ISSN: 0975-1556

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2021; 13(6); 150-154
Original Research Article

To Determine the Frequency of Primary and Secondary Meniscal Tears in Full Vs Partial ACL Injuries, as Well as the Location of Meniscal Tears in Complete Vs Partial ACL Injuries

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Received: 03-07-2021 / Revised: 20-08-2021 / Accepted: 10-09-2021
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Conflict of interest: Nil

Abstract

Aim: To study the meniscal tears associated with complete vs partial anterior cruciate ligament injury. **Methods:** A prospective study was conducted in the Department of Orthopedics, Jawaharlal Nehru Medical College, Hospital, Bhagalpur, Bihar, India from May 2020 to March 2021. 114 patients diagnosed with combined ACL and meniscal injury with a follow up 3months to 1 years of knee injury at our center. The patients were divided into two groups: Complete ACL injury group; 60 knees, mean age 28.2 years) and partial ACL injury group; 54knees, mean age 23.7 years). We compared the two groups with respect to the location of tear. **Results:** The incidence of complete ACL injury was diagnosed with MRI which was 52.63 % and partial ACL injury 47.36%. Regarding the locations of meniscal tears, in complete ACL injury (60 knees), medial meniscal tear was found in 60 %, lateral meniscal tear only in 31.66 %, and bilateral meniscal tears in 8.33 % (5 of 60 knees). In partial ACL injury (54 knees), medial meniscal tear was found in 46.29 % (25 of 54 knees), lateral meniscal tear in 42.59 % (23 of 54 knees), and bilateral meniscal tears in 11.11 % (6 of 54 knees). Medial meniscal tear was commonly associated with complete ACL injury and lateral meniscal tear was commonly associated with partial ACL injury. **Conclusion:** Incidence of medial meniscus tear was more than 50% in complete ACL tear. Lateral meniscus tear was more associated with partial ACL tear compared to complete ACL tear.

Keywords: Meniscus Tear, Bilateral Meniscal Tears, Anterior Cruciate Ligament (ACL) Injury, Orthopedics.

Introduction

Meniscus tears are commonly observed in patients with anterior cruciate ligament (ACL) injuries, with a reported prevalence of approximately 55% to 65%[1-6]. Several studies have shown that associated meniscal tears are strong predictors for the development and progression of knee osteoarthritis (OA) as well as worse patient reported outcomes after ACL reconstruction, especially if a partial or total meniscectomy is performe[7,8]. This observation has led to efforts to preserve as much meniscal tissue as possible, and meniscus repair combined with ACL reconstruction is increasingly preferred over meniscectomy[9].

Whereas medial meniscus tears are more common in patients with chronic ACL insufficiency, lateral meniscus tears are predominately found in acute ACL injuries[10]. Since the complexity of meniscus tears increase in the chronic stage, and tears are less amenable to repair as time passes[11], particularly lateral meniscus tears identified in the early posttraumatic phase may be best suitable for repair. The importance of lateral meniscus repair is emphasized by the fact that lateral meniscectomy is associated with a higher risk for osteoarthritis compared to medial meniscectomy[10]. The pattern of lateral meniscus tears observed in ACL-injured subjects varies greatly and determines subsequent management. Certain tear patterns, such as incomplete longitudinal tears or complete stable longitudinal tears have only minor consequences on knee joint health and can be left in In contrast, other tear patterns, such as root tears, complete radial tears, and bucket-handle tears, are associated with major biomechanical consequences and should be repaired in a timely manner to prevent rapid joint degeneration[11]. Meniscal tears which are horizontal, oblique, radial, bucket handle is more commonly associated with Acute ACL injuries whereas peripheral tears occurring at meniscocapsular junction are more common in conjunction with chronic ACL deficient knees. The presence of associated meniscal tears increases the risk of subsequent degenerative secondary osteoarthritis[12]. In the present study we investigated the incidence of occurrence of primary and secondary meniscal tears associated with complete vs partial ACL injuries. We also aimed to evaluate the location of meniscal tears associated with complete vs partial ACL injuries.

Materials and methods

A prospective study was conducted in the Department of Orthopedics, Jawaharlal Nehru Medical College, Hospital, Bhagalpur, Bihar, India from May 2020 to March 2021. after taking the approval of the protocol review committee and institutional ethics committee.

We collected MRI of 114 patients (114 knees) diagnosed with combined ACL and meniscal injury with a follow up 3months to 1 years of knee injury at our center. The subjects comprised 68 males and 46 Females with mean age of 29.1 (range 20–55) years. The patients were divided into two groups: Complete ACL injury group; 60 knees, mean age 28.2 years) and partial ACL injury group; 54knees, mean age 23.7 years). We compared the two groups with respect to the location of tear. In documenting the location of the tear, we used the classification system described by Cooper *et al.*[13]. This system divides each meniscus into thirds radially. The radial zones are denoted as A, B, and C (A being the posterior third) for the medial meniscus and D, E, and F (F being the posterior third) for the lateral meniscus. A p value less than 0.05 was considered to indicate a significant difference.

