Two-Dimensional Shear Wave Elastography in canine spleen: the impact of premedication and general anesthesia

Tiziana Caspanello[1], Sofia Monteiro[2], Pedro Parreira[2], Ana Lima[2,3,4], João Martins[2,4], Sónia Campos[2,4], Massimo De Majo[2], Ana Santana[2,3,4]

[1] Department of Veterinary Sciences, University of Messina, Messina, Italy
[2]I-MVET, Faculty of Veterinary Medicine, Lusófona University, Lisbon University Center, Portugal
[3]IPLUSO – Polytechnic Institute of Lusofonia, School of Health, Protection and Animal Welfare,
[4]CECAV – Center of Animal and Veterinary Science, Faculty of Veterinary Medicine, Lusófona University – Lisbon University Center, Portugal

Objectives: Two-dimensional Shear Wave Elastography (2D-SWE) is an ultrasound-based technique that assesses tissue stiffness by measuring the speed of shear waves (SWS) which propagate faster in stiffer tissues. Canine spleen is often involved in inflammatory, infectious and neoplastic diseases, and elastography can help differentiating benign from malignant lesions. Reliable SWE measurements require patient immobility, therefore uncompliant dogs might require pharmacological restraint. However, anesthetic drugs can alter splenic perfusion, size, and potentially stiffness. This longitudinal pre- and post- drug administration study aimed to evaluate changes in splenic stiffness in healthy dogs undergoing premedication and general anesthesia, using 2D-SWE.

Materials and Methods: Healthy dogs admitted for elective surgery at the Veterinary Teaching Hospital of Lusófona University, were prospectively enrolled. Each dog underwent three 2D-SWE assessments: (1) baseline (prior to any drug), (2) after premedication (dexmedetomidine 5 µg/kg + methadone 0.2 mg/kg IM), and (3) after induction of general anesthesia (propofol 1 mg/kg IV, followed by isoflurane in 100% O_2). For each examination, three images were acquired from the splenic head, body, and tail, and mean SWS was calculated.

Results: Seven dogs (4 females, 3 males; mean age 3 ± 3.3 years; mean weight 9.2 ± 3.4 kg) were included. Mean SWS values were: 2.15 ± 0.14 m/s (baseline), 2.33 ± 0.13 m/s (premedication), and 2.16 ± 0.20 m/s (anesthesia). Repeated measures ANOVA showed a significant overall difference ($p = 0.032$). Pairwise comparisons showed a trend toward significance between baseline vs. premedication and premedication vs. anesthesia ($p = 0.057$), but no significant difference between baseline and anesthesia ($p = 0.884$).
Conclusions: These results suggest that dexmedetomidine and methadone tend to increase spleen stiffness, introducing potential variability in SWE assessment. The subsequent administration of propofol and isoflurane restored spleen stiffness to values similar to baseline, providing optimal operating conditions and reliable results. Further research should evaluate larger samples and other anesthetic agents, in order to identify the most suitable, safe and reliable protocol for canine splenic SWE.

Keywords: Shear Wave Elastography; dog; spleen; premedication; anesthesia.