

# The insertion of the anterior horn of the medial meniscus: an anatomic study

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## Summary

**Objective.** The purpose of this study was to identify the various patterns of insertion of the anterior horn of the medial meniscus in Ghanaian subjects.

**Study.** The study involved 35 cadaveric knees (26 males and 9 females). Berlet and Fowler classification was used to classify the insertion of the anterior horn of the medial meniscus.

**Findings.** The distribution of the insertion pattern was as follows; 42.9% (15) had type I insertion, 45.7% (16) had type II, type III and IV insertions were each found in 5.7% (2) of the dissected knees. Type II insertion had the highest incidence which was a deviation from what has been reported in literature. The incidence of the anterior intermeniscal ligament (AIML) was 34.3%, which was much lower than most studies have reported.

**Conclusion.** The findings of the study may suggest that the pattern of insertion of the anterior horn of the medial meniscus may be different in the Ghanaian population; further research is needed in this area.

**KEY WORDS:** medial meniscus, anterior intermeniscal ligament.

## Introduction

The menisci are crescentic plates of fibrocartilage located on the articular surface of the tibial plateaus of the knee joint and their presence is vital for proper function of the joint. They give stability to the joint and help distribute loads by increasing the congruence of the articulation between the tibia and the femur<sup>1, 2</sup>. They also have proprioceptive function and may possibly assist in joint lubrication<sup>1</sup>.

Extrusion of the menisci by the femoral condyles is mainly resisted by its firm anchorage to the tibia bone particularly at the menisci horns, hence the integrity of the insertion of the menisci are crucial for proper function. According to Gray's anatomy<sup>1</sup> the anterior horn of the medial meniscus in the adult knee is usually attached to the anterior tibial intercondylar area in front of the anterior cruciate ligament.

Though some studies have found this to be the case<sup>3-5</sup> other sites of insertions have also been identified. This includes insertion onto other areas of the medial tibial plateau aside the flat anterior intercondylar area<sup>3</sup>, as well as insertions onto the anterior cruciate ligament (ACL)<sup>3-8</sup> the anterior intermeniscal ligament (AIML)<sup>3-6</sup> and infrapatellar synovial fold<sup>6</sup>. Some studies have even described insertions onto the intercondylar notch of femur<sup>9-11</sup>. The insertion of the anterior horn of the medial meniscus (MM) have over a period of time been studied by direct observation and by imaging techniques, however there seems to be no information on the various sites of insertion in the Ghanaian population. The purpose of this study was to identify the various patterns of insertions of the anterior horn of the MM in Ghanaian specimens.

## Materials and methods

The study was conducted in the Department of Anatomy of the School of Medical Sciences, University of Cape Coast using 35 cadaveric knees (16 paired and 3 unpaired) from 14 males and 5 females.

The knee joint was opened by first removing the skin around the knee and transecting the quadriceps femoris muscle proximal to the patella and reflecting the patella inferiorly. The medial and lateral collateral ligaments were then released; the anterior and posterior cruciate ligaments transected and the knee gently flexed to expose the menisci. The different insertion sites of the anterior horn of the medial meniscus were noted and classified using the classification system described by Berlet and Fowler. This system classifies the insertion from type I to IV as follows:

Type I-insertion is located in the flat intercondylar region of the tibial plateau.

Type II-insertion is on the downward slope from the medial articular plateau to the intercondylar region.

Type III-insertion is on the anterior slope of the medial tibial plateau.

Type IV-insertion has no firm attachment of the meniscus and there is no identifiable area on the tibial plateau where it attaches.

The anterior horn was also examined for any structural connection with the ACL (menisco-cruciate association). The anterior fat pad was later dissected to determine the presence of anterior intermeniscal ligament (AIML).

## Results

The total number of knees dissected was 35, of these 33 (94.3%) had the anterior horns of their medial menisci anchored to an area on the tibial plateau. Two knees (5.7%) however had no identifiable attachment of their anterior horns to any part of the tibial plateau. The distribution of insertion patterns from the study was as follows: 42.9% (15) had type I insertion, 45.7% (16) had type II, types III and IV insertions were each found in 5.7% (2) of the dissected knees. With the exception of one specimen all paired knees demonstrated similar pattern of insertion. The AIML was present in 12 (34.3%) knees and association between the anterior horn and the ACL was observed in 20 (57.1%) knees (Tab. 1), (Figs. 1,2).

## Discussion

In our study 42.9% (15) of dissected knees had the anterior horns of their MM inserted on to the flat anterior intercondylar area of the tibial plateau (Type I). The most common site of insertion however was on the area of downward slope between the medial articular plateau and the intercondylar area (Type II) and

this insertion pattern was observed in 45.7% (16) of the knees. More than 50% of the knees had insertion site other than the site generally described in literature. This differs from the findings of Berlet and Fowler<sup>3</sup> who observed type I insertion pattern in 59% of specimen. This deviation from the norm may suggest that in some populations the flat anterior intercondylar area may not be the most common site of insertion of the anterior horn of the medial meniscus. Types III and IV insertion patterns each had an incidence of 5.7% and were observed in paired knees. There was one cadaver in which the pattern of insertion was not identical bilaterally. The right knee had a type I while the left had type II insertion pattern. The function of the AIML is not fully understood it has however been suggested that it may have biomechanical<sup>12</sup> as well as proprioceptive functions<sup>3</sup>. In our study 12 (34.3%) of cadavers had the AIML. This number appears small in comparison to the findings of other cadaveric studies which have reported an incidence between 55% and 94%<sup>3, 5, 13-16</sup>. There was a 100% incidence of the AIML in both type III and type IV insertions a finding that is consistent with the observations of Berlet and Fowler<sup>3</sup>. Suggesting that, the presence of the AIML may be important in maintaining the functional integrity of the menisci in these particular types of insertions.

