

The Association Between Gastrointestinal Symptoms and Transvaginal Ultrasound Findings in Women Referred for Endometriosis Evaluation: A Prospective Pilot Study

Zusammenhang zwischen gastrointestinalen Symptomen und Befunden im transvaginalen Ultraschall bei Frauen mit Endometriose-Diagnostik: Eine prospektive Pilotstudie

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ABSTRACT

Purpose To evaluate the relationship between gastrointestinal (GI) symptoms and transvaginal ultrasound (TVUS) findings suggestive of endometriosis.

Materials and Methods A prospective design. Women referred for a diagnostic ultrasound due to suspicion of endometriosis completed a Rome III and Pelvic Floor Distress Inventory (PFDI-20) questionnaire for clinical, GI symptoms, before un-

dergoing TVUS. Endometriosis was diagnosed in the presence of endometriomas and/or deeply infiltrative endometriotic (DIE) lesions. Association between lesion sites and GI symptoms was evaluated by univariate and multivariate analysis.

Results The study included 241 women who presented with: dysmenorrhea (89.6%), dyspareunia (76.3%), chronic pelvic pain (77.2%), dyschezia (66%), hematochezia (15.4%), subfertility (24.5%). GI symptoms were present in 25.3–76.8% and 5.4–55.6% of Rome III and PFDI-20 questionnaire responses, respectively. TVUS findings were endometriomas (23.2%), peritoneal adhesions (46.5%), uterosacral ligament (26.7%), retrocervical (11.2%), rectosigmoid (11.2%), intestinal (4.6%), and bladder (0.8%) involvement, and pouch of Douglas (POD) obliteration (15.4%). There was a high prevalence of peritoneal adhesions, uterosacral ligament involvement, and rectosigmoid and intestinal nodules on TVUS in women with GI symptoms, up to $\chi^2 = 9.639$ ($p = 0.013$) on univariate and $\chi^2 = 8.102$ ($p = 0.005$) on multivariate analysis.

Conclusion We observed an almost 10-fold increase in DIE lesions in women with GI symptoms. We suggest that the presence of GI symptoms should prompt a referral for endometriosis evaluation and performance of a dedicated TVUS before invasive gastrointestinal procedures.

ZUSAMMENFASSUNG

Ziel Bewertung des Zusammenhangs zwischen gastrointestinalen (GI) Symptomen und den Befunden im transvaginalen Ultraschall (TVUS) bei Verdacht auf Endometriose.

Material und Methoden Ein prospektives Design. Frauen, die wegen Verdacht auf Endometriose zur Ultraschall Diagnostik überwiesen wurden, beantworteten vor dem TVUS einen Rom-III- und einen Pelvic-Floor-Distress-Inventory-20 (PFDI-20)-Fragebogen bezüglich klinischer GI-Symptome. Die Endometriose wurde bei Vorliegen von Endometriomen und/oder tief infiltrierenden endometriotischen (DIE) Läsionen diagnostiziert. Der Zusammenhang zwischen Läsionsstellen und GI-Symptomen wurde durch univariate und multivariate Analysen ausgewertet.

Ergebnisse Die Studie umfasste 241 Frauen mit Dysmenorrhoe (89,6%), Dyspareunie (76,3%), chronischen Beckenschmerzen (77,2%), Dyschezia (66%), Hämatochezie (15,4%) und Subfertilität (24,5%). Bei 25,3–76,8% der Antworten auf dem Rom-III-Fragebogen und 5,4–55,6% der Antworten auf dem PFDI-20-Fragebogen lagen GI-Symptome vor. TVUS-Befunde waren Endometriome (23,2%), peritoneale Adhäsionen (46,5%), Beteiligung von Ligamentum sacrouterinum (26,7%), retrozervikale (11,2%) und rektosigmoidale (11,2%) Beteiligung, Darm- (4,6%) und Blasenbeteiligung (0,8%) sowie Douglas-Obliteration (POD) (15,4%). Bei

Frauen mit GI-Symptomen war eine hohe Prävalenz von peritonealen Adhäsionen, Beteiligung des Lig. sacrouterinum sowie rektosigmoidalen und intestinalen Knötchen zu beobachten, mit $\chi^2 = 9,639$ ($p = 0,013$) bei univariater und $\chi^2 = 8,102$ ($p = 0,005$) bei multivariater Analyse.

Schlussfolgerung Bei Frauen mit GI-Symptomen beobachteten wir eine fast 10-fache Zunahme der DIE-Läsionen. Wir schlagen vor, dass vor invasiven gastrointestinalen Eingriffen bei Vorliegen von GI-Symptomen eine Überweisung zur Endometriose-Diagnostik und einem entsprechenden TVUS erfolgen sollte.

