Uterine sliding sign: a simple sonographic predictor for presence of deep infiltrating endometriosis of the rectum

G. HUDELIST*†, N. FRITZER*, S. STAETTNER‡, A. TAMMAA*, A. TINELLI§, R. SPARIC¶ and J. KECKSTEIN†**

*Department of Obstetrics and Gynaecology/Stage III Center for Endometriosis & Pelvic Pain, Wilhelminen Hospital, Vienna, Austria; †Stiftung Endometrioseforschung SEF, Westerstede, Germany; ‡Department of General Surgery, Kaiser-Franz-Josef Hospital, Vienna, Austria; §Department of Obstetrics and Gynaecology, Hospital Vito Fazzi, Lecce, Italy; ¶Clinic for Gynecology and Obstetrics, Clinical Center of Serbia, Belgrade, Serbia; **Department of Obstetrics and Gynaecology, Center for Endometriosis, Villach Hospital, Villach, Austria

KEYWORDS: deep infiltrating endometriosis; preoperative diagnosis; transvaginal sonography; uterine sliding sign

ABSTRACT

Objective To evaluate whether the presence of uterorectal adhesions demonstrated by transvaginal sonography (TVS) could aid as a simple sonographic predictor for deep infiltrating endometriosis (DIE) of the rectum in patients with symptoms suggestive of endometriosis.

Methods This was a prospective multicenter study of women scheduled for laparoscopy because of symptoms suggestive of endometriosis. Patients were assessed prospectively using TVS before laparoscopy and radical resection of disease followed by histological confirmation. Sensitivity, specificity, positive (PPV) and negative (NPV) predictive values, accuracy and positive (LR+) and negative (LR–) likelihood ratios were calculated for the observation of a negative uterine ‘sliding sign’ on TVS in predicting the presence of DIE of the rectum.

Results In total, 117 patients underwent laparoscopy and resection. Thirty-four (29%) patients had DIE of the rectum. A negative sliding sign on TVS predicted DIE of the rectum with a sensitivity of 85%, specificity of 96%, PPV of 91%, NPV of 94%, accuracy of 93.1%, LR+ of 23.6 and LR– of 0.15.

Conclusions Sonographic demonstration of uterorectal adhesions reflected by a negative uterine sliding sign is an easy and practical method for prediction of the presence of DIE involving the rectum. This could be a valuable ‘red flag’ sign for triaging patients to tertiary referral centers and specialized clinics for detailed investigation.

Correspondence to: Associate Professor G. Hudelist, Department of Obstetrics and Gynaecology, Stage III Endometriosis Center & Pelvic Pain Clinic, Wilhelminen Hospital Vienna, 1160 Vienna, Austria (e-mail: gernot_hudelist@yahoo.de)

Accepted: 27 December 2012

INTRODUCTION

Endometriosis is one of the most common gynecological disorders, with prevalence rates ranging between 1.5% and 15%1,2. A significant, negative impact on quality of life and psychological wellbeing is caused by endometriosis-associated symptoms such as dysmenorrhea, dyspareunia and infertility3,4. We have recently shown that there is a considerable diagnostic delay, of over 10 years, from presentation of symptoms to final diagnosis in women affected by endometriosis in Austria and Germany5. This is concordant with other studies showing delay intervals ranging between 7 and 11.7 years in Brazil and the USA6,7. The principal causes of this phenomenon are normalization of endometriosis-associated pain symptoms in patients but also a high number of false diagnoses by doctors who are confronted with patients experiencing pelvic pain7. Primary assessment of patients with pelvic pain and suspected endometriosis is often suboptimal and limited to evaluation of the patient’s past gynecological history and clinical assessment (i.e. speculum and bimanual pelvic examination). Although bimanual examination may be helpful in detecting deep infiltrating endometriosis (DIE) of the so-called posterior compartment8,9, it is of little value in detecting rectal endometriosis and has its limitations in discriminating DIE affecting the vagina, rectovaginal space or uterosacral ligaments10. Over recent years, transvaginal sonography (TVS) and/or magnetic resonance imaging (MRI) have been recommended as appropriate tools for visualization of endometriosis or adenomyosis. However, gynecologists may have limited experience with diagnostic tools such as TVS, which has been demonstrated to be a highly accurate
imaging modality in detecting ovarian endometriosis and DIE\textsuperscript{11–13} and has been suggested for use as the primary imaging modality in patients with pelvic pain\textsuperscript{14}.

