



## A STUDY OF MORPHOMETRY OF ANTERIOR TALO – FIBULAR LIGAMENT:

## Anatomy

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## ABSTRACT

**Background:** Anterior talofibular ligament is a flat, quadrilateral and a relatively strong ligament. It has two bands separated by some vascular branches. The ligament originates from the inferior oblique segment on the anterior border of the lateral malleolus. It courses anteromedially and inserts on the talar body just anterior to the lateral malleolar articular surface. This study puts in an effort to know the morphometry of anterior talo – fibular Ligament so as to be useful to the orthopedics surgeon and other radiological Department so as to give an ideal treatment in reconstruction surgeries.

## KEYWORDS

Morphometry, Ligament, Anterior Talo Fibular Ligament.

## Introduction:

Modern humans are the only known obligate bipedals, where the body weight is transmitted to the ground through the lower limbs; each of them sharing 50% of the body weight in upright posture. The problem with bipedal walking is to maintain the balance of the body as well as to provide stability to the lower limb especially when one limb is off the ground. In this regard the role of the talocrural joint cannot be ignored. The ankle joint is one of the most frequently injured joint<sup>1</sup>. The ankle injuries occur in the plantar flexed position of the foot. The lateral ligament is injured more often when compared to medial. A sprained ankle results due to tear of anterior talofibular and calcaneofibular ligaments when the foot is twisted in lateral direction. In forcible eversion of the foot the deltoid ligament may be torn. At times the deltoid ligament pulls the medial malleolus thereby causing avulsion fracture of the malleolus. Potts fracture occurs when the foot is caught in the rabbit hole in the ground and the foot is forcibly everted. In this condition at first there is an oblique fracture of shaft and lateral malleolus of fibula. The strong eversion pull on the deltoid ligament causes transverse fracture of medial malleolus. If the tibia is carried anteriorly, the posterior margin of the distal end of the tibia is also broken by the talus producing a trimalleolar fracture.

Conventionally X-ray techniques have been used to diagnose ligament injuries.

Magnetic resonance (MR) imaging has opened new horizons in the diagnosis and treatment of many musculoskeletal diseases of the ankle and foot. It demonstrates abnormalities in the bones and soft tissues before they become evident at other imaging modalities.

A limited account of studies is available on ligaments and articular surfaces of the talocrural joint. So in order to gather more information and to compare with the available data, a study of the above topic is helpful.

Anterior talofibular ligament is a flat, quadrilateral and a relatively strong ligament. It has two bands separated by some vascular branches. The ligament originates from the inferior oblique segment on the anterior border of the lateral malleolus. It courses anteromedially and inserts on the talar body just anterior to the lateral malleolar articular surface. This study puts in an effort to know the morphometry of anterior talo – fibular Ligament so as to be useful to the orthopedics surgeon and other radiological Department so as to give an ideal treatment in reconstruction surgeries.

## Aims and Objectives:

To study the morphometry of anterior talo – fibular ligament.

## Materials and Methods:

Thirty formalin fixed human ankles were dissected which was available in the department of Anatomy, Kanachur Institute of Medical Sciences which included nineteen male and eleven female specimen.

Male and female ankles were categorized and also right from the left. Incision was made on the anterior median plane and posterior median plane from caudal one third of leg to proximal one third of foot. Skin was reflected all around the talocrural joint till the meeting of dorsal surface and plantar surface. All the soft tissues including the muscles were dissected and reflected on the anterior, posterior, medial and lateral surfaces. The soft tissue tunnel which surrounds the tendons of muscles is in intimate relation with the underlying ligaments of the talocrural joint.

On the lateral aspect, anterior talofibular ligament was exposed and measurements were taken. The length was taken at three levels namely superior, middle and inferior. The breadth was taken at three different levels namely medial, middle and lateral part. The thickness was then measured.



**Image 1(left):** Width measurements of anterior talofibular ligament taken at different levels.

**Image 2(right):** Length measurements of anterior talofibular ligament taken at different levels.

All the measurements were taken using a thread and digital calipers.

## Observations:

**Table 1: Morphometry of Anterior Talo – Fibular Ligament.**

	Side	Mea	Std.	Sig.	Sex	Mean	Std.	Sig.	
Anterior Talofibular	SUPERIOR	L	17.8	1.47	0.20	M	17.36	1.44	0.829
		R	16.9	2.12		F	17.54	2.47	
	MIDDLE	L	16.8	1.18	0.57	M	16.84	1.28	0.39
		R	16.4	1.98		F	16.31	2.09	
	INFERIOR	L	16.2	2.12	0.95	M	16.69	2.04	0.366
		R	16.3	3.15		F	15.63	3.45	
	MEDIAL	L	14.2	1.86	0.15	M	13.54	2.09	0.381
		R	13.2	1.98		F	14.20	1.72	
	MIDDLE	L	13.3	2.41	0.36	M	12.70	2.59	0.42
		R	12.5	2.25		F	13.42	1.82	
	LATERAL	L	13.6	2.22	0.18	M	13.03	2.32	0.872
		R	12.5	1.94		F	13.16	1.81	
THICKNESS	L	3.04	0.60	0.39	M	3.11	0.56	0.821	

Irrespective of the side and sex to which the ligament belongs, the mean value of the length of the anterior talofibular ligaments in the superior, middle and inferior parts are 17.42 mm, 16.65 mm and 16.30 mm. The widths in the medial, middle and lateral parts are 13.78 mm,

12.96 mm and 13.08 mm. The thickness mean measurement is 3.13 mm.

