Comparative Ultrasound Visibility and MRI Artifacts of Breast Tissue Markers and Wireless Localization Devices: An Ex-vivo Study.

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Objectives

1. Compare the ultrasound visibility and MRI artifact characteristics of two premium breast tissue markers (UltraCor™ Twirl™, Tumark® Vision) and three wireless localization devices (SAVI SCOUT®, Magseed® and LOCalizer™) in a mammalian tissue model simulating the human breast with a breast lesion.
2. Provide insights into device selection for radiologists and breast surgeons based on comparative imaging performances.

Materials and Methods

1. Chicken breast cubes were utilized to simulate breast lesions, while pork phantoms were deployed as models for breast tissue (Figure 1). Each marker or localization device was individually embedded in a 2cm^3 chicken breast cube, which was subsequently placed within a pork phantom.

2. Representative ultrasound images were acquired using a Philips Affiniti 70G ultrasound machine with a 12-5 MHz linear array transducer. These images were independently reviewed by five breast radiologists, and visibility was scored using a 5-point consensus-based system (Table 1).

3. The five pork phantoms were then imaged using a dedicated breast coil by a Siemens Sola Fit 1.5T scanner (Figure 2). T1-weighted FL3D and T2-weighted TSE images were acquired, and the size of MRI artifacts were measured (Table 1).

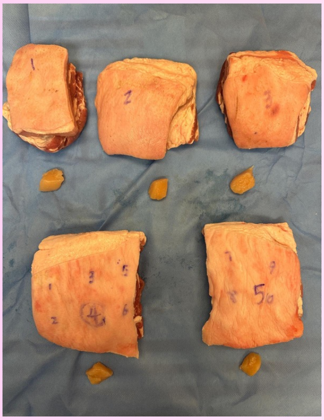


Figure 1 Breast tissue (pork) and lesion (chicken breast) models

Figure 2 Pork phantom in MRI breast coil

Results

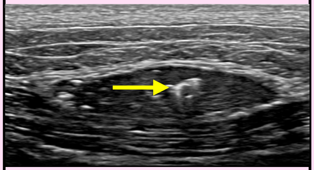
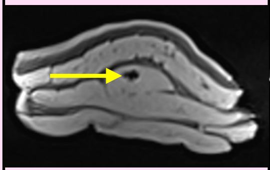
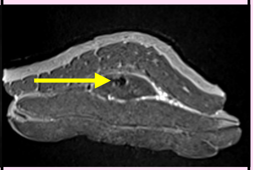
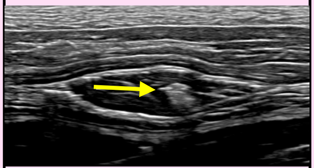
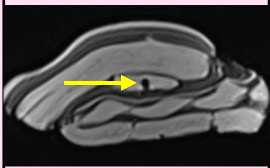
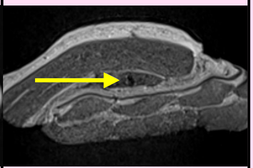
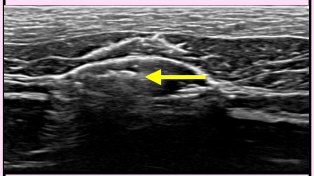
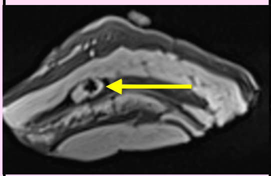
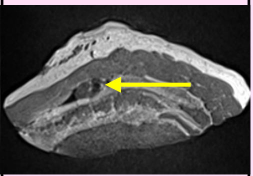
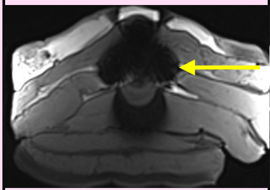
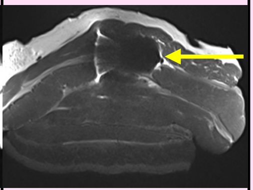
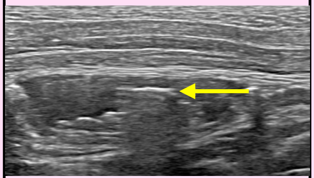
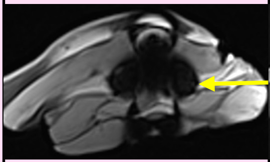
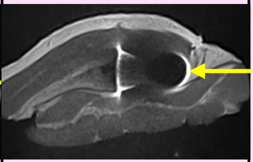
	Ultrasound images	Ultrasound Visibility	T1W FL3D	T2W TSE	MRI Artifacts
UltraCor™ Twirl™ 		Excellent ★★★★			Minimal + Diameter ≤1cm
Tumark® Vision 		Excellent ★★★★★			Minimal + Diameter ≤1cm
SAVI SCOUT® 		Modest ★			Minimal + Diameter ≤1cm
Magseed® 		Moderate ★★★			Substantial +++++ Diameter ≤5cm
LOCalizer™ 		Moderate ★★★			Substantial +++++ Diameter ≤4cm

Table 1 Ultrasound and MRI images of the five markers / localization devices (yellow arrow) with their corresponding ultrasound visibility and MRI artifacts

Conclusion

1. UltraCor™ Twirl™ and Tumark® Vision provide an optimal combination of excellent ultrasound visibility and minimal MRI artifacts in an ex vivo mammalian tissue model, supporting their use for the localization of non-palpable breast lesions.
2. SAVI SCOUT® demonstrates modest ultrasound visibility while producing minimal MRI artifacts. This makes it the preferred marker for patients requiring neoadjuvant treatment and subsequent MRI follow-up.
3. Both Magseed® and LOCalizer™ offer moderate ultrasound visibility with significant MRI artifacts. This limitation may hinder accurate assessment of treatment response following neoadjuvant therapy by MRI. They are best used in straight forward lesion localizations that do not require further MRI follow up.

References: product information of UltraCor™ Twirl™, Tumark® Vision, SAVI SCOUT®, Magseed® and LOCalizer™