Introduction

The prevalence of endometriosis in reproductive-age women is approximately 1–2% (in a general low-risk population) [1] but can range between 30–50% in symptomatic women [2, 3]. Patients with endometriosis mostly present with dysmenorrhea, dyspareunia, chronic pelvic pain and subfertility, but often have gastrointestinal (GI) symptoms, which are more severe and more frequent in these patients [4, 5]. These include abdominal pain, bloating, constipation, painful bowel movements, and diarrhea [6, 7]. There is considerable overlap between GI symptoms that are not related to endometriosis and endometriosis symptoms, which can lead to misdiagnosis or delay in diagnosis [8]. Women presenting with GI symptoms may be misdiagnosed as suffering from IBS [9], which is diagnosed twice as commonly in women than in men, and is the most common diagnosis in women with pelvic pain [10]. It is usually a diagnosis by exclusion and evaluation of endometriosis is not part of the routine workup [11]. As a result, women may undergo invasive GI investigations, which are found to be normal, before being referred for gynecological evaluation.

The gold standard for endometriosis diagnosis is still direct visualization at laparoscopy and histological confirmation. However, TVUS plays a significant role in the noninvasive investigation of suspected endometriosis [12] and is considered the first-line imaging modality [13]. In cases of 'frozen pelvis', TVUS can be a main diagnostic tool for evaluating endometriosis involvement, with high potential for replacing the traditional laparoscopic investigation [14].

There are few studies evaluating the association between GI symptoms and endometriosis-related findings. The aim of this study was to evaluate the relationship between GI symptoms and TVUS findings suggestive of endometriosis, in women referred to a tertiary referral center for evaluation due to suspicion of endometriosis.

Materials and Methods

Patients and setting

A prospective observational study included women above 18 years of age, who were referred for evaluation because of symptoms

suggestive of endometriosis (such as pain and infertility). Women having undergone a hysterectomy or those who could not undergo TVUS were excluded.

Demographic, clinical data, and questionnaires

Women completed a self-reported clinical data survey, GI symptoms questionnaire (Rome III), and Pelvic Floor Distress Inventory questionnaire (PFDI20) and underwent a dedicated 2D TVUS examination. The questionnaires included demographic and clinical information: age, height, weight, parity, infertility history, fertility treatments and type, analgesic use and oral contraceptive treatment use, previous deliveries and/or cesarean sections, previous surgery for endometriosis, and smoking history. In addition, women were asked to report presenting symptoms of endometriosis, such as dysmenorrhea, dyspareunia, cyclic pelvic pain, chronic pelvic pain, and dysuria, and to grade these according to severity. Menstrual irregularity was recorded, including hematuria, menorrhagia, and intermenstrual bleeding. Women were asked to report their age at first symptom (dysmenorrhea or any pain symptoms) and their age at first visit for evaluation. Due to potential symptomatic overlap with inflammatory bowel disease (IBD), we excluded all women with a previous diagnosis of IBD from the analysis.

GI symptoms evaluation

GI symptoms were evaluated by questionnaires as follows. Women were asked about dyschezia and hematochezia during menstruation. Validated Rome III [15] diagnostic criteria questionnaire for functional GI disorders (FGIDs) was used in order to evaluate GI symptoms, and we focused on functional bowel disorders. Stool characteristics were described using the Bristol chart with images of 7 stool types: 1) separate hard lumps like nuts, 2) sausage-shaped, lumpy, 3) like a sausage but with cracks on its surface, 4) like a sausage or snake, smooth and soft, 5) soft blobs with clear cut edges, 6) fluffy pieces with ragged edges, 7) watery stool. Additional criteria were used, such as having a stool frequency of less than 3 times a week or more than 3 times a day, hard stool, soft stool, any effort on defecation, fecal urgency, residual feeling, mucus on defecation, bloating, blood in stool/toilet or on toilet paper, anal pain, painful anal protuberance, abdominal

pain once a week, abdominal pain (frequency-related), and abdominal pain (stool type-related).

The PFDI 20 questionnaire [16] contains 20 questions in three scales. For this study we used the 8 questions regarding colorectal-anal function (CRADI8), which are related to GI symptoms: need to press for stool, inability to empty stool, fecal incontinence, soft stool incontinence, flatus incontinence, pain on defecation, defecation urgency and feeling of a rectal bulge (PFDI 7–14).

