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Diagnostic Accuracy of Transvaginal Ultrasound with Bowel Preparation for Deep Endometriosis: Retrospective Mapping to #Enzian Deep-Disease Compartments

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TVUS-BP and #Enzian Mapping in Deep Endometriosis

TVUS-BP and #Enzian Classification in Deep Endometriosis

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Keywords

Deep endometriosis; Transvaginal ultrasound; #Enzian classification; Diagnostic accuracy; Surgical planning

Abstract

Abstract

Purpose: To evaluate the diagnostic accuracy of transvaginal ultrasound with bowel preparation (TVUS-BP) for preoperative mapping of deep endometriosis (DE), retrospectively translating historically structured ultrasound reports into the deep-disease components of the #Enzian framework and using surgical and histopathological findings as the reference standard.

Methods: This retrospective, single-center diagnostic accuracy study included women with suspected DE who underwent TVUS-BP and subsequent laparoscopic surgery. Examinations were performed between 2013 and 2017 using a standardized pre-IDEA mapping protocol. Historical reports were retrospectively coded for #Enzian A, B, C and F disease by an examiner blinded to surgical and pathological findings. P, O and T components were not analyzed because the historical reports did not document them consistently enough for reliable retrospective grading.

Results: Fifty patients were included; 47 (94.0%) had histopathologically confirmed DE. Overall sensitivity was 85.1% (95% CI 72.3–92.6), specificity 66.7% (20.8–93.9), positive predictive value 97.6% (87.4–99.6), negative predictive value 22.2% (6.3–54.7), and accuracy 84.0% (71.5–91.7). Performance was highest for rectal/rectosigmoid disease (compartment C), whereas compartment B showed lower sensitivity.

Conclusion: Historical structured TVUS-BP reports can be translated into the deep-disease components of the contemporary #Enzian framework. The findings are exploratory because of the small, highly selected surgical cohort and the inability to reconstruct P, O and T components reliably.

Keywords: Deep endometriosis; Transvaginal ultrasound; #Enzian classification; Diagnostic accuracy; Surgical planning

1. Introduction

Deep endometriosis (DE) may involve the bowel, bladder, ureters, uterosacral ligaments and pelvic sidewalls, making accurate preoperative mapping important for surgical planning and multidisciplinary care [1–6]. Transvaginal ultrasound (TVUS) is widely used because it is accessible, dynamic and well tolerated [7–11].

Bowel preparation can improve visualization of posterior pelvic structures and rectosigmoid lesions [12–16]. Structured reporting is equally important: the 2021 #Enzian system includes superficial peritoneal disease (P), ovarian disease (O), tubo-ovarian adhesions (T), deep compartments A–C and F locations [17–19], while the IDEA consensus standardized the sonographic examination and terminology [11].

The examinations analyzed here were performed in 2013–2017, before IDEA and the comprehensive #Enzian system. The study therefore does not propose a competing protocol; it tests whether structured pre-IDEA real-world reports can be translated into later standardized deep-disease terminology. Diagnostic agreement was assessed for the components that could be reconstructed reliably (A, B, C and F) against surgical and histopathological findings.

2. Methods

2.1 Study Design and Reporting Standards

This was a retrospective, real-world, single-center diagnostic accuracy study conducted at the Hospital do Servidor Público Estadual of São Paulo (HSPE-FMO) a tertiary hospital specialized in complex treatment. The objective was to evaluate the diagnostic performance of TVUS-BP interpreted according to the #Enzian classification [18], using histopathological findings as the reference standard. The manuscript was prepared in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) [22] statement and the STARD (Standards for Reporting Diagnostic Accuracy Studies) [23] guidelines for diagnostic accuracy studies.

2.2 Study Population

Medical records of women evaluated and surgically treated for suspected deep endometriosis at HSPE-FMO between March 2013 and June 2017 were retrospectively reviewed.

2.2.1 Inclusion Criteria

Patients were eligible for inclusion if they met all of the following criteria: women evaluated for symptoms and/or imaging findings suggestive of DE and referred for surgical treatment; preoperative TVUS-BP performed by a single physician with formal training; laparoscopic surgical treatment performed by a multidisciplinary team experienced in the management of DE; surgical excision of suspected lesions allowing histopathological assessment; availability of complete surgical and histopathological reports enabling definitive diagnosis and anatomical characterization of disease according to the #Enzian classification [18].

