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Advancing High Value Health Care

Free the T3: Implementation of Best Practice Advisory to Reduce Unnecessary Orders



Discussion

We successfully reduced the number of free T3 and total T3 tests in our system. Expanding on previous work by Sue et al,⁶ we demonstrated effectiveness across inpatient and outpatient settings, and across a broader context of thyroid disease diagnosis and monitoring.

In contrast to other interventions targeting overuse of TFTs, we focused only on T3 testing.^{1,5} The complexity of thyroid disease diagnosis and monitoring is a significant driver of overuse. TSH, T3, and T4 are often ordered...



Free the T3: Implementation of Best Practice Advisory to Reduce Unnecessary Orders

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KEYWORDS: Best practice advisory; Free T3; Quality improvement; Thyroid function tests

INTRODUCTION

Thyroid function tests (TFTs) are commonly overused and amount to 1.6 billion dollars annually in health care spending in the United States.^{1,2} Although national guidelines recommend a thyroid-stimulating hormone (TSH)-centered approach, clinicians often inappropriately order triiodothyronine (T3) and thyroxine (T4).² This may be due to lack of knowledge or ease of ordering all 3 tests at once in premature anticipation of an abnormal TSH.³ Additionally, clinicians order free T3 rather than total T3, despite the American Thyroid Association's recommendations to avoid free T3 due to its high rate of variability.⁴

Several previous interventions to reduce the ordering of unneeded TFTs have been described, but center largely around education, audit, and feedback.⁵ Reflex testing, or limiting processing of T3 only when TSH is low, and resulting T4 when TSH is low or high, is commonly described.⁵ However, this may result in processing T3 when TSH alone or in combination with Free T4 would be sufficient. In con-

The use of a best practice advisory was successful in decreasing T3 testing among patients prescribed levothyroxine in an outpatient setting.⁶ Here we describe a broader nudge intervention using best practice advisory to reduce targeted T3 testing in both hypothyroidism and hyperthyroidism in inpatient and outpatient settings in a large safety net system.

METHODS

Study Design and Setting

This quality improvement initiative was developed under the High Value Care Council at NYC Health + Hospitals, the largest public health system in the United States, with 11 hospitals and over 70 ambulatory centers. Our project was deemed a quality-improvement project by the NYC Health + Hospitals' central research office, and thus an Institutional Review Board submission was not required.

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Conflicts of Interest: None.

Authorship: All authors had access to the data and a role in writing this manuscript.

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Intervention

The intervention was led and designed by the System High Value Care Council at NYC Health + Hospitals with input from select members from the internal medicine, endocrinology, and laboratory services. Best practice advisories were created for total T3 and free T3 orders (Figure 1). The best practice advisory triggered upon order entry, and defaulted for the clinician to remove the test. An informational nudge was positioned at the top of the best practice advisory, providing guidance from NYC Health + Hospital High Value Care Council. As free T3 is an unreliable test, its messaging was different from total T3 and encouraged clinicians not to order. Messaging for total T3 focused on

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Original Research



Thoracic Imaging

Radiologic and Histologic Correlates of Early Interstitial Lung Changes in Explanted Lungs

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Results

Eight lung explants from six donors (median age at explantation, 71 years [range, 60–83 years]; four men) were included (unused donor lungs, $n = 4$; pre-emptive lobectomy for oncologic indications, $n = 2$). Ex vivo CT demonstrated ground-glass opacification, reticulation, and bronchiectasis. Micro-CT and histopathologic examination demonstrated that lung abnormalities were frequently paraseptal and associated with fibrosis and lymphocytic inflammation. The histopathologic results showed varying degrees of fibrosis in areas that appeared normal on CT scans. Regions of reticulation on CT scans generally had greater fibrosis at histopathologic analysis. Vasculopathy and bronchiectasis were also often present at histopathologic examination of lungs with ILAs. Fully developed fibroblastic foci were rarely observed.