TVUS evaluation of endometriosis

All TVUS scans were carried out using a 7.5 MHz transvaginal probe (Voluson GE Medical Systems, Villach, Austria) in a standardized manner. The TVUS examinations were performed by three gynecological imaging experts, each with more than ten years of experience, who had undergone particular training in endometriosis ultrasound. The examination included a thorough evaluation of all pelvic viscera, without bowel preparation. The uterus was studied in a mid-sagittal and transverse plane covering the entire uterine cavity.

A diagnosis of endometriosis on ultrasound was based on the presence of ovarian endometriomas, deeply infiltrative endometriotic (DIE) nodules (e. g. uterosacral ligaments, bowel, bladder nodules), signs of pelvic adhesions (kissing ovaries or absent sliding of viscera, intestinal adhesions), or overt tubal disease as previously described [17, 18]. In brief: The presence or absence of endometriomas, their number, and ultrasound appearance were noted [19]. Pelvic adhesions were suspected in the presence of: endometriomas [20], kissing ovaries, fallopian tube involvement [21], soft markers, such as site-specific tenderness and fixed ovaries [22], fixation of the ovaries or the uterus to adjacent structures such as the broad ligament, Pouch of Douglas (POD) obliteration, bladder, rectum and/or parietal peritoneum, and fine strands of tissue between the ovary and the uterus or the peritoneum [23]. In order to assess for the sliding sign, gentle pressure was placed on the cervix using the transvaginal probe, to establish whether the anterior rectum glides freely across the posterior aspect of the cervix and the posterior vaginal wall. POD obliteration was considered when either the anterior rectal wall or the anterior sigmoid wall did not glide smoothly over the retrocervix or the posterior uterine fundus, respectively [24]. A similar maneuver was performed for the anterior compartment to evaluate for the anterior sliding sign. Evaluation of the anterior compartment was performed with the transducer positioned in the anterior fornix of the vagina. DIE nodules were sought in the anterior and posterior compartments. With the transducer in the posterior fornix of the vagina, we completed the visualization of the posterior compartment, by slowly withdrawing the transducer. Some authors advocate the use of bowel preparation on the evening before the pelvic scan and the use of a rectal enema within an hour before the ultrasound examination to eliminate fecal residue and gas in the rectosigmoid [25], but we performed all examinations without bowel preparation.

Statistical analysis

Categorical variables were described as numbers and percentages. Continuous variables were evaluated for normal distribution

using histograms and Q-Q plots. Normally distributed continuous variables were reported as means \pm SDs and skewed variables were reported as medians and IQR. The association between categorical variables was evaluated using Chi² test or Fischer's exact test, and the association between continuous variables and categorical variables was evaluated using independent samples T-test or Mann-Whitney test. Multivariate logistic regression was used to evaluate the association between lesion sites and GI symptoms after controlling for age and BMI (body mass index). Odd's ratios and 95% CI were reported. All statistical analyses were 2-tailed and statistical significance in all tests was set at $p < 0.05$. Statistical analysis was performed using SPSS software (IBM SPSS statistics version 24, IBM Corporation, Armonk, New York, USA, 2016).

Sample size was analyzed assuming a 50% prevalence of GI symptoms. We have calculated a sample size of 218 subjects in order to achieve a confidence interval of 95% ($Z = 1.96$), with an error of $\pm 5\%$, and a power of 80%.

Ethical aspects

Ethical approval was obtained from our local research ethics committee. Women signed a written informed consent form. No procedure was performed specifically for the purpose of the study and no identifying information is included in the data presented herein.

