



A STUDY OF VARIATIONS IN ANTERIOR TALO – FIBULAR LIGAMENT:

Anatomy

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ABSTRACT

Background: Studies showed that the anatomy of the lateral complex of the ankle joint in relation to peroneal tendons, distal fibula and talus in 22 formalin fixed ankles. In their study, the mean length in single band form (23 percent) was 20.84 mm and the mean width was 7.61 mm. In bifurcate forms (59 percent), the mean length was 18.74 mm and the mean width was 5.39 mm in the superior band. In the inferior band, the mean length was 15.33 mm and the mean width was 4.92 mm. In trifurcate forms (18 percent), the mean length and width in the superior part was 14.38 mm and 4.05 mm. These studies prompted us to study and check the variations if present in the local population. This study is dedicated to find the variations present in the Anterior Talo – Fibular Ligaments.

KEYWORDS

Variations, Anterior Talo – Fibular Ligament, One slip variety, Two slip variety and three slip variety.

Introduction:

One sixth of the static load of the leg is carried by the fibula at the tibiofibular joint¹. These require a high degree of stability which is determined by the passive and dynamic factors². The passive stability depends on the integrity of the collateral ligaments. Talocrural joint is an approximately uniaxial joint³. The range of normal plantar flexion is 30°. Dorsiflexion results in the joint adopting the 'close-packed' position⁷, with maximal congruence and ligamentous tension; from this position. All major thrusting movements are exerted, in walking, running and jumping. The malleoli grip the talus, and even in relaxation no appreciable lateral movement can occur without stretch of the inferior tibiofibular syndesmosis and slight bending of the fibula. The superior talar surface is broader in front, and in dorsiflexion the malleolar gap is increased by slight lateral rotation of the fibula, by 'give' at the inferior tibiofibular syndesmosis and gliding at the superior tibiofibular joint.

The empirical axis of ankle joint passes distal to tips of malleoli at 5 mm ± 3 mm range, (0 to 11 mm) distal to the tip of medial malleolus and 3 mm ± 2 mm range (0 to 12 mm) distal to and 8 mm ± 5 mm anterior to the tip of lateral malleolus⁴. The axis is inclined downwards and laterally in the frontal plane and is rotated posterolaterally in the horizontal or transverse plane. In the frontal plane, the angle between empirical axis of the ankle and midline of the tibia is 82.7 degrees ± 3.7 degrees, with a range of 74 to 94 degrees in the transverse plane, the angle of ankle axis with the transverse axis of the knee is 20 to 30 degrees. Some workers recognized two axis to the ankle joint^{4,5,6,8}. A dorsiflexion axis inclined downwards and laterally and a plantar flexion axis included downward and medially. The changeover occurs within a few degrees of the neutral position of the talus.

The modifications of the neck of the talus and the distal tibia indicating their habitual contact have been taken as evidence of the extreme dorsiflexion of the ankle that occurs in squatting⁹.

Mahmut Ugurlu et al.¹⁰ in 2010 studied the anatomy of the lateral complex of the ankle joint in relation to peroneal tendons, distal fibula and talus in 22 formalin fixed ankles. In their study, the mean length in single band form (23 percent) was 20.84 mm and the mean width was 7.61 mm. In bifurcate forms (59 percent), the mean length was 18.74 mm and the mean width was 5.39 mm in the superior band. In the inferior band, the mean length was 15.33 mm and the mean width was 4.92 mm. In trifurcate forms (18 percent), the mean length and width in the superior part was 14.38 mm and 4.05 mm. In the intermediate part it was 14.46 mm and 4.44 mm and in the inferior part it was 16.12 mm and 4.48 mm. The posterior talofibular mean length was measured to be 24.12 mm and the mean width of 5.09 mm. The calcaneofibular ligament measured a mean length of 26.67 mm and a mean width of 4.57 mm.

Muzaffer Sindel et al.¹¹ in 1998 on their study on the lateral ankle ligaments, in 24 ankles, mentioned that the anterior talofibular ligament was 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 posterior talo-fibular ligament, the mean length was 20.7 mm with a standard deviation of 2.15 mm; the mean width was 6.1 mm with a standard deviation of 0.77 mm. The calcaneofibular ligament measured a mean length of 26.8 mm and a mean width of 6 mm.

These studies prompted us to study and check the variations if present in the local population. This study is dedicated to find the variations present in the Anterior Talo – Fibular Ligaments.

Aims and Objectives:

To study the variations in the Anterior Talo – Fibular Ligaments.

Materials and Methods:

Thirty formalin fixed human ankles were dissected which was available in the department of anatomy, Kanachur Institute of Medical Sciences, Mangalore 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.

Results:

VARIATIONS IN THE ANTERIOR TALOFIBULAR LIGAMENT:

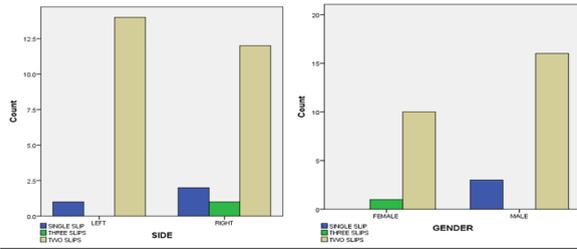
Table 1: Variations in the anterior talofibular ligament.