2.2.2 Exclusion Criteria

Patients were not eligible for inclusion if any of the following conditions were present: history of previous pelvic surgery for endometriosis with significant anatomical distortion that could compromise imaging–pathology correlation; surgical procedures without excision of suspected endometriotic lesions for histological analysis; incomplete medical records preventing reliable extraction of imaging, surgical, or histopathological data; presence of other pelvic conditions requiring extensive surgery that could preclude accurate attribution of findings to DE.

2.3 Transvaginal Ultrasound with Bowel Preparation and #Enzian Classification

2.3.1 Transvaginal Ultrasound with Bowel Preparation

All TVUS-BP examinations were performed by a single physician with dedicated training and experience in endometriosis imaging. The examinations predated the 2016 IDEA consensus and therefore followed the structured institutional protocol in use during 2013–2017 rather than the later IDEA sequence. The historical protocol is summarized in Supplementary Table S2.

Bowel preparation consisted of a low-residue diet on the day preceding the examination and a rectal phosphate enema approximately one hour before TVUS. The same preparation was routinely used to reduce bowel contents and gas and improve visualization of posterior pelvic structures.

The examination used systematic pelvic mapping of the anterior and posterior compartments, with specific documentation of the vagina/rectovaginal septum, uterosacral-ligament and parametrial region, rectum/rectosigmoid, and additional extra-compartmental lesions when present. Reduced organ mobility, fibrotic retraction, adhesions and site-specific tenderness were recorded as indirect signs. Lesions considered suspicious for DE included hypoechoic nodules, irregular fibrotic thickening and hypoechoic plaques.

For compartment B, retrospective coding was considered positive only when the original ultrasound report explicitly localized a lesion to the uterosacral-ligament and/or parametrial region. Findings recorded as suspicious included focal hypoechoic or fibrotic thickening, nodularity, retraction and lesion measurement when available. The historical reports did not consistently distinguish uterosacral-ligament from parametrial involvement as separate subregions and did not document a standardized probe-position or sweep maneuver with sufficient consistency for retrospective reconstruction; therefore, these structures were analyzed together as compartment B. This limitation is important when comparing the historical protocol with later IDEA-based examinations.

2.3.2 Blinded Application of the #Enzian Classification

The original ultrasound reports were retrospectively reviewed and mapped to #Enzian deep-disease categories by the same examiner who had performed the examinations, while blinded to the surgical and histopathological findings during this retrospective coding step. Operative notes, intraoperative findings and pathology reports were not available to the examiner at the time of retrospective ultrasound classification.

This blinding strategy was implemented to reduce interpretation bias and aligns with STARD recommendations [23].

2.3.3 Surgical Procedure and Histopathological Reference Standard

All surgical procedures were performed laparoscopically by the same multidisciplinary team, composed of gynecologic and colorectal surgeons with expertise in deep endometriosis.

All resected lesions were submitted for histopathological examination. Histopathological confirmation of endometriosis was considered the reference standard (gold standard) for diagnosis, anatomical location, and lesion extent.

Surgical and histopathological findings were mapped to the same deep-disease components used for the ultrasound comparison. The primary diagnostic-accuracy analyses therefore compared A, B, C and F findings only.

2.3.4 #Enzian Classification Components Used in This Study

The comprehensive #Enzian system includes P (superficial peritoneal disease), O (ovarian endometriosis), T (tubo-ovarian adhesions/condition), deep compartments A–C, and F locations [19]. Because the 2013–2017 ultrasound reports were designed for deep-endometriosis mapping, P, O and T were not documented with sufficient consistency for valid retrospective #Enzian grading. They were therefore treated as not assessable for this dataset and excluded from diagnostic-accuracy analyses. The analyzed components were A, B, C and F.