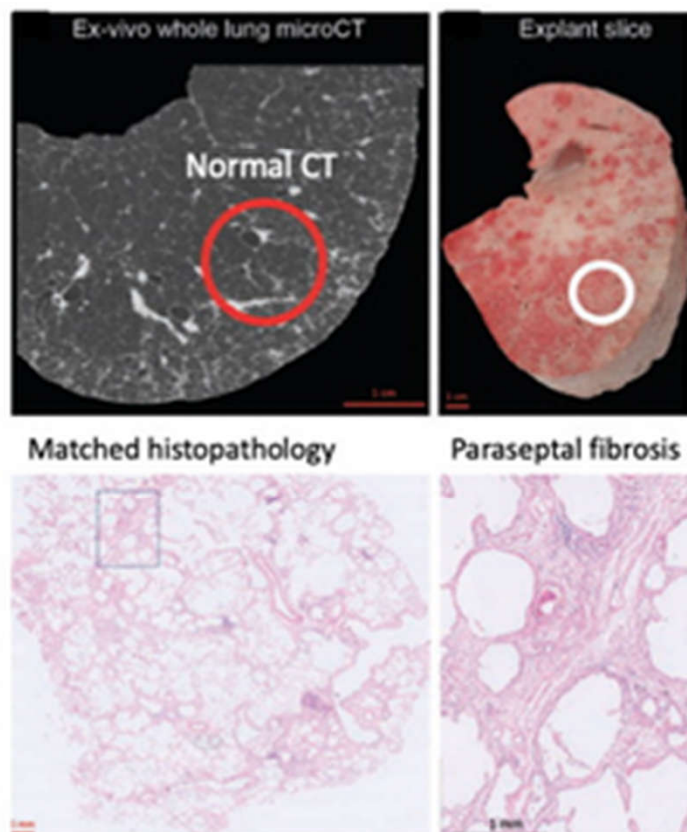
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Conclusion

This study demonstrated direct histologic correlates of CT-defined interstitial lung abnormalities.






Radiologic and Histologic Correlates of Early Interstitial Lung Changes in Explanted Lungs



- In eight explanted lungs with interstitial lung abnormalities (ILAs) from six donors, histopathologic analysis showed varying degrees of fibrosis in areas that appear normal at CT.
- Fibrosis in lungs with ILAs was organized paraseptally and was associated with predominant lymphocytic inflammation.
- Vasculopathy and bronchiectasis were present at histopathologic examination of lungs with ILAs, while fully developed fibroblastic foci were only rarely observed.

ORIGINAL ARTICLE

Low anti-HBc levels are associated with lower risk of virological relapse after nucleos(t)ide analogue cessation in HBe antigen-negative patients

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Markus Cornberg^{1,2,3}  | Benjamin Maasoumy^{1,2,3} 

Abstract

Background and Aims: Low anti-HBc serum levels at the time of therapy cessation were linked to a higher relapse risk in predominantly HBeAg-positive cohorts. We investigated the association of anti-HBc levels with relapse in HBeAg-negative patients.



Methods: Serum levels of anti-HBc, HBsAg and HBcrAg were determined in 136 HBeAg-negative patients, participating in a vaccination trial (ABX-203, NCT02249988), before treatment cessation or vaccination. Importantly, vaccination showed no impact on relapse. The correlation between the biomarkers and their predictive value for relapse (HBV DNA >2000 IU/ml \pm ALT >2xULN) was investigated.

Results: After therapy cessation 50% (N = 68) of patients relapsed. Median anti-HBc prior to treatment stop was significantly higher among relapsers compared to off-treatment responders (520 IU/ml vs. 330 IU/mL, $p = .0098$). The optimal anti-HBc cut-off to predict relapse was 325 IU/ml according to the Youden-Index. About 35% of patients with anti-HBc level <325 IU/ml versus 60% of those with values ≥ 325 IU/mL relapsed ($p = .0103$; sensitivity 50%, specificity 75%). Combining the optimal cut-offs of HBsAg (>3008 IU/mL) or HBcrAg (≥ 1790 U/ml) with anti-HBc increased the proportion of patients with relapse to 80% ($p < .0001$) and 74% ($p = .0006$), respectively.

Conclusion: In contrast to predominantly HBeAg-positive cohorts, in our cohort of HBeAg-negative patients lower anti-HBc levels are associated with a significantly lower relapse risk after nucleos(t)ide analogue cessation. The vast majority of included patients were either genotype B or C and the applicability to other genotypes has to be further evaluated. However, anti-HBc level as an indicator of the host response might be prospectively further explored for prediction models.

