Transvaginal sonography vs uro-colon-CT in the diagnosis of deep infiltrating endometriosis of the anterior and posterior compartment

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Purpose

Deep infiltrating endometriosis (DIE) is defined by the presence of endometrial glands and stroma penetrating the retroperitoneal space to a depth of at least 5 mm. The mostly affected anatomical site is the pelvis, where DIE can involve structures of both the anterior and the posterior compartment. In order to mark the distinction between urinary and gastrointestinal involvement, we considered ureters as part of the anterior compartment (along with the bladder) and rectovaginal septum, rectum, sigmoid and rectosigmoid junction as part of the posterior compartment (along with uterosacral ligaments, parametrium and vagina). DIE is responsible for painful symptoms like dysmenorrhea, dyspareunia, dyschezia, dysuria and chronic pelvic pain as well as infertility. Laparoscopy is the surgical way of excellence to remove the lesions. A precise preoperative identification of the localizations and the extensions of pelvic DIE lesions could be very helpful not only to plan appropriate medical and surgical treatments, but also to inform patients about risks and complications related to surgery, to send them to specialized centers for the treatment of endometriosis, to alert in advance other specialists (colorectal surgeons, urologists) and to manage preoperative prophylactic gestures such as the insertion of ureteral stents.

Although many radiological techniques have been proposed for preoperative evaluation of patients with suspected pelvic DIE, there is no unanimous consensus about the procedure to use. The aim of the study was to compare the diagnostic accuracy of transvaginal sonography (TVS) and Uro-CTColonography (U-CTC), a low-dose CT colonography with a dedicated protocol to study the urinary tract, in preoperative evaluation of DIE of the anterior (aDIE) and posterior (pDIE) compartments.
Methods and materials

We retrospectively analyzed 47 patients, selected on the basis of gynaecological examination, with clinical suspicion of aDIE and/or pDIE, who underwent TVS during gynecological examination and with indication to undergo U-CTC before laparoscopic surgery.

TVSs were performed by two gynecologists of the Center Of Chronic Pelvic Pain and Endometriosis, using a GE Voluson S8 ultrasound system (GE Medical Systems, Zipf, Austria).

U-CTCs were performed using a 64 slice CT scanner (64 Lightspeed VCT, GE Healthcare, Milwaukee, WI, US) with the following protocol: detector collimation 64 x 0.625 mm, rotation time 0.5 s, 120 kV and 200 mA. In the three days before the examinations, patients were asked to follow a low fiber diet with a bowel preparation, consisting in the ingestion of 13.125 g of polyethylene glycol three times a day, with an abundant hydration (minimum 2 l of water per day). Fasting for six hours before the examinations was also required. An intramuscular injection of 20 mg of hyoscine-N-butylbromide was administered (in absence of controindications) 10 minutes before the U-CTC to reduce bowel peristalsis. The distention of the colon was obtained by introducing 1.5-2 l of air in the rectum through a 24 F Foley catheter. 1.5 ml/kg of iodinated contrast material (400 mg iodine/ml) at 2 ml/s were injected with an automatic infusion pump, followed by 250 ml of saline solution to accelerate the urinary excretion of the contrast medium. Patients were scanned first in the supine position from the dome of the diaphragm to the pubic symphysis during the portal phase, 80-90 seconds after the intravenous administration of contrast medium. A second scan was performed in the prone position during the urographic phase, 7-8 minutes after the intravenous administration. No scans were acquired before the injection of the contrast medium. The average radiation dose per patient was 12 mSv.

Radiological images were evaluated by two radiologists with 23 and 10 years of experience in abdominal radiology.

We compared imaging data with the histopatologic analyses of the resected specimens to obtain sensitivity, specificity and accuracy of both the imaging modalities.
Results

The pathologic examination revealed localizations of pDIE in 41/47 women and aDIE in 39/47 women.