Table 1 - #Enzian Components and Their Use in the Present Retrospective Analysis

A. Comprehensive #Enzian components

Component	Anatomical/clinical domain
P	Superficial peritoneal endometriosis — not assessable retrospectively in this dataset
O	Ovarian endometriosis (left/right) — not assessable retrospectively in this dataset
T	Tubo-ovarian adhesions/condition (left/right) — not assessable retrospectively in this dataset
A	Vagina and rectovaginal space
B	Uterosacral ligaments / parametrial structures
C	Rectum and rectosigmoid junction

B. Deep-lesion size grading used for compartments A, B and C

Grade (A/B/C)	Maximum deep-lesion diameter
1	< 1 cm
2	1–3 cm
3	> 3 cm

C. F locations

Code	**Location**
FA	Adenomyosis
FB	Bladder
FU	Ureter
FI	Intestinal segments cranial to the rectosigmoid
F(site)	Other specified extragenital location (site written in parentheses)

Note: P, O and T are integral components of the comprehensive #Enzian classification but were not retrospectively graded because the historical ultrasound reports did not capture them consistently enough for reliable coding. Diagnostic-accuracy analyses were restricted to A, B, C and F. For other extragenital sites, contemporary #Enzian notation uses F(site) rather than the obsolete FO label [19].

2.4 Statistical Analysis

Continuous variables are presented as means ± standard deviations or medians with interquartile ranges, according to data distribution. Categorical variables are expressed as absolute frequencies and percentages.

Diagnostic accuracy metrics—including sensitivity, specificity, overall accuracy, positive predictive value (PPV), and negative predictive value (NPV)—were estimated with corresponding 95% confidence intervals. Analyses were performed for overall detection of deep endometriosis and stratified according to #Enzian compartment and lesion size.

Agreement between ultrasound-based and histopathology-based #Enzian classifications was assessed using Cohen's kappa coefficient. Diagnostic discrimination was further evaluated using receiver operating characteristic (ROC) curve analysis, with calculation of the area under the curve (AUC), in accordance with STARD recommendations [19].

Given the retrospective design of the study, sample size was determined by the number of eligible patients during the study period rather than by an a priori power calculation. In diagnostic accuracy studies, the primary objective is estimation rather than hypothesis testing; therefore, precision of sensitivity and specificity estimates was assessed through 95% confidence intervals.

2.5 Ethics

The study was approved by the institutional review board of the coordinating center (CAAE: 40465320.8.0000.5463) and by the local ethics committees of all participating institutions, in accordance with national regulatory requirements. Given the retrospective nature of the study and the use of de-identified data, the requirement for informed consent was waived where applicable.

3. Results

During the study period (2013–2017), 85 women who underwent surgical evaluation for suspected deep endometriosis were retrospectively identified. After application of the predefined inclusion and exclusion criteria, 50 patients were included in the final analysis. Participant selection and diagnostic classification are summarized in Figure 1, in accordance with STARD recommendations [23]. All included patients underwent both the index test and the reference standard, allowing complete assessment of diagnostic accuracy.

Figure 1. STARD flow diagram of participant inclusion [23]

Legend: Flow diagram illustrating eligibility assessment, exclusions, application of the index test (TVUS-BP interpreted according to the #Enzian classification), reference standard (see Methods: surgery with histopathological confirmation), and final diagnostic classification. All included patients underwent the reference standard, and no inconclusive index test results were observed.

3.1 Baseline Characteristics of the Study Population

Baseline demographic, clinical, and surgical characteristics of the study population are summarized in Table 2. The mean age at surgery was 38.9 ± 5.9 years (range: 27–50). The median interval between symptom onset and surgical treatment was 60 months (interquartile range [IQR]: 27–156), reflecting the chronic nature of disease in this cohort. Regarding reproductive history, 22 patients (44%) were nulligravida and 25 (50%) were nulliparous. A prior history of miscarriage was reported by six patients (12%).

Symptoms at presentation were predominantly pain-related. Dysmenorrhea was reported by 94% of patients, followed by deep dyspareunia (76%) and non-cyclical pelvic pain (74%). Dyschezia was present in 54% of cases, and infertility was reported by 30.6% of patients.

All patients underwent laparoscopic surgery performed by a specialized multidisciplinary team. Intestinal involvement required different surgical approaches, including rectal shaving (44%), discoid resection (28%), and segmental rectosigmoid resection (36%); 6% of patients required more than one intestinal technique during the same procedure. Multicompartment pelvic disease was identified intraoperatively in 11 (22%) of patients. Histopathological examination confirmed deep endometriosis in 47 patients (94%), while three patients (6%) had no histopathological evidence of deep endometriosis.