ORIGINAL ARTICLE

Noninvasive tests for nonalcoholic fatty liver disease in a multi-ethnic population: The HELIUS study

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Henrike Galenkamp^{3,4} | Max Nieuwdorp¹ | Bert-Jan van den Born¹ |
Adriaan Georgius Holleboom¹

Abstract

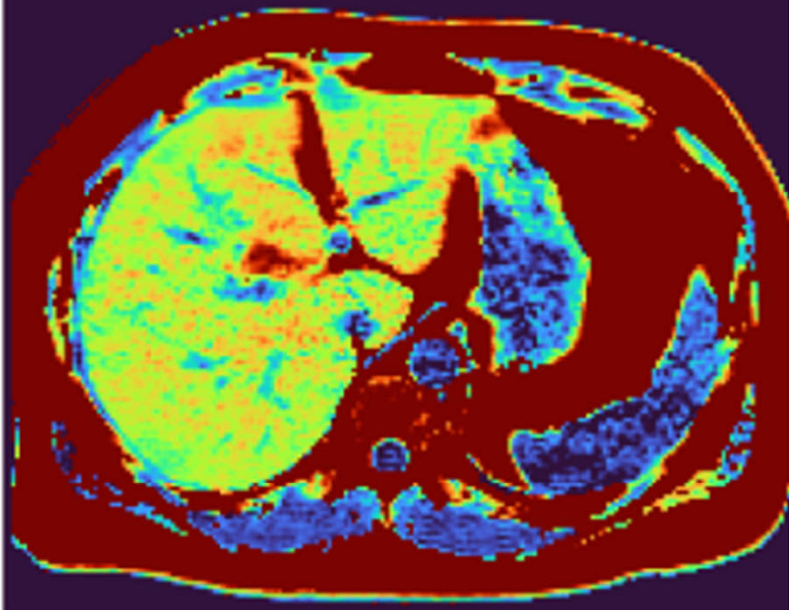
Nonalcoholic fatty liver disease (NAFLD) is increasing in prevalence and severity globally, prompting noninvasive testing, yet limited data exist on noninvasive liver tests (NITs) including transient elastography (TE) in ethnically diverse populations. Therefore, we studied prevalence and ethnic differences in NAFLD with NITs in the multi-ethnic HEalthy Life In an Urban Setting (HELIUS) cohort. NITs of liver steatosis (Fatty Liver Index [FLI]) and fibrosis (Fibrosis-4 index [FIB-4], and aspartate aminotransferase-to-platelet ratio [APRI]) were assessed in 10,007 participants. A subpopulation of 399 participants, selected on high-risk criteria for NAFLD (obesity, type 2 diabetes mellitus [T2DM], and/or elevated NITs), was examined with TE. FLI was ≥ 60 in 27.3% of 10,007 participants, indicating steatosis. Most participants (71.8%) had FIB-4 < 1.30 , excluding advanced liver fibrosis, and 1.1% ($n = 113$) had high FIB-4 (FIB-4 ≥ 2.67), indicating likely advanced liver fibrosis. In the TE subpopulation, 37.8% and 17.3% had steatosis and fibrosis (continuation attenuation parameter [CAP] ≥ 280 dB/m, liver stiffness measurement [LSM] ≥ 7.0 kPa, respectively). Turkish participants had highest adjusted odds ratio (OR) for elevated LSM (1.72, 95% confidence interval [CI] 0.59–5.01) and Ghanaians the lowest (0.24, 95% CI 0.09–0.65). Ghanaians had lowest adjusted OR for elevated CAP: 0.18 (95% CI 0.09–0.37). In diabetics, CAP and LSM were 17.6% and 14.6% higher than in nondiabetics, respectively. Correlations of FIB-4 and APRI with LSM were absent and weak. *Conclusion:* Liver steatosis proxy FLI was elevated in 27.3% of this multi-ethnic population. In Turkish background and in those with T2DM, proxies for steatosis and fibrosis were high, whereas in Ghanaian background, NITs were generally low. Together, this warrants awareness for NAFLD among high-risk populations, taking ethnic background into

Magnetic resonance imaging proton density fat fraction as an imaging-based biomarker of treatment response in patients with nonalcoholic steatohepatitis

