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Anatomical variations of the anterior talofibular ligament of the human ankle joint

Compared with other joints, the ligaments of the ankle have not been studied in great detail; consequently relatively little literature exists. The positions of the 3 major bands of the lateral collateral ligament are well known and documented (Schafer et al. 1915; Sarrafian, 1983; McMinn, 1994; Palastanga et al. 1994; Williams et al. 1995). The detailed anatomy of the ligaments is, however, relatively complex with variations of the major bands and several minor additional bands being reported (Sarrafian, 1993; Burks & Morgan, 1994; Rosenberg et al. 1995).

The anterior talofibular ligament (ATFL) is a major component of the lateral collateral ligament complex of the ankle joint and plays an important role in limiting anterior displacement of the talus and plantar flexion of the ankle. Lateral ligamentous injuries of the ankle joint are extremely common, with the ATFL being particularly susceptible (Garrick 1977). An understanding of the anatomy of these ligaments is, therefore, particularly important when reconstruction or repair is considered. While the anatomy of the major lateral collateral ligaments has been well documented, the variations of the ATFL have not been fully described. The aim of this study was to document the anatomical variations observed in the anterior talofibular ligament of the human ankle joint.

The superficial muscles, tendons and fascia were carefully removed from 26 ankles, from 4 male and 89 female cadavers of European caucasian origin (mean age 83 y; range 73–95 y), whose cause of death did not affect the function of the ankle joint, in order to expose the lateral collateral ligaments. The resulting osteoligamentous preparation was then studied, with the attachments and morphology of the ATFL being noted and photographic records being made.

Single, bifurcate and trifurcate forms of the ATFL were observed (Fig.), there being a pattern in the distribution of these variations amongst the specimens studied. The single and bifurcate forms of the ATFL were observed both bilaterally and unilaterally within individuals. Of the 10 occurrences (38%) of the single form of the ligament, 8 were observed bilaterally and 2 unilaterally. In the 13 occurrences (50%) of the bifurcate form of the ATFL, 12 were observed bilaterally and 1 unilaterally. The trifurcate form of the ATFL was observed 3 times (12%) in this investigation, all 3 occurrences being unilateral and in females, with either the single or bifurcate form completing the pair.

The overall width of the ATFL did not appear to vary greatly irrespective of the number of bands present, suggesting that the variations observed do not modify the ligament's function. This is further reinforced by the attachments of the different bands, which are very close together both on the longitudinal tubercle of the lateral malleolus and the anterior border of the lateral articular facet on the neck of the talus.

The ATFL, therefore, has several morphological variations in the number of bands that it possesses (Fig.). Two of these variations have been described previously by Sarrafian (1983), who maintained that 2 bands were always

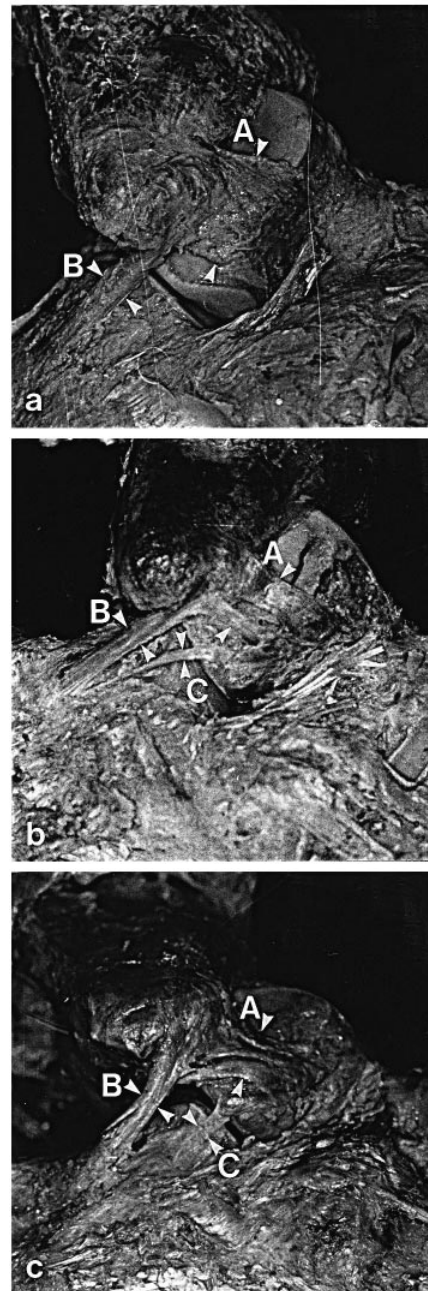


Fig. Variations in the morphology of the anterior talofibular ligament (A) of the human ankle joint: (a) 1 band, (b) 2 bands, (c) 3 bands. The calcaneofibular ligament (B) and lateral talocalcaneal ligament (C) are also shown.

present and occasionally 3. The observations presented here contradict this view, in that 38% of the specimens studied showed only a single band. Burks & Morgan (1994) observed that a distinct inferior band of the ATFL was occasionally present, i.e. that the ATFL consisted of 1 or 2 bands, but did not mention the trifurcate form.

A general pattern of bilateral symmetry within individuals was observed in this investigation in terms of the occurrence of the different bands of the ATFL. The relatively infrequent occurrence of the trifurcate form in this study, as well as its unilateral distribution, suggest that the evenly distributed and generally bilaterally occurring single and bifurcate forms of the ATFL may be more common, with the trifurcate form being an occasional additional variation.

It is clear that there is some variation in the anatomy of the ATFL of the human ankle joint. Whether this is of any functional significance requires further investigation. It is, however, important to document these variations since the ATFL is the most commonly sprained ankle ligament, often requiring surgical repair or reconstruction.

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