Comparison between transvaginal sonography, sonovaginography and magnetic resonance imaging in the diagnosis of posterior deep infiltrating endometriosis

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KEYWORDS: deep pelvic endometriosis; endometriosis; laparoscopy; magnetic resonance imaging; sonovaginography; transvaginal ultrasound

ABSTRACT

Objective To compare clinical evaluation, transvaginal sonography (TVS), sonovaginography and magnetic resonance imaging (MRI) in the diagnosis of posterior deep pelvic endometriosis (DPE).

Methods Women suspected of having posterior DPE, on the basis of subjective symptoms and clinical evaluation underwent digital vaginal and rectal examination, TVS, sonovaginography and MRI. Laparoscopy was performed and specimens were sent for histological examination. Sensitivity, specificity, positive and negative predictive value, as well as positive and negative likelihood ratios were analyzed for each diagnostic method.

Results Fifty-four patients out of 102 women suspected of having posterior DPE underwent laparoscopic surgery. Among these, in 46 (85.2%) cases DPE was confirmed at laparoscopic and histological examination. Sonovaginography correctly identified 43 (93.5%) cases, presenting higher accuracy than did the other procedures. Sonovaginography and MRI were more accurate in diagnosing and discriminating between the different locations of endometriotic lesions, with respective sensitivities of 94.7 and 73.1% for vaginal fornix, 88.9 and 66.7% for the uterosacral ligaments and 80.6 and 83.3% for involvement of the rectovaginal septum. The specificity of sonovaginography and MRI, respectively, was 97.1 and 86.2% for vaginal fornix, 94.3% for uterosacral ligaments and 100 and 77.8% for involvement of the rectovaginal septum. In the diagnosis of rectal endometriosis, we found a sensitivity of 66.7% for both techniques and specificity of 93.8 and 95.8% for sonovaginography and MRI, respectively.

Conclusion TVS should be used as the first-line diagnostic technique and sonovaginography and/or MRI as second-line methods in the diagnosis of DPE. Copyright © 2012 ISUOG. Published by John Wiley & Sons, Ltd.

INTRODUCTION

Deep pelvic endometriosis (DPE) is defined as the presence of endometrial implants, fibrosis and muscular hyperplasia penetrating more than 5 mm into the peritoneum. It occurs in 15–30% of patients with endometriosis and may involve the uterosacral ligaments, the pouch of Douglas, the rectosigmoid colon, the rectovaginal space, the vagina and, occasionally, the bladder. Endometriosis may cause dysmenorrhea, chronic pelvic pain, deep dyspareunia and infertility, and when it infiltrates the rectal or sigmoid wall it may also cause dyschezia and hematochezia. These symptoms can compromise the patient’s quality of life enough to justify invasive surgery. Radical laparoscopic removal of all endometriotic lesions is considered the best management, and, in case of deep endometriosis infiltrating the vaginal or rectal wall, specific procedures are required that present a real risk of complications and need collaboration with gastrointestinal tract surgeons. Noninvasive methods are therefore required to obtain a preoperative diagnosis of the location and extent of endometriotic lesions and of the existence of intestinal infiltration, in order to inform the patient about the various treatment possibilities with their respective risks, and to obtain an adequate basis on which to decide the surgery strategy.

Clinical examination and the patient’s medical history of preoperative symptoms are limited to establishing the extent of DPE lesions, as is not possible to determine the precise relationship between a specific symptom...
and the anatomic–surgical characteristics of endometriotic lesions. Some authors advocate transvaginal sonography (TVS) as the first-line imaging technique because it allows extensive exploration of the pelvis, it is well accepted and widely available, while others support magnetic resonance imaging (MRI) because of its accuracy. Another new technique considered for the diagnosis of DPE is sonovaginography. First described by Dessole et al., it consists of TVS combined with the introduction of saline solution into the vagina, which allows more complete visualization of the vaginal walls and fornix, pouch of Douglas, uterosacral ligaments and rectovaginal septum.