The development of tertiary referral centers with a focus on the diagnosis and surgical treatment of patients with advanced endometriosis has clearly optimized the management of the disease. Ideally, referral should involve triaging women with mild, moderate or severe endometriosis. As a consequence, triaging can only be based on good-quality primary care and a certain diagnostic standard in general gynecological practice. We therefore focused on the development of an easy-to-perform diagnostic test to facilitate the detection of DIE in the absence of highly skilled medical staff trained in TVS for DIE. The aim of the present study was to describe a simple diagnostic sign that could be used to triage women with mild vs advanced endometriosis affecting the rectosigmoid.

METHODS

One-hundred and forty-two consecutive patients presented to our pelvic pain clinics from July 2011 until May 2012 with symptoms suggestive of endometriosis, including dysmenorrhea, dyspareunia, chronic pelvic pain, dyschezia or subfertility following the exclusion of male factors and ovulation disorders, and were scheduled for laparoscopy based on clinical pelvic examination and TVS findings. Patients for whom a complete medical, social, obstetric and gynecological history were available were eligible for inclusion in the study. Exclusion criteria were: a history of gynecological cancer ($n = 3$), previous surgery for DIE involving rectal surgery and/or dissection of the pouch of Douglas (POD) or rectovaginal septum or other disease entities including resection of the bladder and/or anterior rectal wall ($n = 16$), virginity ($n = 4$) and non-availability of consent ($n = 2$). The study was approved by the local Institutional Review Board and informed consent was obtained from all patients enrolled.

TVS was performed at 2 months prior to laparoscopy and radical resection of all visible endometriotic lesions. At the start of the TVS examination, the presence of positive or negative uterine sliding (as described later) was evaluated by one examiner (G.H.). We primarily aimed to evaluate the ‘sliding sign’ in those patients and did not search for additional or other typical signs of DIE at the beginning of the scan.

The 117 patients included in this study underwent laparoscopy and radical resection of all visible areas exhibiting macroscopic signs of endometriosis; this was performed by two experienced surgeons (G.H. and J.K.). All patients with bowel endometriosis were treated with discoid or segmental resection of the rectosigmoid and, if necessary, dissection of the POD and rectovaginal space. Histological confirmation of endometriosis was considered the gold standard of definitive diagnosis of endometriosis.

TVS was carried out by a single examiner (G.H.) using either a Logic 9 (GE Medical Systems, Zipf, Austria) or an Accuvix XQ (Samsung Medison, Seoul, South Korea) scanner equipped with a 5–9-MHz transducer for visualization of the uterus and the rectosigmoid. DIE of the rectum commonly appears in combination with uterosacral adhesions (i.e. fixation of the anterior rectal wall to the posterior uterine wall). As a consequence, the movement of these organs against each other (i.e. sliding of the rectum against the posterior uterine wall) is impaired.

In order to achieve adequate visualization of this phenomenon, the transducer was first introduced in the posterior vaginal fornix and withdrawn backwards to assess the movement of the rectum against the posterior vaginal fornix and the posterior uterine wall in the mid-sagittal plane. In addition, the examiner’s left hand was placed on the patient’s abdomen in order to apply external pressure on the uterus.

Immobility of the rectum against the uterus and the posterior vaginal fornix was considered as ‘sliding sign negative’, reflecting possible adhesion and endometriotic involvement of these structures, independent of the presence of sonographic features associated with rectal endometriosis, as described previously\textsuperscript{11}. Sliding of the rectum against the uterine wall was considered as ‘sliding sign positive’. Following assessment of the sliding sign, TVS was used to visualize the POD, uterosacral ligaments, urinary bladder, the rectosigmoid and the vagina, as described previously\textsuperscript{15}.