Results

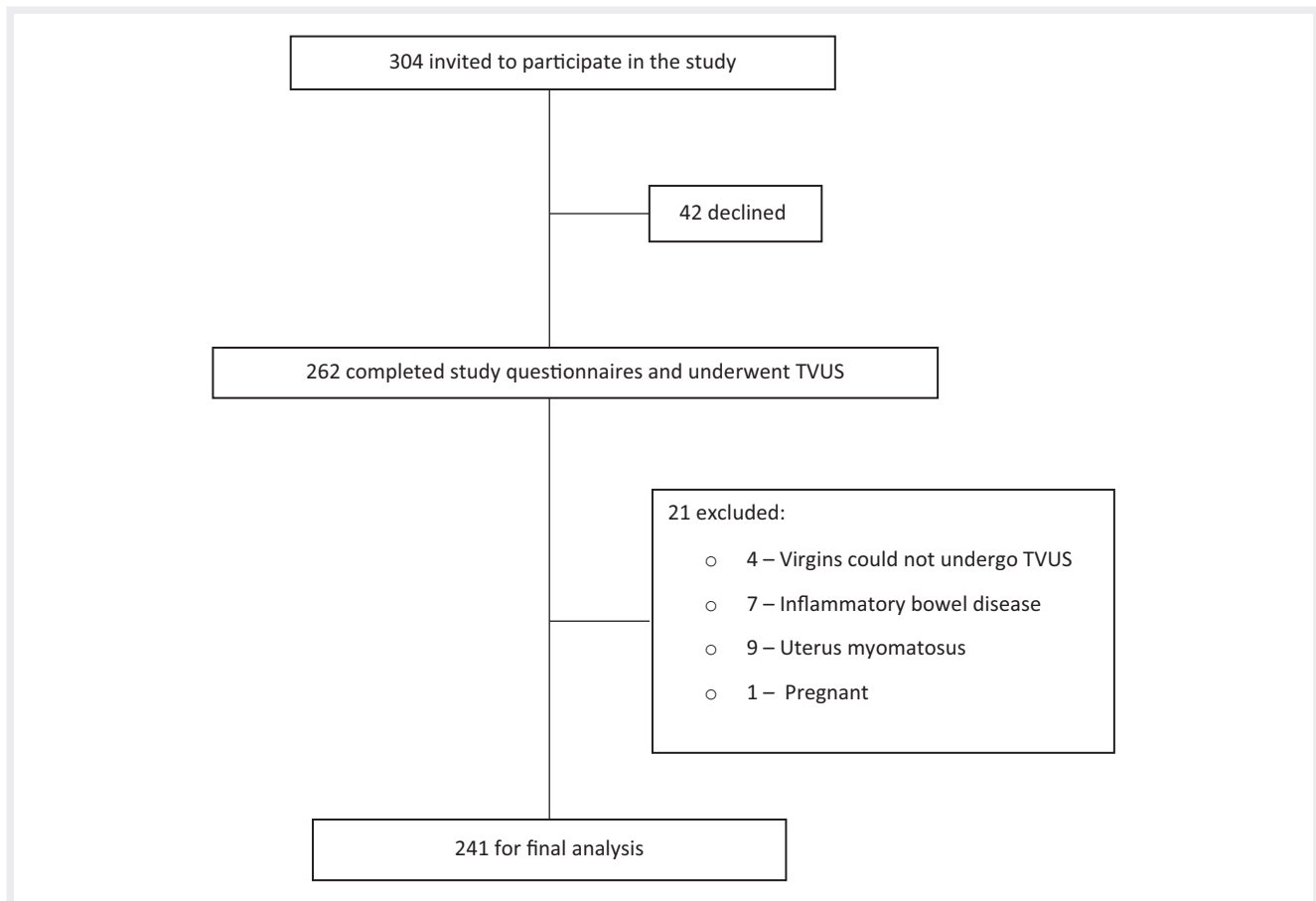
Demographic, clinical data, and questionnaires

304 women were invited to participate in the study. 42 did not wish to take part, 4 were virgins and could not undergo TVUS, 7 were excluded because of IBD, 1 woman was pregnant during the examination, and 9 had concurrent uterus myomatousus (► Fig. 1). This left 241 for the final analysis. Demographic and clinical data is presented in ► Table 1. 140 women (58.1%) were nulliparous (58.1%). 172 women (71.4%) were using some type of analgesic medication: Non-steroidal inflammatory drugs (NSAIDs) (97.1%), narcotics (0.6%), cannabinoids (2.3%). 75 (31.1%) of the patients were previous or current smokers. The mean time from initiation of pain symptoms to first visit for evaluation was 3.75 ± 5.77 years (range: 0–33 years).

Presenting symptoms of endometriosis included: dysmenorrhea 216 (89.6%), dyspareunia 184 (76.3%), chronic pelvic pain 186 (77.2%), ovulation pain 188 (78%), dysuria during menstruation 106 (42.7%), chronic dysuria 70 (29%), menorrhagia 152 (63.1%), menstrual irregularity 62 (25.7%), inter-menstrual bleeding 55 (22.8%), hematuria during menstruation 59 (24.5%), and subfertility 59 (24.5%).

GI symptoms

The vast majority (232 (96.2%)) presented with at least one GI symptom. In women who had only GI symptoms without any symptoms suggestive of endometriosis, 42 of 44 (95.45%) women without dysmenorrhea and all 8 women who presented with subfertility but no other endometriosis symptoms had GI symptoms. GI symptoms from both questionnaires are presented in



► **Fig. 1** Study flowchart.

