



THE ANTEROLATERAL LIGAMENT OF KNEE: A DESCRIPTIVE CADAVERIC STUDY

Dr. Maheshwari Myageri

MD Anatomy Assistant professor Department of Anatomy, KIMS, Hubli 580020

Dr. Manikya R

MS Ortho Assistant professor Department of Orthopaedics, KIMS, Hubli 580020

Dr. Bhavya B S*

MD Anatomy Assistant professor Department of Anatomy, KIMS, Hubli 580020*Corresponding Author

ABSTRACT

Background: The French surgeon, Paul Segond described the existence of “Pearly, resistant fibrous band” at the anterolateral aspect of the human knee in 1879. This is perhaps the first description of what is today known as Anterolateral Ligament (ALL). Injury to this structure (tibial avulsion of anterolateral ligament) is classically called the Segond fracture and is pathognomonic of associated anterior cruciate ligament tear. Aim of the study is to describe the gross anatomy of anterolateral ligament and its relationship with nearby structures. **Methods:** Dissection was done on 30 embalmed cadaveric knees allotted for dissection to medical students at Department of Anatomy, KIMS, Hubli over a period of 2 years. When present, its length and width were measured. **Results:** It revealed that the Anterolateral ligament was present in 20 and absent in 10 specimens. The mean length of ALL is 36.22 ± 1.18 mm and mean width of ALL is 4.28 ± 0.29 mm. **Conclusion:** This study describes the morphology and also estimates the incidence, mean length and mean width (at joint level) of ALL in north Karnataka population.

KEYWORDS : Anterolateral ligament; Segond fracture; Anterior cruciate ligament.

Introduction:

The French surgeon, Paul Segond described the existence of a "Pearly, resistant fibrous band" at the anterolateral aspect of the human knee in 1879. This is perhaps the first description of what is today known as Anterolateral Ligament (ALL). There are various names for this Anterolateral ligament in the literature – short lateral ligament, lateral capsular ligament, capsulo-osseous layers of the iliotibial tract, anterior band of lateral collateral ligament, anterior oblique band.^[1,2] Injury to this structure (tibial avulsion of the anterolateral ligament) is classically called the Segond fracture and is pathognomonic of associated anterior cruciate ligament tear.^[3] Since then, many studies have been conducted on anterolateral ligament existence and its morphology. However, there is a lack of study about the anatomy of the anterolateral ligament in the North Karnataka population. The objective of the present study was to estimate the incidence and study the gross anatomy of the anterolateral ligament in the North Karnataka population.

Materials and Methods:

The study was conducted on 30 lower limbs from embalmed cadavers allotted for dissection to 1 year medical students, at the Anatomy department of our institute, over 2 years (2017-2019) with ages ranging from 60-75yrs.

Inclusion criteria – All cadaver lower limbs available during the study period.

Exclusion criteria- Specimens with gross deformities and previous surgeries of the knee were excluded.

Dissection of the knee was started by first identifying the patella, Gerdy's tubercle, head of the fibula and lateral femoral epicondyle (Refer Fig1). A vertical incision of approximately 10cm in the midline of flexed knee was put. Dissection and the subsequent reflection of skin and subcutaneous tissue were done until the distal part of the Iliotibial band was visualised. The Iliotibial band was cut transversely at approximately 12cm proximal to lateral femoral epicondyle and carefully reflected distally preserving its attachment on Gerdy's tubercle. With the iliotibial band reflected, the superficial lamina of the capsule was visualised and the lateral collateral ligament was identified. Its proximal and distal attachments were ascertained. After careful dissection, ALL was identified (Refer Fig 2). ALL and lateral collateral ligament were tied with thread and pictures were taken. Length and width of ligament were measured with the knee in mid flexed position using a measuring scale.^[4]

Results: The anterolateral ligament was present in 20 knees out of 30 lower limbs. ALL was absent in 10 knees. ALL was attached

proximally to prominence of the lateral femoral epicondyle, anterior to the origin of the Lateral collateral ligament. The fibres of ALL ran an oblique course and were attached distally to the anterolateral side of the proximal tibia midway between Gerdy's tubercle and the tip of the fibular head. It had a firm attachment to the periphery of the middle third of the lateral meniscus. With careful dissection, lateral inferior geniculate artery and vein were observed between lateral meniscus rim and ALL at the level of knee joint line. The capsule between the lateral collateral ligament and ALL was excised by sharp dissection (Refer Fig 3). The measurements of ALL – length (from proximal to distal bony attachments) and width at the joint line were noted in 20 specimens. The mean length of the anterolateral ligament was 36.22 ± 1.18 mm and the mean width of the anterolateral ligament at the joint line was 4.28 ± 0.29 mm.