Jonathan G. Stine^{1,2,3,4}  | Rohit Loomba^{5,6,7}

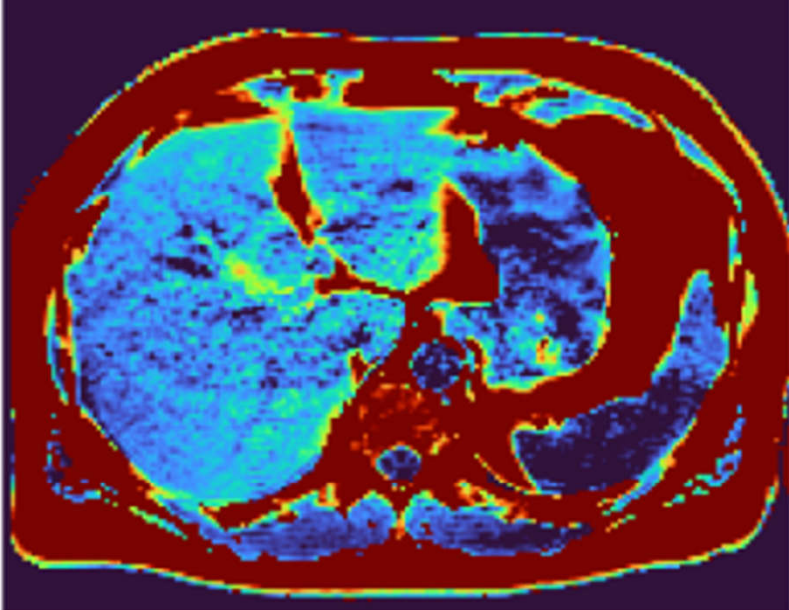
(A)

16.3% \pm 2.7%



(B)

6.2% \pm 2.3%



30%

20%

10%

0

Liver Fat

FIGURE 1 MRI-PDFF scans demonstrating $\geq 30\%$ relative reduction in liver fat. (A) Baseline MRI-PDFF scan meeting diagnostic criteria for NAFLD. (B) Treatment response scan demonstrating $\geq 30\%$ relative reduction in liver fat.

In summary, because liver biopsy has many well-known limitations, methods for routinely noninvasively monitoring treatment response in patients with NASH remains of great clinical importance. MRI-PDFF is a highly validated, quantitative, precise, reproducible, noninvasive imaging-based biomarker of treatment response that is now routinely incorporated into early-phase NASH clinical trials. Emerging evidence suggests that if a 30% or greater relative reduction in MRI-PDFF is achieved, histological improvement in NASH activity and liver fibrosis regression can be expected. At this time, future longitudinal prospective studies are needed to determine whether this threshold of MRI-PDFF reduction leads to a reduction in patient outcomes, including MALOs, as well as overall mortality.

ENDOMETRIOSIS | [ARTICLES IN PRESS](#)

Accuracy of combined physical examination, transvaginal ultrasonography, and MRI to diagnose deep endometriosis.

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than PE, TVUS or any combination to detect DIE. MRI and model B were the most accurate for detecting USL and RS locations with an accuracy of 90.4% and 82.6%, a sensitivity of 91.1% and 50%, and a specificity of 77.8% and 90.9%, respectively. Model B was the most accurate for the vaginal location with an accuracy of 82.6%, a sensitivity of 50%, and a specificity of 90.9%. Finally, MRI was more accurate than any combination for identifying a lateral location with an accuracy of 75.1%, a sensitivity of 36%, and a specificity of 93.8%.

Conclusion

A combination of PE, TVUS and MRI more accurate than each technique separately to diagnose DIE due to the equally high sensitivity of each, and the high specificity of PE and TVUS.