SEX		Single SLIP	Three	Three
Gender	F	0.0%	10%	90%
	M	15%	0.0%	85%
Side	L	6.7%	0.0%	93.3%
	R	13.3% 13.3%	6.7% 6.7%	80.0%

Table No. 16

	Value	Exact Sig. (2-sided)
Fisher's Exact Test(Gender)	2.950	.224
Pearson Chi-Square(Side)	3.701	.126

TABLE NO. 17 CHI-SQUARE TEST.



Graph No.1 (left) and 2 (right): Variations in side (left) and gender (right) in anterior talofibular ligament. X-axis: Components to be measured. Y-axis: count.

Variation is found in the anterior tibiofibular ligament in the form of single slip in three cases out of thirty accounting to 10% of the total. We also found a ligament with three slips in one ligament accounting to 3.33% irrespective of the side and sex to which it belonged.

The one slipped variety is present in 6.7% in left side and 13.3% in right side. The three slipped variety are found in 6.7% only in the right side. The one slipped variety is present in 15% of males only. The three slipped variety is found in 10% of females.

**Discussion:
VARIATIONS IN THE ANTERIOR TALOFIBULAR LIGAMENT:**

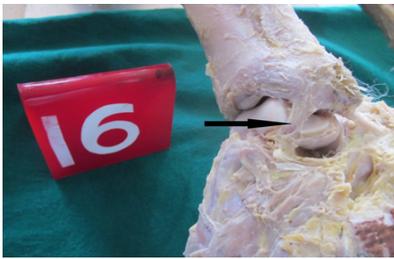


Image 45: Single slip variety of anterior talofibular ligament.

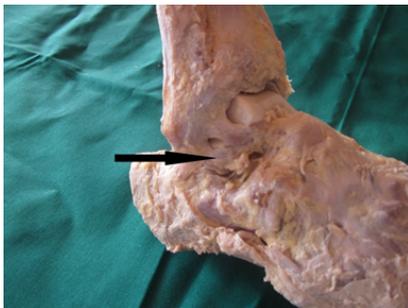


Image 46: Three slips variety of anterior talofibular ligament.

The variations was found in the anterior tibiofibular ligament in the form of single slip in three cases out of thirty accounting to 10% of the total and three slip variety in one ligament accounting to 3.33%.

The one slipped variety was found in 6.7% in left side and 13.3% in right side. The three slipped variety is found in 6.7% in the right side.

The one slipped variety was present in 15% of males. The three slipped variety is found in 10% of females.

According to the study on anatomical variations of the anterior talofibular ligament of the human ankle joint by Milner et al.¹² in 26 ankle specimens, they observed two variations. The single slip variation was observed in 38 percent and the trifurcate form in 12 percent.

Mahmut Ugurlu et al.¹⁰ 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 the single band form was seen in 23 percent, bifurcate forms in 59 percent and trifurcate forms 18 percent.

The study is not in agreement with that of other studies. It may be due to the population difference or difference in the participation of activities.

Conclusion:

The one slipped variety is present in 6.7% in left side and 13.3% in right side. The three slipped variety is found in 6.7% in the right side. The one slipped variety is present in 15% of males. The three slipped variety is found in 10% of females.

References:

- Lambert KL. The weight bearing function of the fibula. A strain gauge study. *J Bone Joint Surg Am.* 1976; 53 (3): 507.
- McCullough CJ, Burge PD. Rotary stability of the load bearing ankle. An experimental study. *J Bone Joint Surg Br.* 1980; 62(4): 460.
- Inman VT. *The joints of the ankle.* Baltimore: Williams and Wilkins 1976: 19, 26, 27, 31, 37, 70–73.
- Lundberg A, Nemeth G, Svensson O K, Selvik G. The axis of rotation of the ankle joint. *J Bone Jt Surg.* 1989; 71B: 94–99.
- Sammarco J. Biomechanics of the ankle. Surface velocity and instant center for rotation in sagittal plane. *Am J Sports Med.* 1977; 5: 231–234.
- Jend H H, Ney R, Heller M. Evaluation of tibiofibular motion under load conditions by computed tomography. *J Orthop Res.* 1985; 3: 418–423.
- MacConaill MA, Basmajian JV. *Muscles and Movements. A Basis for Human Kinesiology.* Baltimore: Williams and Wilkins. 1969; 78, 79.
- Barnett CH, Napier JR. The axis of rotation of the ankle joint in man. Its influence upon the form of the talus and the mobility of the fibula. *Anat.* 1952; 86: 1.
- Inderbir singh. Squatting facets on the talus and tibia in Indians. *J Anat.* 1959; 93: 540.
- Mahmut Uğurlu, Murat Bozkurt, İsmail Demirkale, Ayhan Cömert, Halil İbrahim Acar, İbrahim Tekdemir. Anatomy of the lateral complex of the ankle joint in relation to peroneal tendons, distal fibula and talus: a cadaveric study. *Eklemler Hastalıkları Cerrahisi* 2010; 21(3): 153-158.
- Muzaffer SINDEL, Sevgi DEMİR, Aydın YILDIRIM, Yasar UÇAR Anatomy of the Lateral Ankle Ligaments *Tr. J. of Medical Sciences.* 1998; 28: 53-56.
- Milner CE, Soames RW. Anatomy of the collateral ligaments of the human ankle joint. *Foot Ankle Int.* 1998; 19(11): 757-60.