The mean length values on the right side are 16.99 mm, 16.48 mm and 16.33 mm. The mean width values are 13.27 mm, 12.57 mm and 12.55 mm. The mean thickness measurement is 3.22 mm.

The mean length values on the left side are 17.85 mm, 16.82 mm and 16.27 mm. The mean width values are 14.29 mm, 13.36 mm and 13.60 mm. The mean thickness measurement is 3.04 mm.

The mean length values in males are 17.36 mm, 16.84 mm and 16.69 mm. The mean width values are 13.54 mm, 12.70 mm and 13.03 mm. The mean thickness measurement is 3.11 mm.

The mean length values in females are 17.54 mm, 16.31 mm and 15.63 mm. The mean width values are 14.20 mm, 13.42 mm and 13.16 mm. The mean thickness measurement is 3.16 mm.

#### Discussion:

Irrespective of the side and sex to which the ligaments belongs, the mean value of the length of the anterior talofibular ligaments in the superior, middle and inferior parts are 17.42 mm, 16.65 mm and 16.30 mm. The widths in the medial, middle and lateral parts are 13.78 mm, 12.96 mm and 13.08 mm. The thickness mean measurement is 3.13 mm.

It is rectangular in shape.

The mean length values on the right side are 16.99 mm, 16.48 mm and 16.33 mm with a standard deviation of 2.12 mm, 1.98 mm and 3.15 mm. The mean width values are 13.27 mm, 12.57 mm and 12.55 mm with a standard deviation of 1.98 mm, 2.25 mm and 1.94 mm. The mean thickness measurement is 3.22 mm with a standard deviation of 0.51 mm.

The mean length values on the left side are 17.85 mm, 16.82 mm and 16.27 mm with a standard deviation of 1.47 mm, 1.18 mm and 2.12 mm. The mean width values are 14.29 mm, 13.36 mm and 13.60 mm with a standard deviation of 1.86 mm, 2.41 mm and 2.22 mm. The mean thickness measurement is 3.04 mm with a standard deviation of 0.60 mm.

The measurements are similar on both sides.

The mean length values in males are 17.36 mm, 16.84 mm and 16.69 mm with a standard deviation of 1.44 mm, 1.28 mm and 2.04 mm. The mean width values are 13.54 mm, 12.70 mm and 13.03 mm with a standard deviation of 2.09 mm, 2.59 mm and 2.32 mm. The mean thickness measurement is 3.11 mm with a standard deviation of 0.56 mm.

The mean length values in females are 17.54 mm, 16.31 mm and 15.63 mm with a standard deviation of 2.47 mm, 2.09 mm and 3.45 mm. The mean width values are 14.20 mm, 13.42 mm and 13.16 mm with a standard deviation of 1.72 mm, 1.82 mm and 1.81 mm. The mean thickness measurement is 3.16 mm with a standard deviation of 0.56 mm.

The measurements in both sexes are similar.

According to the study conducted by Mkandawire et al.<sup>2</sup> (2005) on foot and ankle ligament morphometry, the anterior talo-fibular ligament mean length was measured to be  $24.09 \pm 8.03$  mm.

According to a study conducted on diagnosis and treatment of injury to the lateral ligament of ankle by Prins JG et al.<sup>1</sup> (1978), it measures about 15 mm x 8 mm x 20 mm

According to the study conducted by Ruth CJ et al.<sup>4</sup> (1961) on the surgical treatment of injuries of the fibular collateral ligaments of the ankle, the mean measurements were 12 mm x 5 mm x 2 mm.

According to the study on anatomy of the collateral ligaments of the human ankle joints by Milner et al.<sup>5</sup> the mean length measurements was 13 mm with a standard deviation of 3.9 mm and mean width of 11 mm with a standard deviation of 3.3 mm.

Mahmut Ugurlu et al.<sup>6</sup> studied on the anatomy of the lateral complex of the ankle joint in relation to peroneal tendons, distal fibula and talus in 22 formalin fixed ankles and the mean. In bifurcate forms the mean

length was 18.74 mm in the superior band. In the inferior band, the mean length was 15.33 mm.

According to Taser et al.<sup>7</sup> the anterior talo-fibular length was 22.37 mm with a standard deviation of 2.5 mm and the width was 10.77 mm with a standard deviation of 1.6 mm.

According to the study on the lateral ankle ligaments by Muzaffer Sindel et al.<sup>8</sup> in 24 ankles, the anterior talo-fibular ligament was determined of having two bands. Superior band had average length of 19.1 mm with a standard deviation of 2.28 mm and the average width was 6.7 mm with a standard deviation of 1.06 mm. the mean length of the inferior band was measured as 15.2 mm with a standard deviation of 2.62 mm and the mean width as 4.5 mm with a standard deviation of 1.06 mm.

The study is in agreement with other studies in length measurements.

The study is also in agreement with the studies of Prins J G et al.<sup>3</sup>, Milner C et al.<sup>5</sup> and Taser et al.<sup>7</sup> in width measurements.

The study is not in agreement with the studies of Ruth C J et al, Mahmut Ugurlu et al.<sup>6</sup> and Muzaffer Sindel et al.<sup>8</sup> in mean width measurements. It may be due to the population difference.

#### Conclusion:

It is rectangular in shape. The measurements are similar on both sides. The measurements in both sexes are similar.

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