► **Table 2.** All patients described long-standing GI symptoms before being referred to our center. Common GI symptoms were: dyschezia during menstruation 159 (66%), chronic dyschezia 114 (47.3%), and hematochezia during menstruation 37 (15.4%).

Stool frequency, from Rome III questionnaire: more than 3 times per day (5.8%), 2–3 times per day (33.2%), 1 time per day (41.5%), once in 2–3 days (15.4%), less than 1 in 3 days (2.9%), less than 1 per week (1.2%). Stool types were: separate hard lumps like nuts (12.4%), sausage-shaped, but lumpy (14.6%), like a sausage but with cracks on its surface (28.3%), like a sausage or snake, smooth and soft (19%), soft blobs with clear cut edges (9.7%), fluffy pieces with ragged edges (14.2%), watery (1.8%). Other commonly reported GI symptoms included stool frequency of less than 3 times a week (18.7%), stool frequency of more than 3 times a day (20.7%), effort on defecation (43.2%), fecal urgency (34.4%), mucous on defecation (19.9%), blood in stool (8.7%), blood in toilet (7.1%) and blood on toilet paper (37.3%).

TVUS findings and associations with GI symptoms

The prevalence of TVUS findings is presented in ► **Table 3**. The association between TVUS findings in women with suspected endometriosis and GI symptoms is presented in ► **Table 4** by lesion location and the associated GI symptom or symptoms. The

presence of a rectosigmoid nodule increased the PFDI20 anorectal score (CRADI8) from a median of 15.6 (IQR 6.25–31.25) to 32.81 (IQR 12.5–44.53), $Z = -2.327$, $p = 0.02$ (Mann-Whitney). A similar effect was observed for POD obliteration but did not reach statistical significance ($p = 0.084$). On multivariate analysis we found that the risk for finding a rectosigmoid nodule in women who reported feeling a rectal bulge and pain on defecation on PFDI20 was significantly higher than in those without. Similarly, the risk for finding peritoneal adhesions on TVUS in women with defecation urgency on PFDI20 and soft stool on Rome III was significantly higher than in those without (► **Table 4**, ► **Fig. 2–4**, ► **Video 1, 2**).

Discussion

In this study we found an almost 10-fold increase in DIE lesions on TVUS in women who presented with GI symptoms. Common TVUS findings in endometriosis patients, such as peritoneal adhesions, uterosacral ligaments involvement, and posterior compartment, were strongly associated with a multitude of GI symptoms. In particular, we noted specific symptom patterns, such as rectosigmoid nodules in women reporting the feeling of a rectal bulge and pain on defecation. We also noted peritoneal adhesions in women with defecation urgency and soft stools.

► **Table 1** Demographic and clinical data of patients attending a tertiary referral center and included in the study (N = 241).

parameter	mean ± SD/median	range
age, mean ± SD, years	33.3 (± 7.4)	20–53
BMI, mean ± SD, kg/m ²	23.4 (± 4.6)	11.9–38.3
menarche (age), mean ± SD, years	13 (± 1.5)	9–18
first pain symptom (age), mean ± SD, years	21.1 (± 9)	10–45
first visit to physician (age), mean ± SD, years	25.2 (± 8.6)	12–50
parous (%)	41.9	
parity, median	0	0–9
previous IVF treatment, median	2	0–13
cesarean section, median	0	0–5
oral contraceptive use (%)	54.8	
oral contraceptive use, mean ± SD, years	5.1 (± 5)	0.1–28
previous laparoscopy (%)	26.6	
number of previous laparoscopies, median	1	0–12

SD: standard deviation; BMI: body mass index; IVF: in vitro fertilization treatment.

Consistent with previous studies, we noted a high prevalence of GI symptoms in women with endometriosis. Ek et al. [4] compared GI symptoms in 106 endometriosis patients undergoing surgery to 65 controls from the general population and found that women with endometriosis experienced more severe GI symptoms, particularly bloating, incomplete evacuation, and defecation urgency. Maroun et al. [5] found that up to 90% of women with histologically confirmed endometriosis had GI symptoms. In their study, 79% of women who had previously been diagnosed with IBS were found to have endometriosis on laparoscopy. In our study, the evaluation of endometriosis was noninvasive. GI symptoms were present in 96.2% of all respondents and in 95.45% of respondents without endometriosis symptoms.

Women may suffer from endometriosis symptoms for an average of 8–12 years [26] before finally being diagnosed. In our study, women reported long-standing symptoms without any evaluation or diagnosis. Considering the fact that GI symptoms are nearly as common as gynecological symptoms in women with endometriosis [5], our findings suggest that misdiagnosis and excessive medical tests could be reduced. As demonstrated in a case report by Lea et al. [27], only during a laparotomy was endometriosis finally discovered in a patient who had been diagnosed with IBS for years.