Results

The incidence of complete ACL injury was diagnosed with MRI which was 52.63 % (60 of 114 knees) and partial ACL injury 47.36% (54 of 114 knees). Regarding the locations of meniscal tears, in complete ACL injury (60 knees), medial meniscal tear was found in 60 % (36 of 60 knees), lateral meniscal tear only in 31.66 % (19 of 60 knees), and bilateral (including medial and lateral) meniscal tears in 8.33 % (5 of 60 knees).

In partial ACL injury (54 knees), medial meniscal tear was found in 46.29 % (25 of 54 knees), lateral meniscal tear in 42.59 % (23 of 54 knees), and bilateral meniscal tears in 11.11 % (6 of 54 knees). Medial meniscal tear was commonly associated with complete ACL injury and lateral meniscal tear was commonly associated with partial ACL injury. Bucket handle tear was observed in 11 knees (medial: 8 knees, lateral: 3 knees) in complete ACL injury, and 4 knees (medial: 3 knees, lateral: 1

knees) in partial ACL injury, and was more common in the complete ACL group. When meniscal tear locations were classified according to Cooper, the tears in the partial ACL group were frequently located in zones E and F; that is, middle to posterior region of the lateral meniscus. In the complete ACL group, however, there was an increase of tears in zones A and B; that is, middle to posterior region of the medial meniscus. Bucket handle tear was observed in a total of 4 knees (lateral: 1 knees, medial: 3 knees) in the partial ACL group, and 11 knees (lateral: 3 knees, medial 8: knees) in the Complete ACL group, with significantly more bucket handle tears in the complete ACL.

Table 1: Incidence of Partial and Complete ACL injury

	NO.= 114	%
Complete ACL injury	60	52.63 %
Partial ACL injury	54	47.36%

Table 2: Distribution of meniscal tears in ACL-deficient knees

Partial ACL injury	No. =54	%
Medial meniscal tear	25	46.29 %
Lateral meniscal tear	23	42.59 %
Bilateral meniscal tears	6	11.11 %
Complete ACL injury	NO.=60	
Medial meniscal tear	36	60%
Lateral meniscal tear	19	31.6%
Bilateral meniscal tears	5	8.33%

Discussion

The biomechanics of knee during and after ACL injury may help to explain the occurrence of meniscal tears. The most likely combination injury involves external rotation and valgus force on a flexed knee resulting in anteromedial knee instability[14]. The tibia moves forward and rotates laterally with respect to femur. While portion of medial complex and medial tibial plateau are pull forward by these forces. The medial meniscus is held by contraction of semimembranosus causing stress at the periphery of medial meniscus leading to tears at medial meniscocapsular junction[15]. As valgus displacement occurs there is impingement of posterior or middle portion of lateral meniscus between the femur and tibia which may lead to longitudinal meniscal tears. It is also likely that combination of mechanism contribute to sometimes complex injuries of the knee. In 1997 meta-analysis Bellabarba *et al.* reported that meniscal tears were seen in 41-82% of acute ACL ruptures and 58-100% of chronic ACL injuries[16]. It is also postulated that majority of peripheral meniscal lesions are associated with some degree of ACL laxity. In our study, incidence of medial meniscus tear was more than 50% in complete ACL tear probably because of primary meniscal tears during injury and also secondary meniscal tear caused by increased knee joint laxity causing peripheral tears of posterior horn of medial meniscus. Lateral meniscus tear was more associated with partial ACL tear compared to complete ACL tears because of index complex knee injuries and decreased knee translation.

In 2001 Smith and Barrete described meniscal tear pattern in ACL deficient knees based on locations of 575 prospectively evaluated ACL tears. They found no statistically significance difference in medial vs lateral tears. However tears involved the medial meniscus significantly involve the posterior

horn and in the peripheral meniscocapsular junction[17]. Thompson and Fu in analysis of multiple papers found that peripheral posterior horn tears accounted for more than half of meniscal tears seen in patients with acute or chronic ACL injuries[18]. Many papers have also pointed out that peripheral location of these lesions in vascularized portion of meniscus gives them potential to heal and make them amenable to repair rather than removal.

In relation to complete ACL tear, the location of medial meniscus tear was more common in posterior horn compared to middle horn, whereas the incidence in lateral meniscus tear was almost equal in anterior and posterior horn because of increased knee translation due to complete ACL defeciency. In relation to partial ACL tear, the location of medial meniscus tear was more common in posterior and middle horn, whereas the incidence in lateral meniscus was almost equal in anterior and middle horn and more in posterior horn due to relative knee translation.

Conclusion

Incidence of medial meniscus tear was more than 50% in complete ACL tear. Lateral meniscus tear was more associated with partial ACL tear compared to complete ACL tear. In relation to complete ACL tear, the location of medial meniscus tear was more common in posterior horn compared to middle horn, where as the incidence in lateral meniscus tear was almost equal in anterior and posterior horn. In relation to partial ACL tear, the location of medial meniscus tear was more common in posterior and middle horn, where as the incidence in lateral meniscus was almost equal in anterior and middle horn and more in posterior horn.

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