).

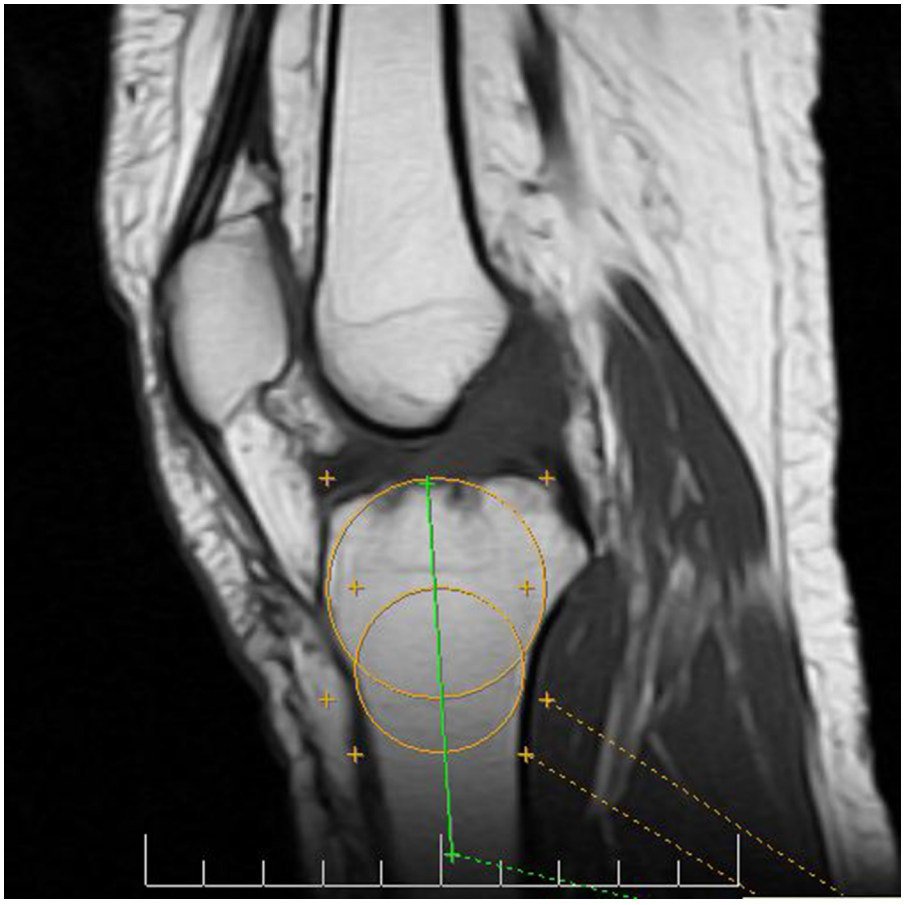

Fig. 1. Sagittal section of intermediate weighted image of MRI showing method of determining longitudinal axis of tibia.