

Relation between Clinical and Arthroscopic Findings of Knee Injuries

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A total of 44 cases studied aimed to find the relation between clinical and arthroscopy findings of knee injuries. Over 54% of the subjects received injuries during sports activities and 45.3% received them while they were working. On examination, quadriceps wasting, positive Lachman test and positive anterior drawer test were frequently observed (90.9%, 75% and 75% respectively). Positive McMurray test and full extension of knee were found in 50% and 100% cases respectively. Knee flexion was observed to be restricted in majority of the cases (75%). Clinical diagnosis demonstrates that over three-quarters (77.2%) of the subjects had anterior cruciate ligament (ACL) injury and 50% medial meniscus injury. Very few were diagnosed as having posterior cruciate ligament (PCL) and lateral meniscus injury. Arthroscopically 33 (75%) subjects were diagnosed as having ACL injury and 11 (25%) with medial meniscus injury. Only 2 (4.6%) and 3 (6.6%) subjects had PCL and lateral meniscus injury respectively. Clinically 29 (66%) subjects were diagnosed as isolated injury and 15 (34%) diagnosed as combined injury. Arthroscopically over 68% were diagnosed as isolated injury and the rest were diagnosed as combined injury.

The overall diagnostic accuracy of our study was 89.7% for ACL, 100% for PCL, 75% for medial meniscus injury and 95.4% for lateral meniscus injury. The sensitivity of clinical diagnosis was 93.4% for ACL injury, 100% for PCL and medial meniscus injury and 33.3% lateral meniscus injury. The specificity was 72.7% for ACL injury, 100% for PCL injury, 66.7% for medial meniscus injury and 100% for lateral meniscus injury. The PPV was 91.2% for ACL injury, 100% for PCL injury, 50% for medial meniscus injury and 100% for lateral meniscus injury. The NPV was 80% for ACL injury, 100% for PCL injury, 100% for medial meniscus injury and 95.3% for lateral meniscus injury. The clinical diagnosis for knee injury is highly accurate, particularly for the PCL injury and lateral meniscus injury. The result demonstrated hundred percent sensitivity for PCL injury and medial meniscus injury and hundred percent specificity for PCL injury and lateral meniscus injury.

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Introduction

The knee is the largest joint of the body. It is a mechanically complex joint. The knee is one of the most frequently injured joint because of its anatomical structure, its exposure to external forces and

the functional demands placed on it. Structurally, this is a weak joint, because the articular surfaces are not congruent. The tibial condyles are too small and shallow to hold the large, convex, femoral condyles in place.¹

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Meniscal function is essential to the normal function of the knee joint. The menisci act as a joint filter, compensating for gross incongruity between femoral and tibial articulating surfaces, prevent capsular and synovial impingement during flexion, extension movements, have joint lubricating function, distribute synovial fluid throughout the joint and aiding the nutrition of the articular cartilage.¹

The cruciate ligaments provide both antero-posterior and rotatory stability. They also help to resist excessive valgus and varus angulation. Both cruciate ligaments have a layered structure and some fibres of each ligament are taut in all positions of the knee. Anterior displacement of tibia (the anterior drawer sign) is resisted by posteromedial part of the anterior cruciate ligament and medial capsule. Posterior displacement is prevented by the posterior cruciate ligament.²

Traumatic lesions of the menisci are produced most commonly by rotation as the flexed knee moves toward an extended position. The medial meniscus, being for less mobile on the tibia, can become implated between the condyles and injury can result. The most common location for injury is the posterior horn of the meniscus and longitudinal tears are the most common type of injury. The other types are transverse and oblique tears, a combination of longitudinal and transverse tears, tears associated with cystic menisci, tears associated with discoid menisci.¹

Miller, Warner and Earner classified meniscal tears on the basis of their location in three zones of vascularity- red (fully within the vascular area), red-white (at the border of the vascular area) and white (within the avascular area).³ Knee ligaments often are injured in athletic activities, motor vehicle accidents,

especially those involving motor cycle are common causes of ligament disruptions. Four mechanisms have been described as capable of disrupting the ligamentous structures around the knee; (i) Abduction, flexion and internal rotation of the femur on the tibia, (ii) Adduction flexion and external rotation of the femur on the tibia, (iii) Hyperextension and (iv) Anteroposterior.¹

When the abduction, flexion and internal rotation of the femur on the tibia occur, the medial supporting structures-the medial collateral ligament and the medial capsular ligament are the initial structures injured. If the force is of sufficient magnitude, the anterior cruciate can also be torn. The medial meniscus may be trapped between the condyles of the femur and the tibia and it may be torn at its periphery as the medial structures tear, thus producing "The unhappy triad of O' Donoghue. The mechanism of adduction, flexion and external rotation of femur on the tibia is much less common and produces the primary disruption laterally.¹