Final diagnosis of endometriosis was based on visualization and radical resection of all tissues exhibiting endometriotic involvement, followed by histological confirmation, defined as the presence of ectopic endometrial tissue (i.e. glandular and stromal structures) on light microscopy\textsuperscript{16}. Dissection of POD was always performed in the presence of POD obliteration in order to achieve full resection of disease and to provide an adequate assessment of the extent of endometriotic infiltration of structures such as the lower rectum, vagina or rectovaginal space. All cases of intestinal endometriosis (i.e. involvement of the small intestine and/or the rectosigmoid) were treated with discoid or segmental resection of the bowel followed by side-to-end or end-to-end anastomosis. Only cases with histopathological confirmation of endometriosis, as described by Clement et al.\textsuperscript{16}, were included in the final analysis and regarded as true positives.

Statistical analysis

Sensitivity, specificity, positive and negative predictive values (PPV and NPV, respectively), test accuracy and positive and negative likelihood ratios ($LR+$ and $LR−$, respectively) were calculated for the presence or absence of uterine sliding in relation to the presence of DIE affecting the rectosigmoid using Catmaker\textsuperscript{®} statistical software (Centre for Evidence-Based Medicine, Oxford, UK).

RESULTS

The mean $\pm$ SD age of patients included in the study was 31.6 $\pm$ 6.5 years. Presenting symptoms are reported in
showed rectal adhesions to the posterior uterine wall. Two of the patients with false-positive results of POD obliteration were observed in the study results. In all three false-positive cases, obliteration of the rectum that was neither fixed to the posterior uterine wall nor to the posterior vaginal fornix, and one patient exhibited endometriosis of the terminal ileum.

Table 1. DIE of the rectum was diagnosed by laparoscopy and histological analysis in 34 (29%) of 117 patients (Table 2). Anatomical location of the other sites of endometriotic disease and results of histopathological analyses are also reported in Table 2.

Data on the sensitivity, specificity, NPV, PPV, accuracy, LR+ and LR− for assessment of the uterine sliding sign on TVS are shown in Table 3. Rectal DIE was correctly predicted by a negative sliding sign in 29 (25%) of 117 women, with three false-positive and five false-negative results. In all three false-positive cases, obliteration of the POD could be demonstrated by laparoscopy. No other cases of POD obliteration were observed in the study cohort. Two of the patients with false-positive results showed rectal adhesions to the posterior uterine wall.

Table 2. Surgical findings in 117 patients with suspected pelvic endometriosis.

<table>
<thead>
<tr>
<th>Site of DIE</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary locations</td>
<td></td>
</tr>
<tr>
<td>Pelvic peritoneum</td>
<td>62 (53)</td>
</tr>
<tr>
<td>Ovaries</td>
<td>13 (11)</td>
</tr>
<tr>
<td>DIE of the rectum</td>
<td>34 (29)</td>
</tr>
<tr>
<td>Other locations</td>
<td></td>
</tr>
<tr>
<td>Uterosacral ligaments</td>
<td>34 (29)</td>
</tr>
<tr>
<td>Pouch of Douglas</td>
<td>20 (17)</td>
</tr>
<tr>
<td>Vagina</td>
<td>15 (13)</td>
</tr>
<tr>
<td>Rectovaginal septum</td>
<td>21 (18)</td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>10 (9)</td>
</tr>
</tbody>
</table>

Table 3. Diagnostic performance of absence of uterine sliding sign on transvaginal sonography for prediction of a laparoscopic finding of rectal endometriosis, in 117 patients with suspected pelvic endometriosis.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n (%) or ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence of rectal/sigmoidal</td>
<td>34/117 (29)</td>
<td></td>
</tr>
<tr>
<td>endometriosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative sliding sign</td>
<td>32/117 (27)</td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>29/34 (85)</td>
<td>73–97</td>
</tr>
<tr>
<td>Specificity</td>
<td>80/83 (96)</td>
<td>92–100</td>
</tr>
<tr>
<td>PPV</td>
<td>29/32 (91)</td>
<td>81–100</td>
</tr>
<tr>
<td>NPV</td>
<td>80/85 (94)</td>
<td>89–99</td>
</tr>
<tr>
<td>Accuracy</td>
<td>109/117 (93)</td>
<td></td>
</tr>
<tr>
<td>LR+</td>
<td>23.6</td>
<td>7.7–72.3</td>
</tr>
<tr>
<td>LR−</td>
<td>0.15</td>
<td>0.07–0.34</td>
</tr>
</tbody>
</table>