Table 2. Baseline demographic, clinical, and surgical characteristics of the study population (n = 50)

Characteristic	Value
Demographic characteristics	
Age, years	38.9 ± 5.9
Age range, years	27–50
Time from symptom onset to surgery, months	60 (IQR 27–156)
Reproductive history	
Nulligravida, n (%)	22 (44)
Nulliparous, n (%)	25 (50)
Previous miscarriage, n (%)	6 (12)
Symptoms at presentation	
Dysmenorrhea, n (%)	47 (94)
Deep dyspareunia, n (%)	38 (76)
Non-cyclical pelvic pain, n (%)	37 (74)
Dyschezia, n (%)	27 (54)
Infertility, n (%)	15 (30.6)
Laparoscopic surgical characteristics (descriptive)	
Rectal shaving, n (%)	22 (44)
Discoid resection, n (%)	14 (28)
Segmental rectosigmoid resection, n (%)	18 (36)
More than one intestinal technique, n (%)	3 (6)
Multicompartment pelvic disease, n (%)	11 (22)
Histopathological confirmation of deep endometriosis, n (%)	47 (94)

Legend: Values are presented as mean ± standard deviation, median (interquartile range), or number (percentage), as appropriate. Multicompartment pelvic disease refers to the intraoperative identification of deep endometriosis involving more than one pelvic anatomical compartment.

3.2 Ultrasound Findings and #Enzian Classification

TVUS-BP was positive for DE in 41 of 50 patients (82.0%), with no inconclusive examinations. Compartment C predominated, and most detected lesions were ≥1 cm (Table 3).

The detailed distribution of ultrasound findings, including the analyzed #Enzian deep-disease components and lesion-size grading, is summarized in Table 3. Overall, compartment C was the most frequently involved site, and multicompartment disease was identified in a subset of patients. Larger lesions (#Enzian grades 2 and 3) accounted for most cases, whereas small lesions (< 1 cm) were less commonly detected.

Table 3 - #Enzian-based ultrasound findings in patients with suspected deep endometriosis

Ultrasound Findings	Value n(%)
Overall ultrasound result	
TVUS-BP positive for deep endometriosis	41(82.0)
TVUS-BP negative for deep endometriosis	9(18.0)
Inconclusive ultrasound examinations	0
Lesion characteristics on ultrasound	
Maximum lesion size, cm – median (IQR)	2.8 (1.7–3.85)
Lesion size range, cm	0.6–11.4
#Enzian compartment on ultrasound	
Compartment A	3(7.3)
Compartment B	4(9.7)
Compartment C	34(82.9)

F lesions (any location)	7(17.1)
Multicompartment involvement on ultrasound	6(14.6)
#Enzian lesion grade on ultrasound	
Grade 1 (< 1 cm)	3(7.3)
Grade 2 (1–3 cm)	21(51.2)
Grade 3 (> 3 cm)	17(41.5)

Legend: Values are presented as number and percentage, as appropriate. #Enzian classification refers exclusively to ultrasound-based anatomical assessment. Multiple lesions could be identified in the same patient; therefore, the sum of counts across #Enzian compartments may exceed the total number of patients. Percentages for #Enzian lesion grades were calculated among ultrasound-positive cases (n = 41). No inconclusive ultrasound examinations were recorded.

3.3 Reference Standard Findings: Surgical and Histopathological Results

Histopathology confirmed DE in 47 of 50 patients (94.0%); three patients had no histopathological evidence of disease. Compartment C predominated at surgery (Table 4).

According to the analyzed #Enzian deep-disease components applied to surgical findings, disease involvement was predominantly observed in the posterior compartment. Compartment C was the most frequently affected site, while compartments A and B were less commonly involved. Additional lesions in distant locations (#Enzian F) were identified in a relevant subset of patients, and multicompartment disease was documented in a similar proportion. The detailed distribution of surgical findings according to #Enzian compartments is presented in Table 4.

Most surgically confirmed lesions were grade 2 or 3 (≥1 cm); grade 1 lesions were uncommon.

Table 4- Surgical and histopathological findings according to the #Enzian classification (reference standard)

Surgical findings	Value n(%)
Overall surgical/histopathological result	
Histopathological confirmation of deep endometriosis	47(94.0)
No histopathological evidence of deep endometriosis	3(6.0)
#Enzian compartment at surgery	
Compartment A	3(6.3)
Compartment B	2(4.2)
Compartment C	41(87.2)
F lesions (any location)	10(21.3)
Multicompartment involvement on ultrasound	10(21.3)
#Enzian lesion grade at surgery	
Grade 1 (< 1 cm)	1(2.1)
Grade 2 (1–3 cm)	22(46.8)
Grade 3 (> 3 cm)	24(51,1)

Legend: Values are presented as number and percentage, as appropriate. Surgical findings were confirmed by histopathological examination and constituted the reference standard. Multiple lesions could be identified in the same patient; therefore, the sum of counts across #Enzian compartments and lesion grades may exceed the total number of patients.

