

3-DIMENSIONAL ENDOVAGINAL ULTRASOUND CAN RELIABLY DETECT NORMAL ANAL SPHINCTER ANATOMY

Hypothesis / aims of study

To assess the reliability of 3D endovaginal ultrasound imaging in the detection of anal sphincter defects.

Study design, materials and methods

77 patients who had undergone concurrent 3D endovaginal ultrasound (EVUS) and 3D endoanal ultrasound (EAUS) with the standard probe (BK2052) were identified. All images were evaluated by trained interpreters in a blinded fashion. Any visualized defects in the external (ExtAS) or internal anal sphincter (IntAS) on EVUS were recorded and compared to the findings from EAUS as the gold standard.

Summary statistics were calculated for the patient population. Exact agreement and Cohen's Kappa were calculated to assess agreement between imaging routes. Sensitivity, specificity, and predictive values were calculated and binomial tests of proportion were used to obtain associated confidence limits. A p value of <0.05 was considered significant.

Results

The mean age of the patient population was 59 years (SD \pm 10.76), the mean BMI was 28.36 (SD \pm 5.99), and the median parity was 2 (range 1, 7). 93% of the patients were Caucasian, 31% had stage 1 or 2 prolapse while 59% had stage 2 prolapse. 19% had a history of known anal sphincter injury. Exact agreement for visualization of ExtAS defects was 35% and 61% for the IntAS. 100% of the images obtained by EAUS were clear enough for evaluation of both the ExtAS and IntAS. In contrast, images obtained by EVUS could not be analysed in 47% of EAS images and in 27% of IAS images due to poor quality. When uninterpretable images were excluded, exact EVUS and EAUS agreement for visualization of EAS and IAS defects was 85.4% and 83.9%, respectively. Of the patients with "uninterpretable" EVUS volumes, EAUS found 44.4% of these to have an ExtAS defect and 14.3% to have an IntAS defect. There was poor agreement of the visualization the ExtAS ($k_w=0.18$, 95% CI 0.07, 0.29) and IntAS ($k_w=0.17$, 95% 0.05, 0.30) between endovaginal and endoanal ultrasounds.

EVUS was found to be 100% specific (95% CI 100.0, 100.0) in the identification of anal sphincter defects, with a positive predictive value of 100% (95% CI 100.0, 100.0). It was also found to be 86% specific (95% CI 76.2, 96.5) in the identification of IAS defects, with a negative predictive value of 93% (95% CI 84.7, 100.0) (Table 1).

Interpretation of results

EVUS can reliably detect normal external anal sphincters with 100% specificity and positive predictive values and internal anal sphincters with 86% specificity and 100% negative predictive values.

Concluding message

In patients with normal anal sphincters, 3D EVUS can reliably identify normal anal sphincters with low false negative results and may be used as an alternative to 3D EAUS as an initial imaging modality. However, further imaging with the more invasive 3D EAUS is warranted if normal anatomy is not demonstrated on endovaginal imaging.

Table 1. Sensitivity and Specificity of 3D EVUS for imaging anal sphincter defects

Comparison group	Sensitivity (%; 95% CI)	Specificity (%; 95% CI)	PPV (%; 95% CI)	NPV (%; 95% CI)
EAS	68.4 (47.5, 89.3)	100.0 (100.0, 100.0)	100.0 (100.0, 100.0)	78.6 (63.3, 93.8)
IAS	75.00 (50.5, 99.5)	86.4 (76.2, 96.5)	60.0 (35.2, 85.0)	92.7 (84.7, 100.0)

EAS=external anal sphincter; IAS=internal anal sphincter; PPV=positive predictive value; NPV=negative predictive value.

Disclosures

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