Figure 1: Bony landmarks on anterior and lateral aspects of knee. P-Patella, TT-Tibial tuberosity, GT-Gerdy's tubercle, FH-fibular head



Figure 2: Shows proximal and distal attachments of ALL. ALL-Anterolateral ligament, LCL-Lateral collateral ligament, PFL-Popliteofibular ligament, PT-Popliteus tendon



Figure 3: Shows relation of ALL with PFL and LCL.1-Anterolateral Ligament,2-Lateral Collateral Ligament ,3-Poplitiofibular Ligament, M-Meniscus

The functional importance was ascertained by observing the ALL getting taut during flexion and internal rotation of the tibia and it gets relaxed during flexion and external rotation of the tibia. Poplitiofibular ligament, which gets taut on external rotation of the flexed knee, is considered to be a functional counterpart of ALL.

Discussion: There is a lot of debate on the existence of ALL and its role in knee stability. A summary of our study in comparison to other authors has been tabulated in table 1. In our study, the ALL was present in 66.6% of knees whereas other authors such as Vincent et al and Helito et al study shows 100% presence. Claes et al study shows the presence of ALL in 97%. Both Runer et al and Jung Cho Ho et al study shows similar results which are 45.5% and 42.5% of incidence respectively. Roessler et al study show an incidence of 60% which is concurrent with the present study. Sabzevari et al conducted dissection on 21 foetal knees, could not prove the presence of ALL.[1,5,6,7]

Table 1: Comparison of our study with other authors. mm - millimeter.¹

| Author (year) | Specimens | Incidence (%) | Length (mm) | Width (mm) |
|---------------------------|-----------|---------------|--------------|------------|
| Vincent et al. (2012) | 10 | 100 | 34.1 ± 3.4 | 8.2 ± 1.5 |
| Claes et al. (2013) | 41 | 97 | 38.5 ± 6.1 | 6.7 ± 3.0 |
| Helito et al. (2013) | 20 | 100 | 37.3 ± 4.0 | 7.4 ± 1.7 |
| Dodds et al. (2014) | 40 | 83 | 59.0 ± 4.0 | 6.0 ± 1.0 |
| Potu et al. (2016) | 24 | 4.16 | 34.23 | 4.04 |
| Runer et al. (2016) | 44 | 45.5 | 42.2 ± 6.2 | 5.6 ± 1.3 |
| Roessler et al. (2016) | 20 | 60 | 39.63 ± 0.78 | 5.28 |
| Jung Cho Ho et al. (2018) | 120 | 42.5 | 30.1 ± 2.1 | 5.2 ± 1.5 |
| Present study(2021) | 30 | 66.6 | 36.22 | 4.28 |

In relation to the study on the morphology of ALL, we found the mean length of ALL was 36.22±1.18mm and the mean width of ALL at the joint line was 4.28±0.29mm. Dodds et al study showed the highest length of 59±4mm. Vincent et al, Claes et al, Potu et al and Jung Cho Ho et al studies showed the length of ALL similar to our study. Vincent et al study showed the highest width of 8.2±1.5mm whereas our study showed a width of ALL on the lower side which is similar to Potu et al study.^[1,5]

In the present study, we found ALL getting taut during flexion and internal rotation of tibia which concurs with the observations made by Segond et al, Rustagi et al, SR Jyothi et al, Monaco et al and Sonnery-Cottet et al.^[2,3,8]

Conclusion:

This study was conducted to draw the attention of anatomists towards the lesser-known anterolateral ligament of the knee joint and facilitate further studies to elucidate its functional importance in movements of the knee joint.

Acknowledgement : The authors would like to thank and pay respect to all those kind hearts who have donated their body for research and education purpose without whom this work would not have been accomplished.

REFERENCES

- Jung Cho Ho and Soon Kwak Dai. Anatomical consideration of the Anterolateral Ligament of the Knee. BioMed Research International.2019;ID 5740473:6pages.
- Rustagi SM , Gopal P , Ahuja MS et al. The Anterolateral Ligament of the Knee: Descriptive Anatomy and Clinical Correlation. Indian Journal of Orthopaedics. 2019;53(1): 89-93.
- SR Jyoti , KS Sachin , TK Vasudha et al. Cadaveric Study on the Anterolateral Ligament of Knee: A Clinical Perspective. International Journal of Anatomy and Physiology.2020;6(3):147-151.

- Romanes GJ. Cunningham's manual of practical anatomy. Volume 1. 15th ed. Oxford: ELBS; 1992. P214-221.
- Claes S , Vereecke E , Maes M et al. Anatomy of the anterolateral ligament of the knee. J Anat.2013;223:321-8.
- Helito CP , Amaral C Jr , Nakamichi YD et al. Why do authors differ with regard to the femoral and meniscal anatomic parameters of the knee anterolateral ligament?dissection by layers and a description of its superficial and deep layers. Orthop J Sports Med. 2016;4:2325967116675604.
- Sabzevari S , Rahmeh-Azar AA , Albers M et al. Anatomic and histological investigation of the anterolateral capsular complex in the fetal knee. Am J Sports Med. 2017;363546517692534.
- Sonnery-Cottet B , Lutz C , Daggett M et al. The involvement of the anterolateral ligament in rotational control of the knee. Am J Sports Med. 2016;44:1209-1.