Detailed anatomy and material properties of the ligaments of the trapeziometacarpal joint

Introduction
Stability of the trapeziometacarpal joint relies on congruency of the articular surfaces and strength of the soft-tissues crossing the joint. Laxity of the ligaments has been proposed as a mechanism for the development of osteoarthritis at the trapeziometacarpal joint1, understanding ligament function is thus of primordial importance in optimizing surgical interventions. In such interventions it is often not possible to spare all ligaments, a choice has then to be made to sacrifice or reconstruct certain ligaments. With this paper, we want to provide an anatomical basis which can be used to decide upon a certain surgical approach.

Methodology
- Sample size: 13 fresh-frozen cadaveric thumbs (9 ind.)
- Ligaments: anterior oblique (AOL) and dorsoradial (DRL)
- Techniques:
  - MRI: measurement of length and thickness
  - dissection: measurement of length and width
  - material testing: measurement of stiffness and hysteresis
- Sample preparation for material testing: step 1 → 2 → 3 → 4 (Fig. 3)
- Cyclic displacement-controlled testing (Bose tester)

Results
Our results show that the DRL is significantly shorter and thicker than the AOL (Fig. 4). The DRL also has a significantly higher stiffness than the AOL (89±21MPa vs. 65±29MPa) and a slightly higher hysteresis (25±3% vs. 21±3%) (Fig. 5).

Discussion & Conclusion
To date, strong importance has been given to the AOL in providing trapeziometacarpal joint stability and in restraining dorsoradial subluxation2,3,4. Our findings seem to suggest, however, that at least equal importance should be given to the stiffer and thicker DRL, a finding which is also supported by more recent biomechanical studies5,6,7,8.

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References