Comparative analysis of inter- and intraligamentous distribution of sensory nerve endings in ankle ligaments: a cadaver study

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Conflict of interest statement

My disclosure is in the Final AOFAS Program Book.

I have a potential conflict with this presentation due to:

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Material

Dissection of 140 ankle ligaments from 10 human cadaver feet

Anatomical complexes

**syndesmosis**
- ATiFL

**lateral**
- ATFL
- CFL
- PTFL

**medial**
- TNL
- TCL
- STTL
- ATTL
- PTTL

**sinus tarsi**
- IER (L, I, M)
- TCOL
- CTL
Histology

- analysis in 5 levels, respectively
- Total cell count/section
- determination of sensory corpuscles according Freeman and Wyke’s classification, modified by Hagert

Conventional
- hematoxylin-eosin → tissue morphology (exclusion of chronic or acute ligamentous lesions)

Immunohistochemistry
- S-100 protein
- neurotrophin receptor p75
- protein gene product 9.5
- smooth muscle actin → sensory nerve endings
- smooth muscle actin → blood vessels
Localisation of sensory nerve endings and blood vessels

Significantly more often located at the epiligamentous region and closed to the insertion into bone (*, $, +, #, \text{p} \leq 0.05)$
Interligamentous distribution of free nerve endings and blood vessels

* free nerve endings (p<0.0001), blood vessels (p=0.001)
§ blood vessels (p=0.005)
No significant differences for all ligaments and corpuscles, except for Ruffini (§) in the TCL (p=0.016) and Unclassifiable (*) in the TNL (p=0.008)
Intraligamentous distribution

No significant differences for all ligaments and corpuscles, except for free nerve endings in the PTFL between the superficial level 1 and the deeper level 4 (p=0.005)
Conclusions

Sensory nerve endings and blood vessels are more often located at epiligamentous regions and closed to the ligament insertion into bone.

Stable and equal inter- and intraligamentous as well as side-related distribution of sensory nerve endings in ankle ligaments.
Abbreviations

distal tibiofibular syndesmosis
ATiFL = anterior tibiofibular ligament

lateral complex
ATFL = anterior talofibular; CFL = calcaneofibular; PTFL = posterior talofibular ligament

medial complex
a) superficial layer
TNL = tibionavicular; TCL = tibiocalcaneal; STTL = superficial tibiotalar ligament
b) deep layer
ATTL = anterior tibiotalar; PTTL = posterior tibiotalar ligaments

sinus tarsi
IER (L, I, M) = inferior extensor retinaculum with its lateral, intermediate and medial roots
TCOL = talocalcaneal oblique ligament; CTL = canalis tarsi ligament

References