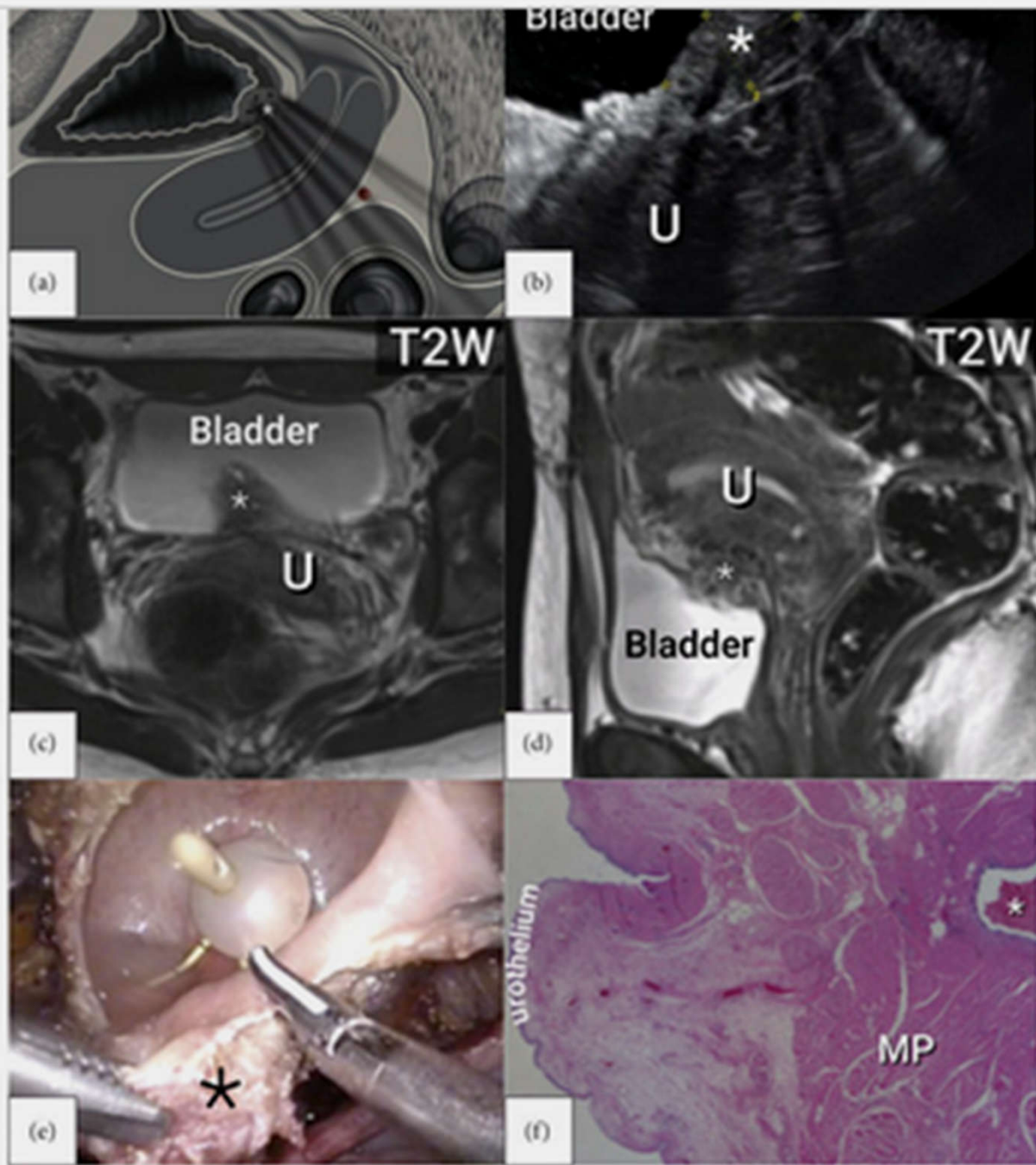
Diagnostic performance for combinations of physical exam, TVUS, and MRI for deep infiltrating endometriosis