3.4 Diagnostic Accuracy of TVUS-BP Compared with the Reference Standard

Against the surgical/histopathological reference standard, TVUS-BP showed high overall sensitivity, positive predictive value and accuracy, whereas specificity and negative predictive value were imprecise because only three patients were disease-negative (Table 5).

Stratified analyses showed the best performance for compartment C and lower sensitivity for compartment B (Table 6).

When disease extent was considered, ultrasound demonstrated high specificity and positive predictive value for the detection of F lesions (any location), indicating a strong ability to correctly identify patients with disease beyond the A–C compartments. Similarly, multicompartment disease was detected with high specificity, although sensitivity was moderate, suggesting that TVUS-BP reliably confirms complex disease patterns when present but may underestimate disease extent in some cases.

Stratification by lesion size further demonstrated that diagnostic performance improved with increasing lesion size. Larger lesions (#Enzian grades 2 and 3) were associated with higher sensitivity, agreement, and discriminatory performance, whereas small lesions (grade 1) were infrequent and associated with wide confidence intervals despite high specificity (Table 6).

Table 5. Overall diagnostic accuracy of TVUS-BP for deep endometriosis using the reference standard

Metric	Value	95% CI
Sensitivity	85.1%	72.3–92.6%
Specificity	66.7%	20.8–93.9%
Positive predictive value (PPV)	97.6%	87.4–99.6%
Negative predictive value (NPV)	22.2%	6.3–54.7%
Overall accuracy	84.0%	71.5–91.7%

Legend: Values are presented as percentages with 95% confidence intervals calculated using the Wilson method. Diagnostic accuracy metrics were calculated using surgical and histopathological findings as the reference standard (TP = 40, FP = 1, FN = 7, TN = 2).

Table 6. Diagnostic accuracy of TVUS-BP stratified by #Enzian compartment and lesion grade

#Enzian category	Sensitivity % (95% CI)	Specificity % (95% CI)	PPV % (95% CI)	NPV % (95% CI)	Kappa (95% CI)	AUC (95% CI)	Accuracy % (95% CI)
Global Detection							
Global TVUS-BP	85.1 (72.3–92.6)	66.7 (20.8–93.9)	97.6 (87.4–99.6)	22.2 (6.3–54.7)	0.3 (0.0–0.5)	0.8 (0.4–1.0)	84.0% (71.5-91.7)
#Enzian compartments							
Compartment A	100.0 (34.2–100.0)	97.3 (86.2–99.5)	66.7 (20.8–93.9)	100.0 (90.4–100.0)	0.8 (0.5–1.0)	1.0 (1.0–1.0)	98.0% (89.9-99.6)
Compartment B	0.0 (0.0–65.8)	83.8 (68.9–92.4)	0.0 (0.0–39.0)	93.9 (80.4–98.3)	-0.1 (-0.3–0.2)	0.4 (0.4–0.5)	88.0% (76.2-94.4)
Compartment C	86.1 (71.3–93.9)	66.7 (20.8–93.9)	96.9 (84.3–99.5)	28.6 (8.2–64.1)	0.3 (0.0–0.6)	0.8 (0.4–1.0)	70.0 (56.2-80.9)
Disease extent							
Multicompartment disease	45.5 (21.3–71.9)	97.4 (86.8–99.5)	83.3 (70.0–93.4)	86.4 (73.3–93.7)	0.5 (0.2–0.7)	0.7 (0.4–0.9)	86.0 (78.6-95.7)
F lesions (any location)	60.0 (31.3–83.2)	97.5 (87.1–99.6)	85.7 (78.6–97.4)	90.7 (78.4–96.3)	0.6 (0.0–0.5)	0.8 (0.4–1.0)	90.0 (78.6-95.7)
#Enzian lesion grade							
Grade 1 (< 1 cm)	100.0 (20.7–100.0)	97.4 (86.5–99.5)	50.0 (9.5–90.6)	100.0 (90.6–100.0)	0.7 (0.4–0.9)	1.0 (0.9–1.0)	98.0 (89.5-99.6)
Grade 2 (1–3 cm)	75.0 (50.5–89.8)	60.9 (40.8–77.8)	57.1 (36.6–75.5)	77.8 (51.0–93.7)	0.3 (0.0–0.6)	0.7 (0.5–0.8)	54.0 (40.4-67.0)
Grade 3 (> 3 cm)	59.1 (38.7–76.7)	82.4 (59.0–93.8)	81.3 (57.0–93.4)	60.9 (53.6–81.4)	0.4 (0.1–0.7)	0.7 (0.6–0.8)	62.0 (48.2-74.1)