The aim of this study was to analyze the characteristics of the techniques commonly used in the diagnosis of DPE and, particularly, to compare sonovaginography with MRI.

PATIENTS AND METHODS

In this prospective study we enrolled 102 symptomatic women referred to the Endometriosis and Chronic Pelvic Pain Office of the Department of Gynaecological Science and Human Reproduction of Padua during the period from February 2005 to October 2010, suspected of having posterior DPE on the basis of subjective symptoms and clinical evaluation. Each patient underwent digital vaginal and rectal examination, TVS, MRI and sonovaginography. Among the 102 women, 54 patients underwent laparoscopic surgery to remove all of the endometriotic lesions on the basis of their high level of symptoms and acceptance of the risk of rectal and/or vaginal resection.

Inclusion criteria were: presence of at least one symptom (from moderate to severe) correlated with DPE (chronic pelvic pain, dysmenorrhea, deep dyspareunia and dyschezia), and presence of one or more lesions identified as DPE at clinical or imaging evaluation (TVS, sonovaginography or MRI). Exclusion criteria were: contraindications for MRI and laparoscopic surgery and refusal of the patient to provide informed consent.

For each patient we collected age at surgery, parity, body mass index (BMI) and hormonal treatment before surgery. All the women were asked to describe their pain during the two ultrasound imaging procedures using a 10-point visual analog scale (VAS).

The first clinical investigations were digital vaginal and rectal examinations, which were considered suggestive of DPE when an area of thickening or a nodule in the uterosacral ligaments or in the vaginal cul-de-sac, or a painful nodule in the rectovaginal septum was found.

The first-line imaging method used was TVS. All the examinations were performed by the same operator (E.C.) using a 6.5-MHz transvaginal probe (Siemens Sonoline 1, Erlagen, Germany) in the secretory phase of the menstrual cycle and they included routine analysis of the uterus and ovaries and analysis of the peritoneal surface that covers the pouch of Douglas, the retrocervical area (uterosacral ligaments, torus uterinus and posterior vaginal fornix) and the rectovaginal septum. We suspected deep retrocervical endometriosis when a thick block of hypoechoic tissue, nodular or irregular formations or retractable masses were found in this area, including lesions on the uterosacral ligament, pouch of Douglas and/or vagina. We also searched for free fluid, obliteration of the pouch of Douglas and signs of adhesion to adjacent structures, assessing the simultaneous changes of the position of adjacent structures using the Valsalva maneuver, mobilization of the probe and pressure on the abdomen by the operator.

As a second stage, the same team of two operators (E.C. and C.S., as the methodology requires the presence of two operators) performed sonovaginography in the same section. The procedure consisted of TVS combined with the introduction of saline solution into the vagina. A 6.5-MHz transvaginal probe was used (Siemens Sonoline 1) with, at its base, a purpose-designed hydraulic ring (Colpo-Pneumo Occluder, Cooper Surgical, Berlin, Germany) that inflates with approximately 40 mL of saline solution in order to prevent the escape of the 60–120 mL of saline that is subsequently injected into the vagina using a Foley catheter. The solution creates an acoustic window between the transvaginal probe and the surrounding structures of the vaginal channel and exerts a pressure that distends the vaginal walls, permitting more complete visualization of the vaginal walls and fornix, uterosacral ligaments, pouch of Douglas and rectovaginal septum.

Endometriotic lesions were detected as irregular hypoechoic structures at the level of the vaginal wall, often infiltrating the surrounding structures and uterosacral ligaments. Once an endometriotic lesion had been detected, we recorded the location and degree of infiltration.

Exophytic lesions or plaque protruding from the posterior vaginal fornix was classified as vaginal fornix DPE. Lesions deeply infiltrating the rectovaginal septum were considered as rectovaginal DPE, and when they infiltrated the rectal wall, fixing the rectal tract during Valsalva maneuver or pressure with the probe, they were interpreted as rectal endometriosis. Lateral lesions infiltrating the uterosacral ligaments were considered to be uterosacral DPE (Figures 1–3). TVS and sonovaginography were performed without bowel preparation (i.e. without use of laxatives or enema), and with the operators blinded to the results of the other investigations.

