ULTRASOUND ELASTOGRAPHY FOR EVALUATION OF TENDONS AND JOINT CAPSULES IN HEALTHY DOGS AND HORSES: A PRELIMINARY STUDY

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Ultrasound strain elastography (USE) is a non-invasive technique that uses ultrasounds to provide information about tissue stiffness and elasticity [1], based on the principle that tissue compression by an ultrasound probe produces a displacement within the tissues [2]. This technique has been proven useful to evaluate human and horse muskoloskeletal system, in healthy and pathological tendons, which show an altered elasticity [3, 4, 5].

The aim of this study was to investigate the feasibility of the USE on various tendons and joint capsules in healthy dogs and horses, as well as to describe their elastographic appearances. We included in the study 5 dogs and 5 horses. Ten normal biceps brachii (BT), calcaneal (CT) and supraspinatus tendons (SST) and ten normal fetlock joint capsules (JC) were examined using the USE. Each structure was examined transversely and longitudinally except for the calcaneal tendon due the unfeasibility of a transverse study in that region [6].

Semi-quantitative and qualitative analysis of each structures was performed using the strain ratio (SR). The elastographic studies were performed at the area considered the most vulnerable to injury: in the BT the SR of the tendon was calculated in the bicipital groove; in the SST the SR was measured at his insertion on the greater tubercle of the humerus and in the CT, the SR was calculated at its insertion on the calcaneus. For those tendons, different structures located within the region of interest have been chosen as control structures, respectively the SST, the supraspinatus muscle and the standoff pad above the CT. Regarding the JC, the SR was measured at its insertion on the dorsal proximal aspect of the first phalanx, using the dorsal digital extensor tendon as reference.

All examined tendons appeared hard and the capsules soft on both qualitative and semi-quantitative analysis.

In conclusion, the findings of the present study indicate that the USE is easily realizable in those anatomical regions and is a feasible method to determine elasticity values of muscoloskeletal structures. Further studies comparing the elasticity values of normal and pathologic tissues are necessary to determine the diagnostic role of this technique.

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ULTRASOUND ELASTOGRAPHY OF THE CRICOARYTENOIDEUS LATERALIS MUSCLES IN CLINICALLY NORMAL HORSES: INITIAL EXPERIENCES

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Recurrent laryngeal neuropathy (RLN) most commonly affects the left side of the larynx and it is characterized by a distal axonopathy, resulting in progressive monolateral denervation atrophy of intrinsic laryngeal muscles (1). The cricoarytenoideus dorsalis muscle (CAD) is an abductor of the arytenoid cartilage and vocal fold, and its dysfunction results in a significant reduction in airflow, severe exercise-induced hypoxemia and an abnormal upper airway sound (1).

The diagnosis of RLN is primarily based on a history of poor performances, associated with an abnormal upper respiratory noise, external examination and palpation of the larynx, and upper airway endoscopy (2). Nevertheless, in early stages of RLN ambiguity of clinical and endoscopic findings can lead to misdiagnosis. Although atrophy of the CAD results in significant clinical signs, the adductor muscles of the arytenoid cartilage are affected earlier and more profoundly (1). The cricoarytenoideus lateralis muscle (CAL) is an adductor of the arytenoid cartilage, situated between the thyroid lamina and the arytenoid cartilage; it is not externally palpable or visible with endoscopy, thus an earlier dysfunction is often clinically undetected. CAL can be visualized ultrasonographically in normal horses and recent studies proved the diagnostic sensitivity of CAL ultrasonography also for RLN (1,2).

Ultrasound strain elastography (EUS) is a recent technique used to evaluate the mechanical proprieties of muscle tissue, based on low-frequency compression of the tissue applied via the hand-held ultrasound transducer, causing axial tissue displacement (strain), which is then calculated by comparing the echo set before and after the compression (3,4).

The purpose of this study was to determine the feasibility of EUS on CAL muscles in healthy horses. Twelve CAL muscles from 6 horses were assessed using B-mode and EUS. All horses were sedated and examined in standing position, with mild controlateral neck extension. The hair was not clipped and alcohol was used as an acoustic coupling agent. Sonography was performed with a linear array transducer (9 MHz) by two different operators. Each structure was examined in transverse and longitudinal planes for the caudolateral window of the larynx, as previously described (1). Semi-quantitative analysis of CAL muscles was performed, comparing the strain ratio between a reference area, represented by the thyroid cartilage, and different regions of interest of CAL (3 in transverse and 5 in longitudinal plane). Mean and standard deviation of Elasticity Index (EI) and Strain Ratio (SR) of each region were calculated, and Mann Whitney-U test was performed to assess interobserver agreement (SpSS).

CAL was easily imaged in all examined horses. Both examiners were able to correctly perform EUS examination, obtaining high quality images during at least 3 compression-relaxation cycles, and results showed interobserver statistical significative comparability. EI and SR of CAL were 2.68 ± 1.85 and 1.48 ± 1.30 on transverse plane, and 2.21 ± 1.60 and 1.24 ± 1.44 on longitudinal plane. The results of our study indicate that the CAL muscle can be assessed by mean of EUS, but further research is required to make such results diagnostically relevant.

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