Legend: Diagnostic accuracy metrics were calculated using surgical and histopathological findings as the reference standard. Values are expressed as percentages with 95% confidence intervals, except for Cohen's kappa coefficient and the area under the ROC curve (AUC). Analyses were stratified according to #Enzian compartments (A, B, and C), presence of F lesions (any F location, including isolated or associated lesions), and multicompartment disease (involvement of two or more #Enzian compartments). Confidence intervals are wide in some strata due to limited sample sizes.

Receiver operating characteristic curve analysis demonstrated moderate overall discriminatory capacity for TVUS-BP in detecting deep endometriosis (AUC = 0.7589; 95% CI: 0.4–1.0) (Figure 2). The AUC indicates moderate discrimination between patients with and without the target condition in this highly selected cohort.

Figure 2. Receiver Operating Characteristic (ROC) curve for TVUS-BP diagnostic performance using the #Enzian classification.

Legend: ROC curve illustrating the overall diagnostic performance of transvaginal ultrasound with bowel preparation (TVUS-BP) for detecting and classifying deep endometriosis according to the #Enzian system. The area under the ROC curve (AUC) was 0.7589 (95% CI: 0.4–1.0), indicating moderate discriminatory capacity. The diagonal reference line represents chance performance (AUC = 0.5).

3.5 Exploratory analysis of factors associated with false-negative ultrasound findings

In an exploratory analysis restricted to patients with surgically confirmed DE, potential factors associated with false-negative ultrasound findings were evaluated. No statistically significant associations were identified between false-negative results and compartment B involvement, small lesions (#Enzian grade 1), or multicompartment disease. In these subgroups, the absence of false-negative cases precluded reliable estimation of odds ratios, reflecting limited sample size rather than lack of a clinically relevant trend.

4. Discussion

TVUS-BP showed good overall agreement with surgical and histopathological findings for deep-endometriosis mapping, with the strongest performance for rectal/rectosigmoid disease (C) and lower sensitivity for compartment B. These results concern only the A/B/C/F components reconstructable from the historical reports and do not validate the complete contemporary #Enzian system.

The rationale for using 2013–2017 data is methodological. The examinations predated IDEA and comprehensive #Enzian but used structured anatomical reporting. The analysis therefore evaluates whether older real-world reports retain meaning when translated into current terminology. Unlike the prospective multicenter study by Montanari et al. [20], this is a historical translation study rather than a competing contemporary validation cohort.

The high positive predictive value reflects both useful lesion mapping and the very high prevalence of DE in this surgically selected cohort. Accordingly, the result is most relevant to preoperative planning in tertiary-care patients and should not be generalized to unselected diagnostic populations [25–30].

Performance was highest for compartment C, consistent with prior evidence for TVUS in rectosigmoid endometriosis [7,8,12–15]. Bowel preparation may contribute by reducing acoustic interference and improving visualization of posterior pelvic structures [12,13,24].

Compartment B remained challenging. In the historical protocol, B combined the uterosacral-ligament and parametrial region when explicitly documented. Contemporary methods use more detailed landmarks and maneuvers [11,18]; lower sensitivity here may therefore reflect both intrinsic anatomical difficulty and the limited granularity of a pre-IDEA protocol.

Larger lesions were detected more reliably than smaller lesions, consistent with their greater sonographic conspicuity [20,34–36].

Limitations include the selected tertiary surgical population, small sample, and only three disease-negative patients, resulting in wide confidence intervals for specificity, negative predictive value and subgroup estimates. The 2013–2017 protocol also predates IDEA and comprehensive #Enzian; P, O and T were not documented consistently enough for valid retrospective grading, so the analysis is necessarily partial.