Figure 1 Sonovaginography showing exophytic endometriotic lesion at level of posterior vaginal fornix (arrow).
All patients also underwent MRI using a 1-T MR imaging system (Siemens Harmony, Erlagen, Germany) by a single expert radiologist (A.T.) previously informed about the patient’s history, but not about the results of the other imaging examinations. Before the examination we administered 20 mg of hyoscine butylbromide (Buscopan) to reduce intestinal peristalsis. Patients did not undergo any bowel preparation. We used routine clinical sequences: 5 mm thickness T2 turbo spin echo weighted images in axial, sagittal and coronal planes were acquired. Axial T1 images with and without fat suppression were also collected, before and after intravenous injection of gadolinium contrast medium (Figures 2 and 3).

The diagnosis of DPE was based on the combined presence of morphological abnormalities and signal abnormalities such as hyperintense foci on T1-weighted and/or fat-suppression T1-weighted MR images, corresponding to hemorrhagic foci or small hyperintense cavities on T2-weighted images, or areas corresponding to fibrosis, with a signal close to that of pelvic muscle on T1- and T2-weighted images, with or without foci or cavities and with or without contrast enhancement after injection of contrast medium (Figures 2 and 3).

All 54 women finally underwent laparoscopic surgery to remove all the endometriotic tissue and specimens were sent for histological examination.

Statistical analysis

For each diagnostic method we calculated sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV), as well as positive and negative likelihood ratios. Data regarding VAS pain score of TVS and sonovaginography were compared using Student’s t-test. *P < 0.05* was considered statistically significant.

RESULTS

The mean age of the 54 women was 32.3 ± 5.8 years and mean BMI was 20.6 ± 2.2 kg/m². Forty-seven (87.0%) of the women were nulliparous. In 28 (51.9%) cases the patients were receiving hormonal treatment before surgery, in 22 (40.7%) cases estroprogestins were being taken for contraception and/or endometriosis, and in six (11.1%) cases gonadotropin-releasing hormone analog treatment had been administered for 3–6 months. No patient underwent hormonal treatment after surgery.

In 20 (37.0%) cases a vaginal excision and in six (11.1%) cases a segmental bowel resection was performed. In 46 (85.2%) cases DPE was confirmed at laparoscopic investigation and histological examination, and in the other eight (14.8%) cases pelvic adhesions, obliteration of the pouch of Douglas and/or superficial pelvic endometriosis were found. Among the patients with DPE, 36 (78.3%) cases showed rectovaginal septum involvement, 19 (41.3%) showed vaginal fornix involvement and in nine (19.6%) cases the uterosacral ligaments were involved.

In the diagnosis of the presence of endometriotic lesions, clinical examination identified 40 out of 46 (87.0%) cases, transvaginal sonography identified 34 (73.9%), sonovaginography identified 43 (93.5%) and MRI identified 42 (91.3%). Diagnostic performance data of these three techniques are given in Table 1, and data for diagnosis in the three specific locations (vaginal fornix, uterosacral ligaments and rectovaginal septum) are shown in Table 2. Table 3 gives performance data of TVS, sonovaginography and MRI in the diagnosis of rectal endometriosis.

Table 1 Performance of clinical examination, transvaginal sonography (TVS), sonovaginography and magnetic resonance imaging (MRI) in the detection of posterior deep pelvic endometriosis

