

*Original Article*

# MORPHOMETRIC STUDY ON TIBIAL MENISCI IN WEST INDIAN CADAVERS

**Soniya A Gupta\***, **Saiprasad P Bhavsar\*\***, **Alka Singh\***, **Medha V Ambiye\*\*\***

\* Anatomy Department, Mayo Institute of Medical sciences, Barabanki, Uttar Pradesh.

\*\* Department of Preventive and Social Medicine, TNMC, Mumbai

\* Anatomy Department, Mayo Institute of Medical sciences, Barabanki, Uttar Pradesh.

\*\*\* Anatomy Department, TNMC, Mumbai.

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## ABSTRACT

Tibial menisci of knee joint are more commonly injured in young population specially in persons involved in sports activities. These menisci are cartilaginous structures with poor blood supply to the inner portion. Most of the times, these damaged menisci need to be transplanted. It requires the knowledge of size and shape of the menisci. Aim of our study was to classify the menisci according to its shape and identify the discoid meniscus in the Western Indian population. In present study, medial meniscus was found to be crescent shaped (10%), U shaped (72%), sickle shaped (16%) and V shaped (2%). While, the lateral meniscus was subgrouped as C-shaped (96%) and U-shaped (4%). No discoid meniscus was found in present study. This study may be helpful for the orthopedicians performing arthroscopy and transplantation surgeries.

**KEYWORDS :** Knee joint, lateral meniscus, medial meniscus, morphometry.

## INTRODUCTION

Tibial menisci are the semicircular cartilaginous lamellae present in the knee joint. They contribute in increasing the congruity of knee joint by deepening the articular surfaces of tibia to receive the condyles of femur[1]. The meniscus serves the function of load sharing, shock absorption, joint stability, joint nutrition and overall protection of articular cartilage[2]. Advanced technologies such as arthroscopy, magnetic resonance imaging have vital role in diagnosing various anatomical abnormalities and variations of intra-articular structures of knee joint. Knee joint is more commonly injured in sports and routine activities. According to Stocker et. al. meniscal injuries accounted for 12% of all football knee injuries in a recent high school injury survey, in 1997[3]. Textbooks of surgery note that medial meniscus is injured more often than lateral meniscus and the proportion given is 4:1, 5:1 or even up to 20:1[4]. Also, the investigations of these parameters

are important in order to describe the morphological features for clinical diagnosis and for surgical procedures[5]. Discoid type of lateral meniscus has been discussed in both anatomical and orthopaedic literature. Very few data are available related to classification of menisci according to their shapes or racial differences[6]. In present study an attempt has been made to classify the menisci according to their shapes and to identify the discoid meniscus in the western Indian population.

## MATERIALS AND METHODS

The present study titled "Morphometry of tibial meniscus: a cadaveric study" was carried out at anatomy department of T N Medical College, Mumbai. The permission of the Head of Department of Anatomy was taken prior to beginning of the study. Consent was not required being a cadaveric study.

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## Address for Correspondence :

Dr. Soniya Gypta  
Assistant Professor,  
Department of Anatomy  
Mayo Institute of Medical Sciences,  
Gadia, Barabanki, (U.P.)-225001  
E-mail: gupta.soniya546@gmail.com

100 menisci from 50 skeletally mature cadaveric knee joints of either sex were included in the study. Exclusion criteria used were as follows:

- (a) Knee joint with meniscal tear
- (b) Evidence of previous surgery on knee joint.

50 cadaveric knee joints preserved in 10% formaldehyde solution were made available from the dissection hall of anatomy department. Overlying skin and the muscles of knee joint were dissected. Horizontal incision was given at the level of knee joint line to make a cut in the collateral ligaments, ligamentum patellae and the patellar retinacula. Vertical incision was made on each side of the joint capsule so as to open the joint from anterior side. Joint capsule was removed and relevant ligaments were excised so as to expose the menisci. Further fine dissection of soft tissues around the knee joint was done to expose the tibial plateau. All 50 cadaveric knee joints were dissected in the similar fashion. The shapes of menisci were noted and classification was made. Medial meniscus was classified as crescentic, sickle shaped, U shaped and V shaped. While lateral meniscus was classified as U shaped and C shaped. Meniscus which covers the tibial plateau circularly, is said to be discoid in shape. The data were tabulated & analyzed subsequently. Windows Excel software was used to process and analyse the data and produce the results.

#### **OBSERVATIONS**

**Figure 1: V shaped medial meniscus & U shaped lateral meniscus**



**Figure 2: U shaped medial meniscus & C shaped lateral meniscus**



**Figure 3: Sickle shaped medial meniscus & C Shaped lateral meniscus**



**Figure 4: Crescent shaped medial meniscus & C shaped lateral me**



#### **DISCUSSION**

Lesions of the menisci are commonly encountered in knee joint injuries. Our knowledge and understanding of the anatomy and function of the menisci have evolved significantly over the past

few decades. Clinical treatment of meniscal tears need to be based on these special anatomical and functional characteristics. Medial meniscus is more commonly injured than lateral. Hence, transplantation surgery of medial meniscus is more commonly performed. It has been stated that providing a meniscal allograft that matches the size and shape of the meniscus to the recipient's knee, is the responsibility of the tissue bank providing the graft[7]. Studies done by Brantigan et. al[8]. and Miller et. al[9]. say that the medial meniscus is much larger in diameter and thinner at the periphery. Studies by Pollard et. al[10]. and Shaffer et. al[11]. describe medial meniscus as semicircular in shape with the posterior horn wider than the anterior horn. Study by Greis et. al. mentions that medial meniscus is C shaped; posterior horn is larger than anterior horn in anteroposterior dimension[12]. Didio reported that the posterior region of medial meniscus is quite wide whereas the anterior extremity is sharp and thin, as stated in the study of Murlimanju et. al[13]. Miller explained that the lateral meniscus is smaller in diameter, thicker about the periphery, and usually wider than medial[9].

In present study, medial meniscus was found to be crescent shaped (10%), U shaped (72%), sickle shaped (16%) and V shaped (2%). While the lateral meniscus was subgrouped as C-shaped (96%) and U-shaped (4%). No discoid medial or lateral meniscus was found in present study.

Murlimanju et. al[14]. studied the menisci of the knee joint in adult cadavers of the South Indian population. 50% of the medial menisci were found to be crescent-shaped, 38.9% were sided V-shaped and 11.1% were sided U-shaped.

In the study performed by. Murlimanju et. al[14]., the percentages of the different types of lateral menisci were 61.1% C-shaped and 38.9% crescent-shaped. No discoid medial or lateral meniscus was observed in the study.

Monllau et. al. reported an incidental finding of bilateral hypoplastic medial menisci in a young female[15].

Byung-ill lee et. al. reported symptomatic bilateral discoid menisci with abnormal attachment to anterior cruciate ligament (ACL) in three patients[16].

The variations of the shape of the menisci are explained by embryological meniscal development[17]. The meniscus arises from the differentiation of mesenchymal tissue within the limb bud and it becomes a clearly defined structure by the eighth week of fetal development[18]. The menisci arise from the eccentric portions of the articular interzone during O'Rahilly stage 22, however until ninth week of development, they are not easily distinguishable[19].

Present study revealed incidence of discoid meniscus as 0% in Western Indian population. Finally, present study can be of much help for orthopedic surgeons concerning meniscal surgeries and arthroscopy of knee joint. They should be aware of the possible anatomical variations that may exist in the menisci facilitating the rehabilitation process. Studies related to the morphology of menisci are scarce. Hence, the present study will help to enrich the literature on this subject and will provide a database for future researchers.

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