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

DISCUSSION

Adequate assessment of patients with symptoms suggestive of endometriosis is crucial to the quality of the further management of the disease. The preoperative ‘staging’ of women with suspected endometriosis enables the clinician to discuss and plan appropriate surgical treatment options, especially in cases of advanced disease, which often necessitates a multidisciplinary treatment approach. Although advanced imaging techniques, such as MRI or multislice computed tomography, have been shown to be valuable tools for non-invasive diagnosis of DIE,3,17,18 these modalities are time-consuming and expensive. Readily available tools are needed, not only in specialized centers, but also in the primary care outpatient clinic setting, where they would be particularly useful.

TVS has been shown to be a highly valuable, cost-effective non-invasive tool to diagnose ovarian endometriosis and DIE.11,12 However, the learning curve for medical doctors or sonographers to gain diagnostic skills in order to accurately assess patients with DIE may vary between individuals. Furthermore, the availability of qualified training facilities is limited because of the need for adequate numbers of patients who may only be encountered in tertiary referral centers. It is therefore questionable whether these standards are applicable in the primary care setting in order to select patients for treatment in specialized centers.

The present study shows that the use of a simple diagnostic sign enables the sonographer to estimate the probability of advanced vs low-stage endometriotic disease without the necessary skills to assess other, more specific, sonographic signs of DIE. By using the uterine sliding sign as a basic marker for rectosigmoidal endometriosis, we were able to detect 29 out of 34 patients with DIE affecting the rectum with a PPV and a NPV of 91% and 94%, respectively, and corresponding LR+ and LR− values of 23.6 and 0.15, respectively.

Recently, Reid et al. demonstrated the use of the sliding sign as an accurate predictor of obliteration of the POD. In their study, the absence of sliding of the bowel was associated with POD obliteration, with accuracy 93.0%, sensitivity 83.3%, specificity 97.1%, PPV 92.6%, NPV 93.2%, LR + 29.2 and LR − 0.17. However, only 63% of the patients with POD obliteration exhibited rectal endometriosis. In contrast, in the present study, we found only two patients with POD obliteration who were not affected by rectal DIE. The difference between these results may be attributable to the fact that all patients in our study underwent full surgical exploration of the
POD when obliterated and underwent rectal resection in cases of rectal endometriosis. In contrast, Reid and colleagues did not perform full surgical exploration in all cases of POD obliteration, nor did they mention whether full excision of rectal DIE was performed. As a consequence, the presence of rectal endometriosis may have been underestimated19.

Nevertheless, the present study does have some critical issues that need to be addressed. First and foremost, we conducted the study in tertiary referral centers and sonography was performed by a highly experienced sonographer. These conditions do not reflect the primary care setting. Furthermore, it should be mentioned that lack of sliding of the bowel against the cervix and posterior uterine wall may also be caused by postinflammatory or postinterventional adhesions, which may be encountered in higher numbers in the primary care setting than in tertiary referral clinics. As a consequence, values for test accuracy may be reduced. In addition, we underline that use of the sliding sign should neither act as a substitute for using classical sonographic signs of rectal infiltration nor be used as a specific marker for rectal DIE. We propose to use the sliding sign as a possible ‘red flag’ sign for Stage 1 and Stage 2 sonographers. Following on from this, a proof-of-principle study is warranted, in order to demonstrate the practicality and the accuracy of the method when used by less experienced staff.

The aim of the present work was to describe a simple, easy-to-detect sonographic marker focused on estimation of probability of rectal DIE in order to triage patients for referral to specialized clinics, and not to diagnose specifically DIE preoperatively, as demonstrated in previous studies11.

In conclusion, use of the uterine sliding sign may enhance basic diagnostic standards and facilitate the triage process in the outpatient setting. Adequate patient selection and referral to specialized clinics may reduce diagnostic delay and optimize the management of patients with advanced endometriosis.

ACKNOWLEDGMENT

This work was supported by the OEGEO, Österreichische Gesellschaft für Endokrinologische Onkologie.

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