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Clinical examination</th>
<th>TVS</th>
<th>Sonovaginography</th>
<th>MRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity (%)</td>
<td>87.0</td>
<td>73.9</td>
<td>93.5</td>
<td>91.3</td>
</tr>
<tr>
<td>Specificity (%)</td>
<td>75.0</td>
<td>87.5</td>
<td>87.5</td>
<td>75.0</td>
</tr>
<tr>
<td>PPV (%)</td>
<td>95.2</td>
<td>97.1</td>
<td>97.7</td>
<td>95.5</td>
</tr>
<tr>
<td>NPV (%)</td>
<td>50.0</td>
<td>36.8</td>
<td>70.0</td>
<td>60.0</td>
</tr>
<tr>
<td>LR+</td>
<td>3.48</td>
<td>5.91</td>
<td>7.47</td>
<td>3.65</td>
</tr>
<tr>
<td>LR−</td>
<td>0.17</td>
<td>0.29</td>
<td>0.07</td>
<td>0.11</td>
</tr>
<tr>
<td>LR+ *, positive likelihood ratio; LR−, negative likelihood ratio; NPV, negative predictive value; PPV, positive predictive value.</td>
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<td></td>
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</tr>
</tbody>
</table>
DISCUSSION

As the surgical treatment of posterior DPE may be very challenging for patients and surgeons, preoperative assessment of the location, characteristics and presence or absence of vaginal or rectal wall infiltration by endometriotic lesions is important in order to inform the patient about the various treatment possibilities, with their respective risks, and to allow adequate counseling regarding decisions on the treatment strategy in agreement with the patient.

TVS is commonly adopted as the first-line imaging procedure in women with suspected DPE because it permits an extensive exploration of the pelvis, can detect, for example, rectal wall infiltration, and is well accepted, widely available and not expensive. Bazot et al. in a study in 2003, using TVS for the diagnosis of intestinal DPE, achieved a sensitivity and specificity of 95 and 100%. Abrao et al. in 2007 obtained a sensitivity and specificity of 98.1 and 100% and Hudelist et al. in 2009 also presented high values, with a sensitivity of 96% and specificity of 98%. Another study, published in 2010 by Goncalves et al., showed that TVS with bowel preparation can diagnose endometriosis of the rectum and sigmoid with high sensitivity (97%) and specificity (100%). Other authors have achieved lower levels of diagnostic accuracy with TVS, leading them to propose new ultrasound methods to increase the detection rate of DPE. We argue that it is probable that the authors who achieved excellent results with TVS are highly experienced and ultraspecialized in the diagnosis of DPE, while other operators, although experienced, could not reach such high detection rates. In our study TVS, although performed by an experienced operator, achieved a good specificity (87.5%) but lower sensitivity (73.9%), with NPV 36.8%, LR+ 5.91 and LR− 0.29.

Menada et al. tested TVS combined with water-contrast in the rectum (RWC-TVS) in patients with suspected rectovaginal endometriosis; this technique presented higher accuracy than simple TVS in the diagnosis of rectal endometriosis (sensitivity 97%, specificity 100%, PPV 100% and NPV 91.3%) but lower specificity in the diagnosis of endometriotic lesions located in the uterosacral ligaments, retrocervical area and pouch of Douglas. Bergamini et al. also tested RWC-TVS, reporting that it has the same accuracy as transrectal sonography and effectiveness equal to that of barium enema in the detection of a significant intestinal lumen stenosis related to rectosigmoid endometriosis.

In 2003 Dessole et al. presented a new ultrasonographic technique, sonovaginography, as a more accurate and specific examination than TVS in the diagnosis of DPE, achieving a sensitivity of 90.6%, specificity 85.7%, PPV 93.5% and NPV 80%. Sonovaginography is simple, with low pain or discomfort for the patient and it can be performed directly by the gynecologist at limited expense. It provides information on the location, extent and infiltration of endometriotic lesions in the rectovaginal septum. It can also be performed as a dynamic test because the operator can assess changes in the position of endometriotic nodules compared to the rectal wall position and assess the suspicion of bowel infiltration. However, a limitation of this technique is that it depends on the examiner’s ability and experience.