To the best of our knowledge, this is the first study to evaluate the association between specific GI symptoms and the location of endometriosis lesions using a noninvasive tool. Fauconnier et al.

► **Table 2** Prevalence of reported GI symptoms from Rome 3 criteria and PFDI20 questionnaires in the study population.

symptoms	prevalence (%)
Rome 3 (N = 241)	
hard stool	63 (26.1)
soft stool	90 (37.3)
residual feeling	97 (40.2)
bloating	155 (64.3)
anal pain	106 (44)
painful anal protuberance	61 (25.3)
abdominal pain once a week	185 (76.8)
abdominal pain, stool frequency-related	102 (42.3)
abdominal pain, stool type-related	95 (39.4)
PFDI 20 (N = 223)	
need to press for stool	96 (43)
inability to empty stool	124 (55.6)
hard stool incontinence	12 (5.4)
soft stool incontinence	25 (11.2)
flatus incontinence	82 (36.8)
pain on defecation	117 (52.7)
defecation urgency	118 (53.2)
feeling of rectal bulge	34 (15.3)

GI: gastrointestinal; PFDI20: pelvic floor distress inventory questionnaire.

► **Table 3** The prevalence of TVUS findings in women with suspected endometriosis attending a tertiary referral center and included in the study (N = 241).

TVUS findings	prevalence (%)
endometriomas	right 32 (13.3), left 56 (23.2)
peritoneal adhesions	right 106 (44), left 112 (46.5)
kissing ovaries	8 (3.3)
uterosacral ligament involvement	64 (26.7)
retrocervical nodules	27 (11.2)
rectosigmoid nodules	27 (11.2)
other intestinal nodules	11 (4.6)
pouch of Douglas obliteration	37 (15.4)
Bladder nodules	2 (0.8)

TVUS: transvaginal ultrasound.

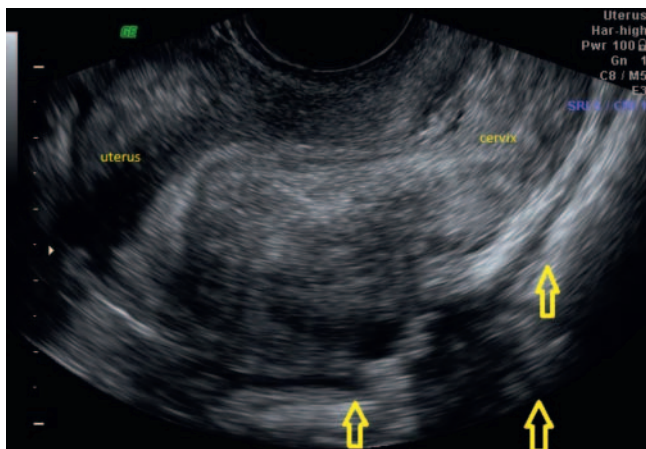
[28] compared DIE lesions that were diagnosed at laparoscopic surgery in patients with pelvic pain and GI symptoms. They found that bowel and vaginal lesions were associated with GI symptoms. While they defined GI symptoms as more than two symptoms

► **Table 4** Univariate and multivariate analysis of the association between TVUS findings in women with suspected endometriosis and GI symptoms (N = 241).