The historical nature of the dataset is also its specific contribution: it tests whether structured anatomical descriptions obtained before international standardization remain interpretable within a modern framework. Supplementary Table S2 makes the historical protocol explicit; prospective studies using the complete contemporary system remain necessary.

Strengths include surgical and histopathological confirmation, a consistent examiner, blinding during retrospective coding, and a real-world Latin American tertiary-care setting.

5. Conclusions

In this highly selected tertiary-care surgical cohort, historical TVUS-BP reports could be translated into the A, B, C and F components of the contemporary #Enzian framework, with the highest agreement for rectal/rectosigmoid disease. Because P, O and T could not be reconstructed reliably and the cohort contained few disease-negative patients, the findings are exploratory and should not be interpreted as validation of the complete #Enzian classification. Prospective studies using the full contemporary protocol are required.

What does this study adds to the clinical work

Structured pre-IDEA TVUS-BP reports can retain clinically useful anatomical information that is translatable to contemporary deep-disease #Enzian compartments. Historical datasets should, however, be labeled as partial-framework analyses when P, O and T cannot be reconstructed reliably.

Author Contributions

João Paulo Barreto da Cunha: protocol/project development, data collection or management, manuscript writing/editing. Marcelo Antonini: protocol/project development, data analysis, manuscript writing/editing, supervision. Fernando Bray Beraldo: data collection or management, manuscript writing/editing. Ana Maria Gomes Pereira: data collection or management, imaging methodology, manuscript writing/editing. Rogério Machado Cury: data collection or management, manuscript writing/editing. Paula Seba Rahe: data collection or management, manuscript writing/editing. Marcelo Augusto Ribeiro Fontenelle Junior: protocol/project development, supervision, manuscript writing/editing.

