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POSTEROLATERAL CORNER INJURIES WITH ASSOCIATED LIGAMENT INJURIES OF THE KNEE: A RETROSPECTIVE STUDY

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Abstract:

Background: Posterolateral corner of knee consists of a number of static and dynamic restraints. Static restraints are the lateral collateral ligament, arcuate ligament, fabellofibular ligament, popliteofibular ligament, joint capsule and coronary ligaments. Dynamic restraints are biceps femoris and popliteus muscle tendon units. Aim of this study is to emphasize on early recognition of injury to the posterolateral corner and to assess the interval between the injury and diagnosis in patients with this injury.

Materials and Methods: Hospital records of 75 patients who had been referred with suspected posterolateral corner injury of the knee were reviewed between June 2013 – June 2016 at St. John's Medical College Hospital, Bangalore. These injuries were diagnosed based on a combination of clinical assessment, imaging and arthroscopy.

Results: 56 patients (75%) presented within 24 hours of injury with mean presentation at 5 days (Range 0-15) after the injury. There was a mean delay to the diagnosis of injury to the posterolateral corner of 25 months (Range 0-300) from the time of injury. Injuries in 54 patients (72%) were not identified at the time of initial presentation, with the injury to the posterolateral corner only recognized in patients who had multiple ligamentous injuries. The correct diagnosis, including injury to the posterolateral corner, had only been made in 38 patients (50%) at the time of referral. MRI correctly identified 19/20 cases when performed within 12 weeks of injury.

Discussion: Injury to the posterolateral corner of the knee frequently remains overlooked. Reasons for not diagnosing this injury include, failure to perform appropriate clinical examination, using tests with low sensitivity, poor training in the assessment of ligament laxity and failure to get MRI done. In our study, the most common mechanism of injury was a non-contact twisting injury.

Conclusion: Our study focusses on the need for examination and investigation of acute ligamentous injuries at the knee with symptoms of instability.

Key-words: *Posterolateral / corner / MRI / ligament / drive through sign*

Introduction:

Knee is the most commonly injured joint in the body. Posterolateral corner injuries constitute of 16% all knee injuries and are responsible for sustained instability and failure of concomitant reconstructions if not recognized. Injuries to the posterolateral corner may be missed during during the initial assessment of a patient. Failure to detect these injuries has been shown to be an important cause of recurrent instability and failed cruciate ligament reconstructions. Without proper recognition and treatment, significant chronic pain, chronic posterolateral instability and osteoarthritis may occur. The main structures that provide stability to the lateral aspect of the knee are the fibular collateral ligament, popliteus and popliteofibular ligament.[1] The posterolateral complex and the posterior cruciate ligament have a synergistic relationship, with the PCL acting as secondary restraint preventing external rotation and the posterolateral corner helping in resisting posterior tibial translation, mostly in lower degrees of flexion. Posterolateral corner injuries is more commonly injured in conjunction with the posterior cruciate ligament or multiple ligamentous injuries.[2] Posterolateral corner is designed to resist varus stress, external rotation of tibia and posterior translocation of the tibia. MRI can accurately visualize posterolateral corner injuries with associated ligament injuries and early diagnosis may have a significant impact on the surgical treatment plan and patient outcomes. Aim of the study, therefore was to assess the interval between injury and diagnosis in patients with posterolateral corner injury of the knee.

Materials And Methods:

We retrospectively reviewed the hospital records of 75 patients with injury to the posterolateral coner injury of knee who presented to St. John's Medical College Hospital, Bangalore between June 2013 - June 2016. These injuries were diagnosed based on a combination of clinical assessment, imaging and arthroscopy. Hospital records were reviewed to identify those patients with an associated ligament injury, the mechanism of injury, interval to diagnosis, whether injury was identified at the initial presentation or at the time of referral and subjective history. Total of 75 patients with a posterolateral corner injury were identified. There were 67 males and 8 females between the age groups 18-55 (Mean age 36.5 years) at the time of injury.

Clinical assessment was done with tibial external rotation (Dial) test with the patient prone at both 30^0 and 90^0 of flexion. We visually assessed external rotation in supine position to rule out anteromedial rotation instability as the cause of increased external tibial rotation. The posterolateral drawer test and external rotation recurvatum tests were performed as described by Hughston and Norwood. Varus stress tests was performed at both 0^0 and 30^0 flexion and reverse pivot-shift test was performed by positioningthe patient in supine position with the knee flexed to 90◦.Signs of varus thrust gait pattern were used to aid in diagnosis. With arthroscopy, assessment of "drive through sign" done in which there is more than 1 cm of lateral opening and exceptional posterior visualization of lateral meniscus.