In our study we compared clinical examination and three different techniques in the diagnosis of DPE: TVS,
Table 2 Performance of clinical examination, transvaginal sonography (TVS), sonovaginography and magnetic resonance imaging (MRI) in the discrimination of the localization of deep posterior endometriotic nodules

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Clinical examination</th>
<th>TVS</th>
<th>Sonovaginography</th>
<th>MRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaginal fornix</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity (%)</td>
<td>57.9</td>
<td>57.9</td>
<td>94.7</td>
<td>73.1</td>
</tr>
<tr>
<td>Specificity (%)</td>
<td>88.6</td>
<td>91.4</td>
<td>97.1</td>
<td>94.3</td>
</tr>
<tr>
<td>PPV (%)</td>
<td>73.3</td>
<td>78.6</td>
<td>94.7</td>
<td>87.5</td>
</tr>
<tr>
<td>NPV (%)</td>
<td>79.5</td>
<td>80.0</td>
<td>98.1</td>
<td>86.8</td>
</tr>
<tr>
<td>LR+</td>
<td>5.065</td>
<td>6.75</td>
<td>33.157</td>
<td>12.89</td>
</tr>
<tr>
<td>LR−</td>
<td>0.475</td>
<td>0.46</td>
<td>0.054</td>
<td>0.279</td>
</tr>
<tr>
<td>Uterosacral ligaments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity (%)</td>
<td>55.6</td>
<td>55.6</td>
<td>88.9</td>
<td>66.7</td>
</tr>
<tr>
<td>Specificity (%)</td>
<td>80.0</td>
<td>95.6</td>
<td>95.6</td>
<td>95.6</td>
</tr>
<tr>
<td>PPV (%)</td>
<td>35.7</td>
<td>71.4</td>
<td>80.0</td>
<td>75.0</td>
</tr>
<tr>
<td>NPV (%)</td>
<td>90.0</td>
<td>91.5</td>
<td>97.7</td>
<td>93.5</td>
</tr>
<tr>
<td>LR+</td>
<td>2.77</td>
<td>12.5</td>
<td>19.99</td>
<td>14.99</td>
</tr>
<tr>
<td>LR−</td>
<td>0.55</td>
<td>0.465</td>
<td>0.11</td>
<td>0.34</td>
</tr>
<tr>
<td>Rectovaginal septum involve</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity (%)</td>
<td>58.3</td>
<td>63.9</td>
<td>80.6</td>
<td>83.3</td>
</tr>
<tr>
<td>Specificity (%)</td>
<td>83.3</td>
<td>88.9</td>
<td>100</td>
<td>77.8</td>
</tr>
<tr>
<td>PPV (%)</td>
<td>87.5</td>
<td>92.0</td>
<td>100</td>
<td>88.2</td>
</tr>
<tr>
<td>NPV (%)</td>
<td>50.0</td>
<td>53.2</td>
<td>72.0</td>
<td>70.0</td>
</tr>
<tr>
<td>LR+</td>
<td>1.75</td>
<td>5.75</td>
<td>∞</td>
<td>5.95</td>
</tr>
<tr>
<td>LR−</td>
<td>0.25</td>
<td>0.41</td>
<td>0.194</td>
<td>0.34</td>
</tr>
</tbody>
</table>

LR+, positive likelihood ratio; LR−, negative likelihood ratio; NPV, negative predictive value; PPV, positive predictive value.

Table 3 Performance of transvaginal sonography (TVS), sonovaginography and magnetic resonance imaging (MRI) in the evaluation of bowel infiltration by deep endometriotic nodules

<table>
<thead>
<tr>
<th>Parameter</th>
<th>TVS</th>
<th>Sonovaginography</th>
<th>MRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity (%)</td>
<td>33.3</td>
<td>66.7</td>
<td>66.7</td>
</tr>
<tr>
<td>Specificity (%)</td>
<td>91.7</td>
<td>93.8</td>
<td>95.8</td>
</tr>
<tr>
<td>PPV (%)</td>
<td>33.3</td>
<td>57.1</td>
<td>66.7</td>
</tr>
<tr>
<td>NPV (%)</td>
<td>91.7</td>
<td>95.7</td>
<td>95.8</td>
</tr>
<tr>
<td>LR+</td>
<td>4.0</td>
<td>10.66</td>
<td>16.0</td>
</tr>
<tr>
<td>LR−</td>
<td>0.727</td>
<td>0.356</td>
<td>0.347</td>
</tr>
</tbody>
</table>

LR+, positive likelihood ratio; LR−, negative likelihood ratio; NPV, negative predictive value; PPV, positive predictive value.