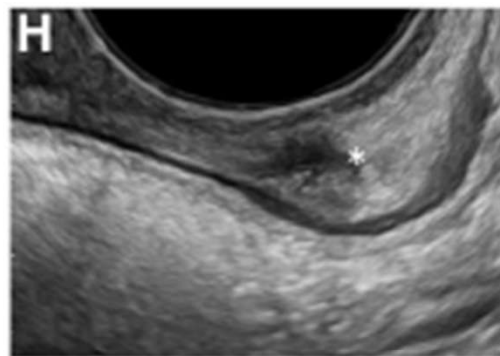
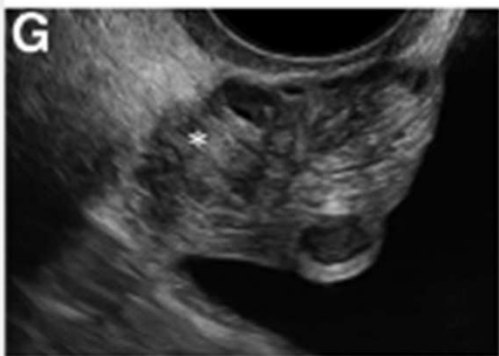
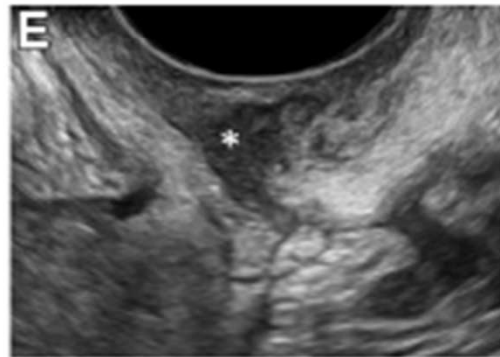
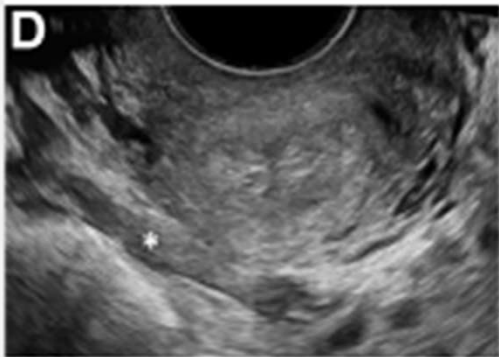
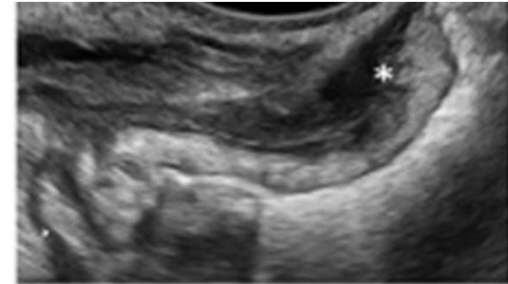
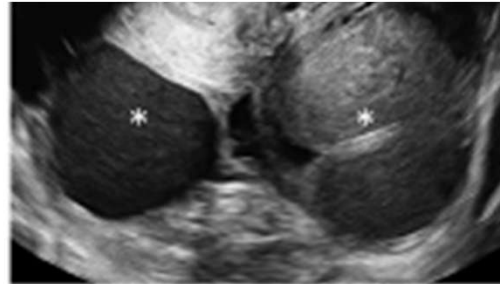
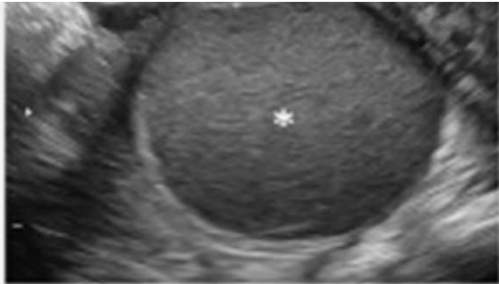
	Physical exam + MRI	Physical exam + TVUS	TVUS + MRI	Model A	Model B
Sensitivity	79.4%	80%	87.4%	77.7%	91.4%
Specificity	33.3%	33.3%	66.7%	33.3%	33.3%
Accuracy	78.7%	79.2%	33.3%	77%	90.4%

For individual methods, MRI showed the highest sensitivity and accuracy at 94.9% and 93.8%, respectively.

MRI showed more sensitivity than physical exam, TVUS, or any combination to detect deep infiltrating endometriosis. The researchers also found that MRI and model B were the most accurate for detecting uterosacral ligaments and rectosigmoid locations. This included accuracies of 90.4% and 82.6%, sensitivities of 91.1% and 50%, and specificities of 77.8% and 90.9%, respectively.

Model B also had the highest accuracy for the vaginal endometriosis location at





Ultrasound images demonstrating various endometriotic lesions at transvaginal sonography examination. The asterisk * marks the lesion: (a) Endometrioma, (b) bilateral endometriomas with kissing ovaries in transverse plane, (c) hypoechoic lesion in muscle layer of the anterior bowel wall, (d) endometriotic lesion in the right uterosacral ligament in a transverse plane, (e) endometriotic lesion in the vaginal wall, (f) "diabolo like" nodule, (g) endometriotic lesion in the bladder, (h) endometriotic lesion in the rectovaginal septum, (i) obliteration of the pouch of Douglas with endometriotic nodule in the bowel adherent to the uterus