Results:

9 (12%) injuries were isolated, while 32 (43%) were associated with injuries to ACL, 21 (28%) with injuries to PCL, 12 (16%) with an injury to both ACL and PCL and one (1.5%) was combined with an injury to ACL, PCL and medial complex. A total of 71 (94%) of the patients complained of instability to the knee. The causes of injury were sports related, such as football in 49 (65%) of patients and due to road traffic accidents in 21 (28%) or as a result of falling in 5 (7%) patients.

Presentation to hospital occurred within one day of injury in 56 (75%) patients although the mean time to presentation from injury was 5 days (Range 0-15). In all, 54 of the injuries (72%) were not diagnosed correctly at presentation. Only those associated with multi-ligamentous injuries in the 14 patients with a dislocation of the knee were diagnosed correctly at presentation. At the time of referral more than half of the patients remained incorrectly diagnosed, with referral being made by orthopaedic consultants, orthopaedic registrars, general practitioners, physiotherapists and sports-medicine related doctors. The alternative diagnoses given were ACL injuries, PCL injuries, combined ACL-PCL injuries, dislocations, lateral collateral ligament injuries, meniscal injuries and chondral defects.

15 (20%) of patients were seen within two weeks of the injury with the remainder seen later. The mean delay to diagnosis was 25 months (Range 0 days-300 months). If 5 patients were excluded as outliers, who had waited over 7 years for a diagnosis, the mean delay to diagnosis was 12.5 months (Range 0-75).

Total of 45 (60%) patients had undergone a modified Larson reconstruction and 6 (8%) patients underwent repair to the posterolateral corner. The remaining patients were

either awaiting treatment or were stabilized after high tibial osteotomy and did not wish to proceed with anatomic reconstruction. Plain radiography was performed on 56 (75%) patients. Weight bearing AP views of the knee showed lateral joint opening in 42 (56%) patients with injuries and 33 (44%) patients needing an opening wedge high tibial osteotomy to correct varus malalignment before ligament reconstruction.

MRI was performed on 20 patients within 12 weeks of injury and on another 20 patients at more than 12 weeks after the injury. Posterolateral corner injuries were identified in all but one who underwent scanning within 12 weeks of injury.

Discussion:

Most cases of PLC injuries present with a history of acute trauma related to sports injuries or road traffic accidents. Blunt trauma to the anteromedial aspect of the tibia with a posteromedial directed force, knee hyperextension and external tibial rotation over a fixed foot are the most common injury mechanisms.[3] The primary role of the posterolateral corner in preventing anterior tibial translation in a normal knee is minimal but in an ACL deficient knee, the medial meniscus and the posterolateral corner function as secondary stabilizers with the PLC acting in the early degrees of flexion. Posterior translation is mainly controlled by the PCL, but the PLC acts as a secondary restraint in early degrees of knee flexion. Combined PCL and PLC injuries present with greatly increased posterior tibial translation compared to isolated PCL injuries.

Detailed examination of the affected knee should be performed to assess range of motion, patellar instability, extensor function and to look for possible concomitant injuries. Tests to assess posterolateral instability include the varus stress test, posterolateral drawer test, dial test, reverse pivot-shift test and external rotation recurvatum test.[4] Gait must be assessed for varus injury or hyperextension patterns, and the overall limb alignment must be evaluated because this could change the surgical plan for chronic injuries.

The varus stress test is performed by positioning the kneeat both 30◦of flexion and in full extension while applying a varus force through the patient's foot and ankle with one handand stabilizing the knee at the proximal thigh using the otherhand. The examiner should place his fingers at the joint lineto grade joint line opening relative to the contralateral knee. Apositive varus stress test with opening of the lateral compartment at 30^0 of knee flexion but not at full extension indicatesan isolated complete tear of the FCL. If gapping is still presentat full extension, concomitant cruciate injury is presumed.