TVS showed higher overall accuracy and sensitivity in diagnosing pDIE [Fig. 1 on page 5, Fig. 2 on page 5] (sensitivity, specificity and accuracy respectively 98%, 33% and 89% for TVS and 71%, 50% and 68% for U-CCT). Sensitivity in detecting aDIE [Fig. 3 on page 6] was slightly higher for TVS while specificity and accuracy were almost comparable for both techniques (sensitivity, specificity and accuracy respectively 46%, 96% and 78% for TVS and 38%, 96% and 75% for U-CCT).

U-CCT showed better results in the evaluation of the involvement of sigmoid colon [Fig. 4 on page 7, Fig. 5 on page 8] (sensitivity, specificity and accuracy respectively 67%, 71% and 83% vs 22%, 97% and 70% for TVS), rectosigmoid junction [Fig. 6 on page 9, Fig. 7 on page 9] (sensitivity, specificity and accuracy respectively 65%, 83% and 74% vs 52%, 79% and 66% for TVS), ureters [Fig. 8 on page 10, Fig. 9 on page 11] (sensitivity, specificity and accuracy respectively 63%, 71% and 68% vs 22%, 96% and 74% for TVS) and bladder dome [Fig. 10 on page 12] (sensitivity, specificity and accuracy respectively 67%, 96% and 93% vs 43%, 97% and 89% for TVS).
**Fig. 1:** TVS: ultrasonographic visualization of a 20 mm endometriotic lesion of the sigmoid colon.

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Fig. 2: TVS: a 34 mm endometriotic lesion involving the serosa of the rectosigmoid junction.

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Fig. 3: TVS: visualization of an endometriotic lesion of the anterior compartment of the pelvis involving the bladder wall.

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Fig. 4: Prone CT scan in the urographic phase: a 20 mm endometriotic nodule adjacent to the sigmoid wall involving serosa, with subsequent reduction in lumen diameter.

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**Fig. 5:** Supine CT scan in the portal phase: a 35 mm extended endometriotic lesion involving the serosa of the distal sigmoid tract.

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![Supine CT scan in the portal phase: a 35 mm extended endometriotic lesion involving the serosa of the distal sigmoid tract.](image)

**Fig. 6:** Prone CT urografic scan: visualization of a 27x16 mm lesion of pDIE located at the rectosigmoid junction, causing lumen reduction; residual lumen equal to 1/3 of the caliber.

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Fig. 7: Prone CT scan in the urographic phase: a 42 mm endometriotic localization adjacent to the recto-sigmoid junction, with involvement of the parietal serosa and subsequent lumen stenosis. A 53 mm right ovarian cyst that can be referred to an endometriotic cyst dislocating the homolateral ureter.

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**Fig. 8:** U-CTC, supine position: a 30 mm endometriotic lesion located in correspondence of the right ovary, close to the bladder cuff, producing dislocation of the homolateral ureter.

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**Fig. 9:** Coronal (left), sagittal (center) and Maximum Intensity Projection (right) reconstructions of the excretory phase: a 4 cm long endometriotic infiltration of the
ureteral wall causing irregular reduction of the diameter of the distal left ureter, associated with grade II-III hydronephrosis.

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**Fig. 10:** Curved multiplanar reconstruction in portal phase (left) and sagittal multiplanar reconstruction in the excretory phase (right): a solid multiloculated lesion (about 7 cm) shows intravesical protrusion. The lesion is strictly contiguous to the sigmoid colon which presents stenosis of the lumen extended for 10 cm.

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Conclusion

TVS, performed by specialists in endometriosis, is considered the gold standard technique for patients with symptoms of DIE, due to its better accuracy if compared with U-CTC. This result could be partly explained by the fact that specialists in endometriosis can more easily complement ultrasonographic findings with anamnestic data, pain scale scores and clinical examinations.

U-CTC should be indicated only for selected patients, who present nodules that result to be more difficult to detect with TVS, like localizations involving the sigmoid colon, the rectosigmoid junction, the ureters and the bladder dome.
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