In knee injuries diagnostic arthroscopy is a useful tool among all the joints and is most accessible. However, a direct look inside is not a substitute for clinical examination. A detailed history and meticulous assessment of the physical signs are indispensable preliminaries and remain the sheet anchor of diagnosis. It is not that arthroscopy fails to disclose what is there; the problem is that it shows too much and the clinician will still have to decide which of the abnormalities detected are the cause of the patient's complaints (Solomon et al, 2001).² Arthroscopy should be considered as a diagnostic aid used in conjunction with a good history, complete physical examination and appropriate radiographs.⁴ In our country, most patients are from poor socio-economic

condition, MRI bears an extra financial burden to them.

Methods

This study was a cross sectional, observational study conducted at National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Dhaka between July 2008 to June 2010. Study population were the patients of knee injury admitted at NITOR. The Inclusion criteria were Cruciate ligaments and/or menisci injury leading to persistent instability of knee for at least 2 months and non-responsive to conservative treatment without osteoarthritis and associated intra-articular fracture about knee. The Exclusion criteria were Patients of cruciate ligaments and/or menisci injury with previously operated for knee injuries, osteoarthritis of knee, cruciate ligaments and menisci injury associated with intra articular fracture about knee. A total of 44 cases fulfilling the above mentioned enrollment criteria were consecutively included in the study. Data were collected using a structured questionnaire (research instrument) which contained all the key variables of interest.

Detailed procedure: Detailed history of the patients of cruciate ligaments and/or menisci injury admitted in NITOR was taken and clinical examinations were performed. Plain radiographical examination of knee were performed to detect any intra articular fracture, pathology and to exclude the diagnostic dilemma selecting the cases who met the eligibility criteria. Arthroscopic evaluation was done and diagnosis was made. Postoperatively the patients were immobilized with analgesic, and antibiotic support.

Statistical analysis: Data were processed and analysed using SPSS (Statistical package for Socscial Sciences) version 11.5. The test statistics used to analyse the data were descriptive statistics like frequency,

corresponding percentage, mean and standard deviation. Summarized data were then presented in the forms of tables and charts with interpretation.

Results

A total of 44 subjects of knee injury were evaluated clinically and arthroscopically to find out the closeness of the two diagnostic procedures. The findings obtained from data analyses are presented below.

Affected knee:

Table I shows the distribution of the subjects by their affected knee. Over half (56.9%) of the subjects had right knee affected and the rest 19(43.1%) left knee affected.

Table I: Distribution of subjects by affected knee (n = 44)

Affected knee	Frequency	Percentage
Right	25	56.9
Left	19	43.1

Mechanism Of Injury: Evaluation of mechanism of knee injury shows that nearly 55% of the injuries were due to abduction, flexion and internal rotation of femur upon tibia and 4.6% of injuries occurred due to adduction, flexion and external rotation of femur upon tibia. Hyperextension of knee caused 22.8% of injuries and antero-posterior displacement caused 18% of injuries (Table II).

Clinical diagnosis: Clinical diagnosis demonstrates that over three-quarters (77.2%) of the subjects had anterior cruciate ligament (ACL) injury and 50% medial meniscus injury. Very few were diagnosed as having posterior cruciate ligament (PCL) and lateral meniscus injury. Isolated injuries were found 66% and combined injuries were 34%.

Among the combined injuries, 14(31.7%) were anterior cruciate ligament and medial meniscus and 01(2.3%) were anterior cruciate ligament and posterior cruciate ligament (Table III).

Table II. Distribution of patients by mechanism of injury (n = 44)

Mechanism	Frequency	%
Abduction + Flexion + Internal rotation of femur upon tibia	24	54.6
Adduction + Flexion + External rotation of femur upon tibia	02	4.6
Hyperextension of knee	10	22.8
Antero-posterior displacement	08	18.0

Table III. Distribution of subjects by clinical diagnosis (n = 44*)

Clinical diagnosis	Frequency	Percentage
ACL injury	34	77.2
PCL injury	02	4.6
Medial meniscus injury	22	50
Lateral Meniscus injury	01	2.2
Isolated injury	29	66.0
Combined injury-	15	34.0
ACL+MM	14	31.7
ACL+PCL	01	2.3

* Multiple responses

Arthroscopic diagnosis (fig 1): Arthroscopically 33(75%) subjects were diagnosed as having ACL injury, out of them complete tear were 30(68.2%) and partial tear were 03(6.8%). 11(25%) with medial meniscus injury, out of them bucket handle tear were 05(11.4%), oblique tear and posterior horn tear both were 03(6.8%). Only 2(4.6%) had complete PCL tear and 03(6.6%) had lateral meniscus injury, out of them 02(4.4%) had anterior horn and 01(2.2%) posterior horn injury. Isolated injuries were found 68.1% and combined injuries were

20.4%, among them ACL & Medial meniscus were 07(16.0%). ACL & Lateral meniscus and ACL,PCL & Lateral Meniscus both were 01(2.2%) (Table IV).