Sonovaginography and MRI. We opted for comparison of the two ultrasonographic techniques with MRI, as it is an efficient and widely used technique, highly accurate for the diagnosis of posterior DPE. It allows the evaluation in multiple planes of all multifocal, scattered and small endometriotic lesions and it also allows a relatively objective assessment, although there is a learning curve that depends on the specific anatomic location of the endometriosis. Additionally, analysis of the images obtained can be performed subsequently and independently by several observers. Nevertheless MRI cannot accurately estimate the depth of penetration of endometriosis in the muscolaris propria of the intestinal wall, it can be limited by artifacts related to the presence of fecal residuals, enhanced intestinal peristalsis or anatomical anomalies of the patient and it is more expensive than the other methods.

In our experience, sonovaginography achieved better results than did the other techniques reviewed here and it was also scored as being more comfortable for the patient than TVS, although the difference was not statistically significant. We also observed that MRI and even more so sonovaginography are more accurate in diagnosing and discriminating between the different locations of endometriotic lesions.

In the diagnosis of rectal endometriosis, we found a sensitivity of 66.7% for both techniques, but good values of specificity of 93.8 and 95.8% for sonovaginography and MRI, respectively, showing that both techniques may help in the diagnosis and precise location of DPE and of rectal endometriotic infiltration. Sonovaginography could therefore be an option for those operators who do not achieve good results with TVS.

Guerriero et al. tested another variant of sonovaginography, ‘tenderness-guided’ transvaginal sonography (tg-TVS); a dynamic technique that involves creating an acoustic window between the probe and the surrounding vaginal structures by increased amounts of ultrasound gel inside the probe cover and asking the patient to indicate which points are more painful under gentle pressure from the probe during the examination. Using this new approach, the authors achieved a specificity of 95%, sensitivity 90%, PPV 97% and NPV 86% in detecting DPE. Recently Saba et al. compared tg-TVS with MRI, stating that the two methods present similar results in the identification of rectosigmoid endometriosis. When used in combination the sensitivity increased to 95%, suggesting that tg-TVS and MRI have complementary roles in the diagnosis of rectosigmoid endometriosis, depending on the site affected.

In our opinion, physical examination together with TVS could be adopted as first-line diagnostic techniques, in accordance with Hudelist et al., who showed that...
REFERENCES


QUERIES TO BE ANSWERED BY AUTHOR & EDITOR

IMPORTANT NOTE: Please mark your corrections and answers to these queries directly onto the proof at the relevant place. Do NOT mark your corrections on this query sheet.

Queries to Author:

AQ1 Please check that all affiliations are correct and complete

AQ2 Au: "Women suspected of having posterior deep pelvic endometriosis on the basis of subjective symptoms and clinical evaluation, underwent clinical evaluation...", I have changed the second "clinical evaluation" to 'digital vaginal and rectal examination' to avoid repetition here, ok? (OS)

AQ3 Au: "we found mean values of sensitivity, 66.7% for both the two techniques" changed to 'we found a sensitivity of 66.7% for both techniques' as you don’t seem to be giving a mean here, ok? (OS)

AQ4 Au: "Transvaginal sonography should be used as the first-line diagnostic technique and sonovaginography and/or MRI as second-line methods in the diagnosis of DPE", should we specify posterior DPE here? (OS)

AQ5 Au: "localization and extension of endometriotic lesions" changed to 'location and extent of endometriotic lesions', ok? (OS)

AQ6 Au: "Clinical examination and the patient’s medical history of preoperative symptoms are limited to establishing the extent of DPE lesions...", this statement reads as if clinical exam and symptoms can be used to determine extent of DPE lesions, but nothing beyond this. However, I wonder if this should instead be ‘Clinical examination and the patient’s medical history of preoperative symptoms are limited in establishing the extent of DPE lesions... i.e. that they are of limited use for the assessment of the extent of DPE lesions?' (OS)