The posterolateral drawer test is performed with thepatient in supine position, the knee flexed at 90◦, and thefoot 15◦externally rotated and stabilized by the examiner. Aposterior directed force is applied against the tibia and apositive test consists of increased posterior translation andexternal rotation when compared to the contralateral side, indicating injury of FCL, popliteus tendon, and popliteofibularligament.[5]

With the patient in the supine position, the external rotation recurvatum test is performed by lifting the patient's legby the great toe while stabilizing the distal thigh with theother hand. The amount of genu recurvatum produced by the maneuver should be compared to the uninjured side. Measurement of the heal heights using a ruler can objectivelydetermine the amount of recurvatum.[6] A negative test should be interpreted with caution due to the high incidence of falsenegative results.

The reverse pivot-shift test is performed by positioningthe patient in supine position with the knee flexed to 90◦.A valgus load and external rotation force is applied whilethe knee is slowly extended. If a PLC injury is present, the load will cause posterolateral subluxation of the tibialplateau and, when the knee reaches around 30◦of flexion,the iliotibial band will cause to tibia to abruptly reduce. Apositive reverse pivot-shift must always be compared to theuninjured side because it can be positive in 35% of normalknees.

Rotational stability can be evaluated using the dial test.[7] The dial test is performed with the patient both in the proneand supine positions by stabilizing the patient's thigh andapplying an external rotation force at the patient's ankle.The test is performed both at 30◦of knee flexion and at 90◦of knee flexion. If the patient presents with a PLC injury, a side-to-side difference of more than 10◦of external rotation is expected at 30◦of flexion. Because the PCL functionsas a secondary stabilizer of external rotation, especially athigher degrees of flexion, a decrease in the external rotationshould be seen in isolated PLC injuries at 90◦. If the externalrotation increases at 90◦, a combined PLC and PCL injury ispresent.[5]

In our study 54 (72%) patients had been incorrectly diagnosed at the time of initial presentation, and those in whom the diagnosis had been correctly established had suffered

multiple ligament injuries. The correct diagnosis, including injury to the posterolateral corner, had only been made in 38 patients (50%) at the time of referral.

We found an extensive delay to diagnosis in spite of the fact that these patients presented promptly after injury. Acute repair is generally considered to be better than reconstruction at a later age. Of the 51 patients who had already undergone ligament stabilization, 45 had reconstruction rather than repair. This may be because only 20 (26.7%) of patients were referred within the first 2 weeks after injury, which is the period when anatomical repair is feasible. In a study by Baker et al only 15 of the 157 posterolateral corner injuries were identified early enough to have anatomical repair.

We found that injuries of the posterolateral corner were most often combined with injury to the ACL, secondarily with that of the PCL, and only 12% were isolated. Our results were comparable with those of previous studies showing that the posterolateral corner is rarely injured in isolation, although LaPrade et al found a greater incidence of isolated injury to the posterolateral corner than we did (26.8%). The distribution of combined injuries in our series was similar to that found by LaPrade et al.[8] Instability was found the most important feature associated with these injuries, both in our series and elsewhere. Careful evaluation of the posterolateral corner should be carried out in all patient with suspected cruciate ligament pathology as most injuries to the posterolateral corner occur in association with an injury to the cruciate ligaments.

When performed within 12 weeks of injury, MRI correctly identified all but one of the injuries to the posterolateral corner, but when performed after 12 weeks of injury it was considerably less accurate. In our study the commonest mechanism of injury was a non-contact twisting injury mostly sports related or road traffic accidents. This agrees with the findings of LaPrade and Terry who in a prospective study found that 51% of patients who had suffered injury to the posterolateral corner had a history of either a twisting injury or non-contact hyperextension.

Conclusion:

Diagnosis of injury of the posterolateral corner is often overlooked in cases of multiple ligament injuries. MRI accurately identifies a posterolateral corner injury in the acute phase, but may be of limited use at longer intervals. We conclude that a negative MRI, especially when performed at more than 12 weeks after injury does not exclude the possibility of an injury to the posterolateral corner of knee. Injuries of the posterolateral corner of knee are commonly associated with symptoms of instability. Posterolateral corner injury, also known as the "dark side of the knee", is commonly associated with multi-ligamentous injuries and improved understanding of the anatomy and biomechanics can lead to improved diagnostics and development of surgical techniques that can restore knee stability.

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Ethical clearance: Obtained from Institutional Ethical Review Board (IERB), St. John's Medical College, Bangalore 560-034.

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