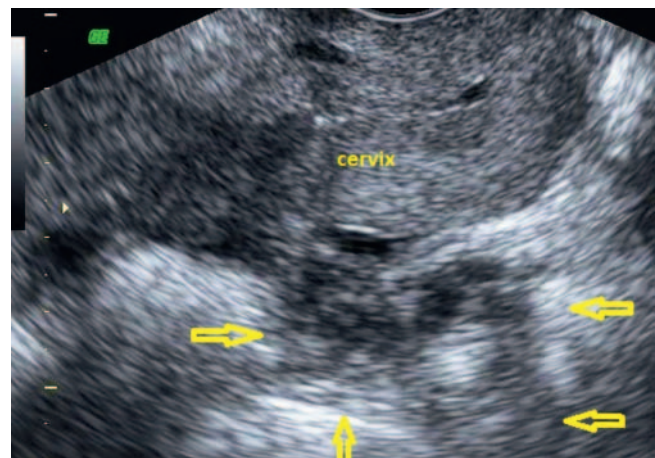
TVUS finding	GI symptom	univariate (Chi ²)	P-value	multivariate (95% ci)	P-value
endometriomas	anal pain (Rome 3)	3.708	0.060	0.684 (0.935–1.006)	0.098
peritoneal adhesions	soft stool (Rome 3)	7.043	0.012*	4.805 (1.37–16.856)	0.014*
	fecal urgency (Rome 3)	4.864	0.042*	1.513 (0.862–2.655)	0.149
	painful anal protuberance (Rome 3)	4.133	0.053	0.453 (0.185–1.110)	0.083
	inability to empty stool (PFDI 20)	3.489	0.081	1.153 (0.630–2.110)	0.645
	soft stool incontinence (PFDI 20)	3.522	0.077	1.627 (0.614–4.312)	0.327
	defecation urgency (PFDI 20)	5.490	0.028*	2.671 (1.063–6.714)	0.037*
kissing ovaries	anal pain (Rome 3)	3.653	0.073	0.172 (0.021–1.405)	0.1
uterosacral ligament involvement	anal pain (Rome 3)	4.690	0.039*	0.645 (0.347–1.2)	0.166
	hard stool incontinence (PFDI 20)	3.784	0.072	1.729 (0.227–13.172)	0.597
	pain on defecation (PFDI 20)	3.798	0.072	1.766 (0.817–3.816)	0.148
retrocervical nodule	need to press for stool (PFDI 20)	3.999	0.051	1.84 (0.592–5.721)	0.292
rectosigmoid nodule	pain on defecation (PFDI 20)	7.319	0.012*	3.507 (1.029–11.955)	0.045*
	feeling of a rectal bulge (PFDI 20)	8.583	0.007*	8.102 (1.885–34.822)	0.005*
intestinal nodules	soft stool incontinence (PFDI 20)	9.639	0.013*	6.146 (1.018–37.1)	0.048*
POD obliteration	hard stool incontinence (PFDI 20)	4.888	0.060	1.032 (0.067–15.972)	0.982

TVUS: transvaginal ultrasound; GI: gastrointestinal; PFDI20: pelvic floor distress inventory questionnaire; POD: pouch of Douglas.

* statistically significant.



► **Fig. 2** TVUS in the midsagittal plane in a 29-year-old patient presenting with dysmenorrhea, pain on defecation, and feeling of a rectal bulge. The image depicts a large posterior compartment nodule involving the retrocervical and rectosigmoidal area. The sliding sign was absent. Annotated are the C – cervix, U – uterus, N – nodule (limits of the nodule are shown in arrows and are measured in 2D).