Figure 1. Arthroscopic examination of knee

Table IV. Distribution of subjects by arthroscopic diagnosis (n = 44*)

Arthroscopic diagnosis	Frequency	Percentage
ACL injury-	33	75.0
Complete tear	30	68.2
Partial tear	03	6.8
PCL injury(Complete tear)	02	4.6
Medial meniscus injury	11	25
Lateral Meniscus injury-	03	6.6
Anterior horn	02	4.4
Posterior horn	01	2.2
Isolated injury	30	68.1
Combined injury-	09	20.4
ACL+ MM	07	16.0
ACL + LM	01	2.2
ACL + PCL + LM	01	2.2

* Multiple responses

Accuracy of Clinical Diagnosis in different Injury type: Table V shows the accuracy of clinical diagnosis as a screening test in diagnosing knee injury considering Arthroscopy as gold standard. The overall diagnostic accuracy of ACL, PCL, Medial

Meniscus and Lateral Meniscus injury is 89.7%, 100%, 75% and 95.4% respectively.

Table V. Accuracy of clinical diagnosis by different injury type

Injury Type	Sensitivity %	Specificity %	PPV %	NPV %	Accuracy %
ACL	93.4	72.7	91.2	80	89.7
PCL	100	100	100	100	100
Medial Meniscus	100	66.7	50	100	75
Lateral Meniscus	33.3	100	100	95.3	95.4

Discussion

Clinical diagnosis demonstrates that over three-quarters (77.2%) of the subjects had anterior cruciate ligament (ACL) injury and 50% medial meniscus injury. 02(4.6%) were diagnosed as having posterior cruciate ligament (PCL) and 01(2.2%) were lateral meniscus injury. Arthroscopically 75% of the subjects were diagnosed as having ACL injury and 25% with medial meniscus injury. Only 4.6% and 6.6% subjects had PCL and lateral meniscus injuries respectively. Madhusudhan (2008)⁵ reported 63.6% patients with PCL injuries and 36.4% patients with anterior cruciate ligament injuries, 36.4% medial meniscus injury and 27.3% lateral meniscus injuries clinically. These findings are not consistent with findings of our study.

In clinical diagnosis 34(77.2%) were ACL injury, out of them 31(70.6%) diagnosed as ACL injury arthroscopically. 02 (4.6%) subjects, who were not dignosed as ACL injury clinically, were diagnosed as ACL injury arthroscopically.

Arthroscopically, out of 33 subjects complete tear were 30(68.2%) and partial tear were 03(6.8%). 02(4.6%) had complete PCL tear.

Jah (2005)⁶ reported accuracy of clinical diagnosis for ACL, PCL, medial and lateral menisci injury to be 91.4%, 100%, 96.9% and 85.5% respectively. In the present study diagnostic accuracy for medial meniscus was a bit lower than that found in the study of Jah but other components were almost similar. The sensitivities of the clinical diagnosis for the corresponding injuries were 85.7%, 100%, 100% 84.6% respectively and the specificities for the corresponding injuries were 95.9%, 100%, 95.6% and 91.2% respectively. The sensitivities and specificities for ACL and PCL injuries in the present study were almost consistent with findings of Jah but for medial and lateral meniscus they differed widely.

Crawford found sensitivities of clinical diagnosis 86.5% for ACL, 76% for lateral meniscus and 91.4% for medial meniscus and specificity 95.2% for ACL, 93.3% for lateral meniscus and 81.1% for medial meniscus most of which are not consistent with our findings.⁷

Oei and associates (2003) reported sensitivities of clinical diagnosis for ACL 94.4% for lateral meniscus 79.3% and for medial meniscus 93.3% while specificity 94.3% for ACL, 95.7% for lateral meniscus and 88.4% for medial meniscus.⁸ All these findings except sensitivity of lateral meniscus are in close proximity to the findings of the present study.

Conclusion

From the present study, it is clear that, the clinical diagnosis for knee injury is highly accurate, particularly the PCL injury and lateral meniscus injury. Our results also demonstrated hundred percent sensitivity for PCL injury and medial meniscus injury and hundred percent specificity for PCL injury and lateral meniscus injury.

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