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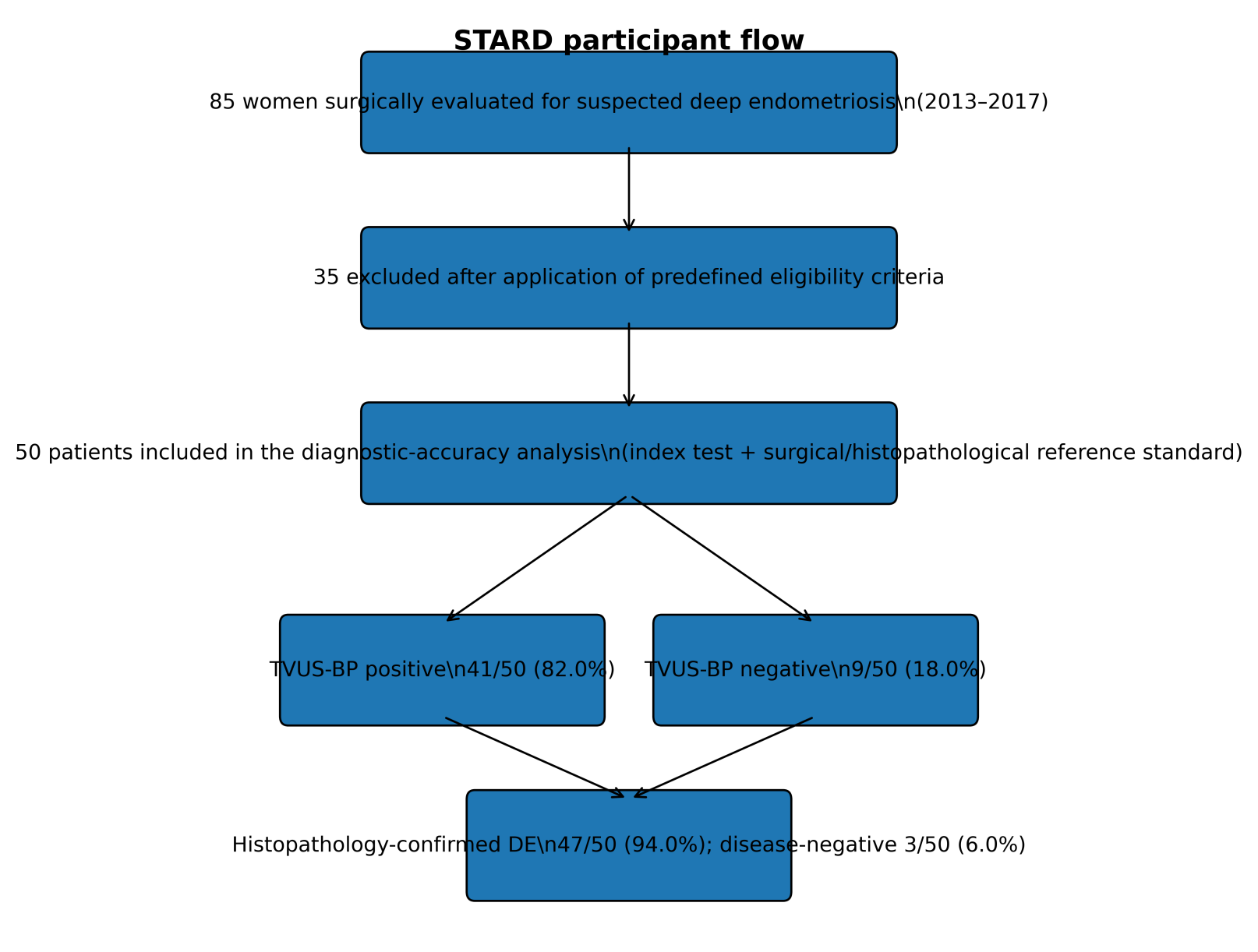
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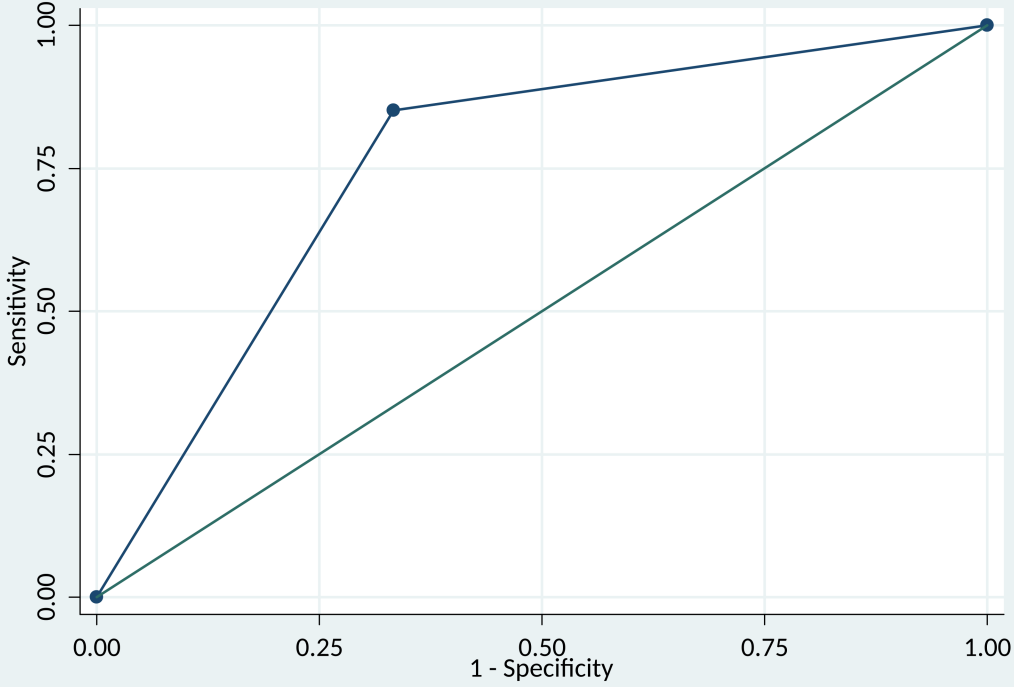
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Data Availability: The data that support the findings of this study are available from the corresponding author on reasonable request, subject to institutional and ethical restrictions.


STARD participant flow
85 women surgically evaluated for suspected deep endometriosis\n(2013–2017)
35 excluded after application of predefined eligibility criteria
50 patients included in the diagnostic-accuracy analysis\n(index test + surgical/histopathological reference standard)
TVUS-BP positive\n41/50 (82.0%)
TVUS-BP negative\n9/50 (18.0%)
Histopathology-confirmed DE\n47/50 (94.0%); disease-negative 3/50 (6.0%)


Sensitivity
0.00
0.25
0.50
0.75
1.00
1 - Specificity
0.00
0.25
0.50
0.75
1.00
Area under ROC curve = 0.7589

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