**Evolutions, trends, and challenges in equine ultrasound.**

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Ultrasound is a well-established modality in equine clinical practice since several decades.

In the last years, ultrasound has continued to technically advance, extending into higher frequencies and taking advantages from tissues harmonic phenomena and the use of compound imaging. This has led to a better image quality, better contrast resolution and improved tissue interface discrimination in equine ultrasound. Beam steering has been used in musculoskeletal ultrasound (at the enthesis of the suspensory ligament, in the stifle and in the foot) to better distinguish between hypoechoic patterns of pathological value and fibres bundles oriented in a different plane, but also to obtain an orientation of the ultrasound beam perpendicular to the bone for a better assessment of enthesopathies or to better distinguish artefacts form meniscal damage. Ultrawide bandwidth multi-frequency transducers, technology sharpening the ultrasound beam in the elevation direction with continuous focusing and single crystal transducers have provided improved penetration and detail resolution in difficult areas, and more uniform images from near to far field. These technical improvements have led to the obtention of better-quality images in hard-to-image regions and and/or in hard-to image equine patients. Doppler imaging has become routinely used in equine musculoskeletal ultrasound to assess tendons’ vascularity. The recent development of microvascular flow imaging ultrasound techniques has increased Doppler sensitivity to detect low flow in small vessels extending the ability of Power Doppler. This can be particularly useful in horses for the assessment of tendon and synovium vascularity. Also, it makes visible normal intratendonous vessels in specific anatomical locations in normal horses, which can be surprising as tendons were essentially avascular while using Color Doppler. It may also increase the rate of positive Doppler results in tendons with sub-clinical B-more abnormalities, especially suspensory branches, as these anatomical structures can already show minimal signal using Power Doppler when they contain sub-clinical B-mode changes.

Parallel to the technological advances in ultrasound, the last 2 decades have seen a tremendous progressive increase in use of Magnetic Resonance Imaging (MRI) to assess musculoskeletal damage in horses, not only in the distal limb but also in other diagnostic challenging areas as the proximal suspensory ligament origin. This fundamental transformation has partially reduced the number of ultrasound examinations of the distal limb, especially of the foot. On the other side, increased portability, and better image quality of affordable portable ultrasound machines (including pocket-size wi-fi transducers) have increased the number of Point-of-care ultrasound (PoCUS) thoracic and abdominal protocols available in horses and their use by equine practitioners and non-radiologist specialists. With these big changes in the equine imaging scenario, it is interesting to explore a new look at the ultrasound examination performed by the imaging specialist. This new look should focus on the values of a high-quality ultrasound examination mainly seen as real-time cognitive practice and challenging the view of ultrasound being “less advanced” than MRI and the comprehensive ultrasound being “superior” to PoCUS in a pyramid of accuracy and/or expertise. In the assessment of the anatomical regions where an overlap with MRI may exist, ultrasound should be promoted as an easily available complement in selected cases for its real-time abilities (to explore mobility of structures, content of cavities, easily guide interventional procedures…), for the added value of vascular assessment and for its time-efficiency to increase field of view, compare the contralateral limb and follow-up specific accessible lesions. In the assessment of anatomical regions or patients where PoCUS examination is more and more used, PoCUS and comprehensive ultrasound by an imaging specialist should be placed in two parallel trajectories with different strengths, opportunities, and patients.

This presentation will discuss ultrasound developments, their potential clinical impact in equine practice and the evolving role of ultrasound in equine practice.