Studies have also identified a structural link between the ACL and the anterior horn of the medial meniscus<sup>3,5</sup>, and it is speculated that the connection of fibers from the anterior horn to the ACL could serve as a secondary restraint to motion of the anterior horn of the medial meniscus<sup>5</sup>.

**Table 1. Incidence of AIML and Menisco-Cruciate association in the various insertion Types.**

Type of insertion	Menisco-cruciate Association (%)	AIML (%)
I	10 (66.7)	3 (20.0)
II	8 (50.0)	5 (31.3)
III	2 (100.0)	2 (100.0)
IV	0 (0.0)	2 (100.0)

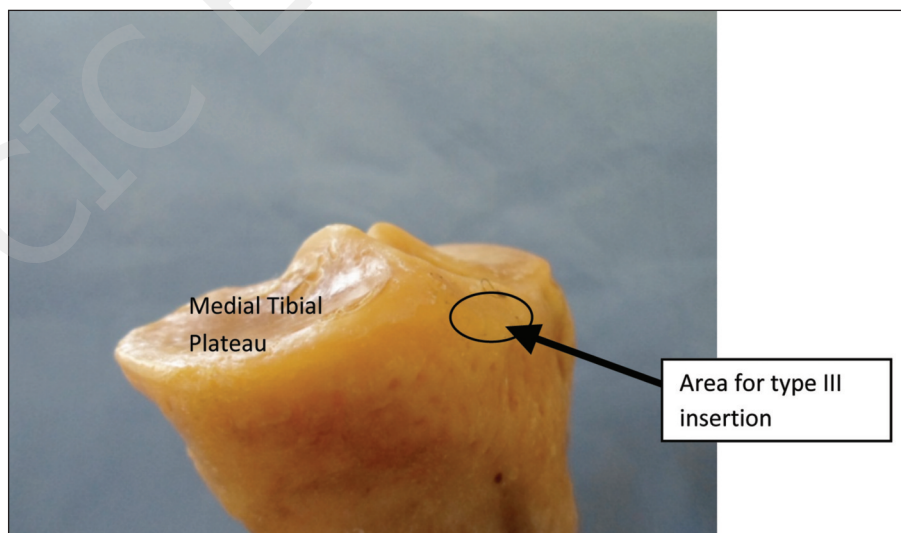


Figure 1. Type III insertion site of the anterior horn of the medial meniscus.

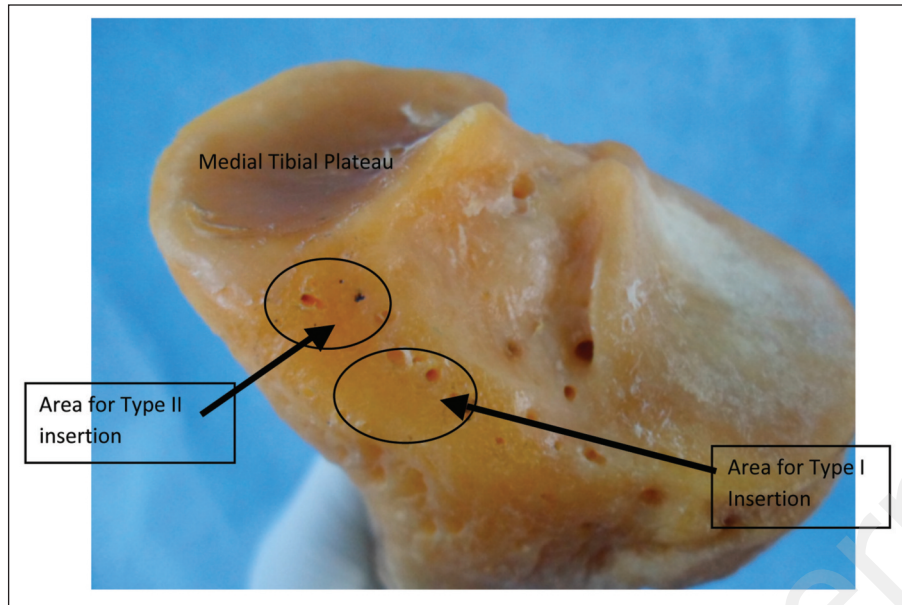


Figure 2. Type I and II insertion sites of the anterior horn of the medial meniscus.

Kohn and Moreno<sup>5</sup> reported this association in all specimens dissected. This was however not the observation in this study which found its occurrence in only 57.1% of the dissected knees, a finding that is similar to 59% incidence reported by Berlet and Fowler<sup>2</sup>.

## Conclusion

The findings of our study are suggestive of two things: 1) that the flat area of the anterior intercondylar area may not be the most common site for insertion of the anterior horn of the medial among the Ghanaian population; 2) that the incidence of the AIML may also be much lower among Ghanaians. Care must however be taking when extrapolating the findings of this study to the general population due of the small sample size involved. Notwithstanding, these findings seem to suggest a deviation from the expected and need further investigation.

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