Radiographic Landmarks of the Lateral Ankle Structures for Ligament Reconstruction

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C. Thomas Haytmanek

My disclosure is in the Final AOFAS Mobile App. I have no potential conflicts with this presentation.

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Background

• Lateral ankle ligament injuries rank among the most frequently observed athletic injuries\textsuperscript{2,4,7}

• Up to 20% of patients experience chronic instability that may require surgical intervention to restore lateral ankle stability\textsuperscript{5-6}

• Current lack of objective quantitative data detailing the ligament attachment sites on standard radiographic views
Purpose

- To quantitatively describe the anatomic attachment sites of the anterior talofibular ligament (ATFL), calcaneofibular ligament (CFL), and posterior talofibular ligament (PTFL) on standard radiographic views with respect to reproducible osseous landmarks to assist with intraoperative and postoperative assessment of lateral ankle ligament repairs and reconstructions.
Methods

- Twelve, non-paired, fresh frozen foot and ankle cadaveric specimens
- Ligament footprints were marked with 2 mm stainless steel spheres embedded in cortical bone\(^3,8-10\) prior to obtaining standard mortise and lateral radiographs

A modified anatomical illustration from Clanton et al\(^1\) of the lateral ankle. A graphical representation of the anterior talofibular ligament (ATFL) origin (1) and insertion (2) and calcaneofibular ligament origin (3) and insertion (4) that have been marked with 2 mm stainless steel spheres. A subset of selected anatomical osseous landmarks used for radiographic reference measurements are also indicated (arrows): a, distal point talar neck; b, proximal point talar neck; c, anterior fibular tubercle; d, apex lateral talar process; e, inferior tip of the lateral malleolus; f, posterior point peroneal tubercle; posterior point of the calcaneus
Methods

- Measurements were performed twice by two blinded raters independently to calculate mean distances and assess reliability via intraclass correlation coefficients.
- Measurements were reported with respect to established radiographic reference frames.
Results

- Radiographic measurements demonstrated excellent reproducibility between raters and across trials
  - Excellent agreement for mortise and lateral views
  - Excellent agreement for measurements of each individual ligament

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ATFL, Anterior Talofibular Ligament; CFL, Calcaneofibular Ligament; PTFL, Posterior Talofibular Ligament; ICC, Intraclass correlation coefficient; LB, lower bound; UB, upper bound
Anterior Talofibular Ligament (ATFL)

• Lateral view:
  – 8.4 ± 1.8 mm from inferior tip of the lateral malleolus
  – 13.8 ± 2.0 mm from the apex of the lateral talar process

• Mortise View:
  – 4.9 ± 1.4 mm proximal to the inferior tip of the lateral malleolus
  – 9.0 ± 2.1 mm from the apex of the lateral talar process
  – 18.9 ± 3.1 inferior to the superior lateral corner of the talar dome
Calcaneofibular Ligament (CFL)

- **Lateral view:**
  - 5.0 ± 1.4 mm from inferior tip of the lateral malleolus
  - 18.5 ± 4.6 mm from the posterior point of the peroneal tubercle

- **Mortise View:**
  - 2.9 ± 1.4 mm proximal to the inferior tip of the lateral malleolus
  - 18.0 ± 5.1 mm from the apex of the lateral talar process
Posterior Talofibular Ligament

- **Lateral view:**
  - 7.9 ± 2.5 mm from inferior tip of the lateral malleolus
  - 6.8 ± 3.2 mm from the posterolateral talar tubercle

- **Mortise View:**
  - 6.1 ± 1.0 mm proximal to the inferior tip of the lateral malleolus
  - 15.2 ± 2.1 mm from the apex of the lateral talar process
Conclusions/Clinical Relevance

- Radiographic parameters quantitatively describing the anatomy of the lateral ankle ligaments were defined with excellent reproducibility and agreement between reviewers.
- Quantitative radiographic data will assist in preoperative planning, improve intraoperative localization, and provide objective measures for postoperative assessment of anatomic repairs and reconstructions.
References


