1. Introduction

Deep fascia is formed by a connective membrane that sheaths all muscles. It is devoid of fat, forms sheaths for the nerves and vessels, becomes specialized around the joints to form or strengthen ligaments, envelops various organs [1].

The fascia lata is the deep fascia of the thigh. It is often used as a graft material in a variety of orthopaedic procedures. Autologous nature of this graft eliminates the risk of graft-versus-host reactions [2]. Knowledge of the normal structure and function, chemical content of fascia will help towards a clearer understanding of the pathological changes which can occur [3]. Till now, to the authors’ best knowledge, neither elemental composition nor biomechanical properties of canine fascia lata were subject to detailed analysis. Therefore in this study both facial elemental content and mechanical behaviour were examined.

2. Material and methods

Specimens of seven pathologically unchanged canine deep fascia of the thigh were collected post mortem. These cadavers weren't frozen prior to examination. Samples around 5mm x 50mm were cut (using a special punch) from the fascia lata in different directions: transversal and longitudinal to the collagen fibres.

Uniaxial tensile tests were conducted using MTS Synergie 100 testing machine with initial lengths of 10mm at a crosshead speed of 5mm/min [4,5]. Before each measurement Mitutoyo gauge was used to measure the thickness of the tested specimens, and then their cross-sectional area was calculated for the variable value of the specimen geometry. The specimens were subjected to three cycles of loading and unloading until repeatable mechanical performance was obtained. The preconditioned specimens were loaded at 10% of their initial length.

The materials for the analysis of the elemental compositions were taken from the same region in all dogs adjacent to samples for mechanical study. Each specimen was fixed in 2,5% glutaraldehyde in phosphate buffer at pH 7.4. After routine preparation for scanning electron microscope, samples were dried and elemental composition of the fascia was performed by means of scanning electron microscope with X-ray microanalyses devise (Fig.1). The results for each element concentration within the given fascia sample were displayed as [wt.%]. Additionally mapping of examined elements at the surface of each sample was performed.

![Fig. 1: View of measurement system: scanning electron microscope EVO 15 LS and X-ray microanalyses devise Quantax Esprit 1.8.2 (Bruker).](image)
3. Experimental results

The stress-strain curve was plotted for each of the specimens tested (Fig.2). We report the maximum tensile strength and elastic modulus.

From the stress–strain curve, the maximum tangential modulus \( E \) was taken as the maximum slope of curve (linear part of curve) representing the viscoelastic phase of specimen extension. The tensile strength \( \sigma_{\text{max}} \) was taken as the peak stress obtained before failure of specimen. The results of the stress-strain analysis of the fascia are consistent with the stress-strain curves that are typically observed for soft tissues.

Analysis of elementary composition of canine deep fascia of the thigh has demonstrated that the most important elements are the following: C, N, O, Na, Mg, Al, Si, P, S, Cl, K, Ca, Co.

4. Conclusion

The results presented in this work are preliminary; it is evident that the mechanical response of fascia lata depends on the direction of loading. Undertaken research, in the future, could be a starting point, to create reference ranges for the content of elements in the healthy fascial tissue, as well as confirm the usefulness of the test animal model as a substitute for human tissue. Moreover, it is planned to determine of the possible influence of particular fascial element content and facial mechanical properties.

5. References