AQ7 Au: "The aim of this study was to analyze the characteristics of the techniques commonly used in the diagnosis of DPE and, particularly, to compare sonovaginography with MRI", should we specify posterior DPE here? (OS)

AQ8 Au: "presence of one or more lesions referred to DPE at clinical and instrumental evaluation (TVS, sonovaginography and MRI)" changed to 'presence of one or more lesions identified as DPE at clinical or imaging evaluation (TVS, sonovaginography or MRI)', is this correct? In particular, did you require (as I have assumed) that a lesion was identified as DPE only using one (i.e. at least one) of the four diagnostic methods?

In addition, should ‘posterior’ be specified for DPE in this sentence (x2)? (OS)

AQ9 Au: "...which were considered suggestive of DPE when an area of thickening...", again, should this be posterior DPE? (OS)

AQ10 Author query: In the previous paragraph it states that there was only one operator doing the TVS exams; would it be appropriate to change ‘the same team of two operators’ to ‘a team of two operators’?

AQ11 Au: "...performed sonovaginography in the same section", should “section” perhaps be ‘session’ here? (OS)

AQ12 Au: "a specific pneumatic ring" changed to 'a purpose-designed hydraulic ring', ok? (OS)

AQ13 Author query: Could you please check the changes made to the figure captions?

AQ14 Au: "that could often infiltrate the surrounding structures and the uterosacral ligaments" changed to ', often infiltrating the surrounding structures and the uterosacral ligaments’, is that correct? (OS)

AQ15 Au: "we collected also location and infiltration" changed to 'we recorded the location and degree of infiltration', ok? (OS)

AQ16 Au: "and when they infiltrated the rectal wall, fixing the rectal tract involved during Valsava manoeuvres or pressure with the probe, have been interpreted as rectal endometriosis" changed to 'and when they infiltrated the rectal wall, fixing the rectal tract during Valsalva maneuver or pressure with the probe, they were interpreted as rectal endometriosis', is that correct? (OS)

AQ17 Au: '(i.e. without use of laxatives or enema)’ added following “bowel preparation”, is that correct? (OS)

AQ18 Au: Please note that I have removed ‘single-blind study’ here, as this study does not match the standard use of this term (i.e. patients but not investigators blinded to case/control status). (OS)

AQ19 Au: "gadopentate” changed to ‘gadopentetate’, ok? (OS)

AQ20 Au: “The protocol also provided the administration of vaginal sterile ultrasound gel”, “provided” changed to ‘included’, ok? (OS)

AQ21 Author query: ‘adherences’ changed to ‘adhesions’; OK?
Queries to Author:

AQ22 Author query: Most of the data contained here in the original MS have been deleted as they are given in the 3 tables, and Journal style is not to repeat data between tables, figs and text. However, the specificity of sonovaginography for identifying the cases was given in the original text as 87.7%, but in Table 1 as 87.5%. Could you please say which is correct?

AQ23 Au: Please note that I have added ‘. 0’ to values in the Tables not given to one decimal place, ok? (OS)

AQ24 Au: ‘...and it is quite objective in the execution, even if a learning curve is required depending on specific endometriotic anatomic locations’ reworded to ‘...and it also allows a relatively objective assessment, although there is a learning curve that depends on the specific anatomic location of the endometriosis’, ok? (OS)

AQ25 Author query: I am assuming that ‘increased gel’ means ‘increased amounts of gel’; OK?

AQ26 Au: ‘Using this new approach, the authors achieved specificity 95%, sensitivity 90%, PPV 97% and NPV 86% in detecting DPE’, is the underlined text added here correct? (OS)

AQ27 Au: ‘...while MRI has the advantage of objectivity in the procedure and analysis’, I have changed ‘execution and reporting’ here to ‘procedure and analysis’, do you agree? (OS)
After receipt of your corrections your article will be published initially within the online version of the journal.

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