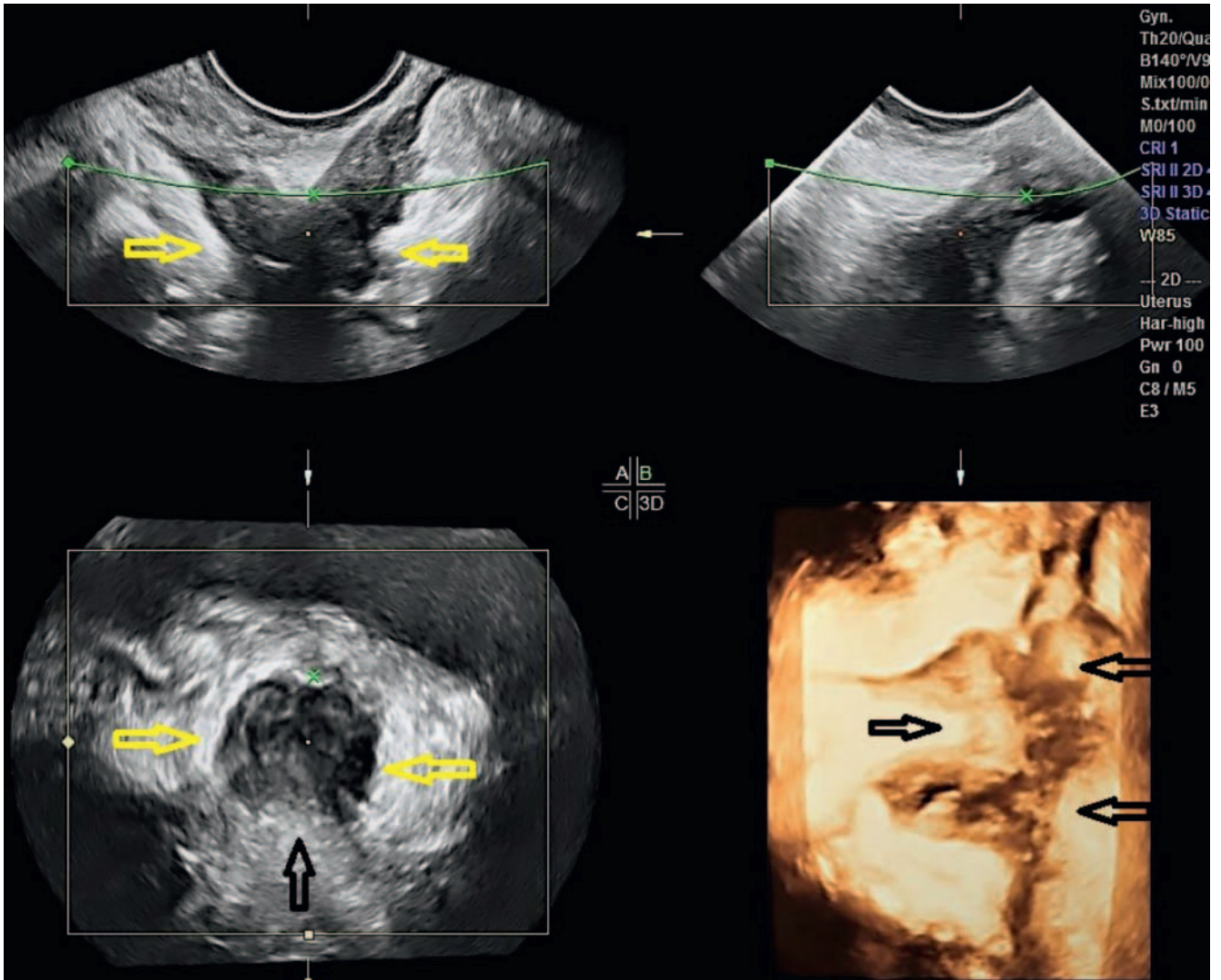


► **Fig. 3** TVUS in the midsagittal plane in a 31-year-old patient presenting with dysmenorrhea, dyspareunia, and dyschezia. Additional questioning revealed a multitude of GI symptoms. The image depicts a large sacrouterine nodule extending towards the retrocervical area. Annotated are the C – cervix, U – uterus, USL – sacrouterine nodule, R – retrocervical area (limits of the nodule are shown in arrows).

including GI involvement (from previous medical records), we evaluated the association between specific lesion sites and GI symptom, prospectively.

An alternative explanation for the relationship between endometriosis and GI symptoms is comorbidity between IBS and endo-

metriosis [9]. Endometriosis is a common finding in women with IBS. Early evaluation of clinical manifestations, such as dyspareunia, chronic pelvic pain, and family history of endometriosis in IBS patients, may help in endometriosis diagnosis and treatment



► **Fig. 4** TVUS in the midsagittal plane in a 35-year-old patient with GI symptoms without dysmenorrhea. The patient reported a feeling of a rectal bulge and pain on defecation. The image depicts a large posterior fornix nodule extending into the retrocervical area. Annotated are the PF – posterior fornix, C – cervix, N – nodule (limits of the nodule are shown in arrows).

and in exclusion of IBS. As described by Moore et al. [29], the low FOODMAP diet of IBS patients appears to be effective in reducing bowel symptoms in women with endometriosis. In addition to similar clinical symptoms, Viganò et al. [30] suggested that the diseases share a common pathophysiological pathway, which underlies the persistence of a chronic inflammatory state. IBS should possibly be a diagnosis of exclusion, but only after endometriosis has been ruled out.

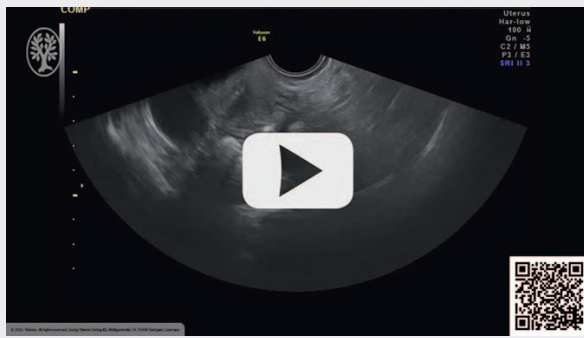
In this study, all patients suffered from abdominal or pelvic pain. Pain is a common factor to both IBS and chronic pelvic pain. The differential diagnosis between endometriosis and IBS may be subjective, depending on the specialty of the practitioner. Gastroenterologists may not regularly ask about dyspareunia or dysmenorrhea, just as gynecologists may not inquire frequently about bowel habits, pain on defecation, or stool consistency. This raises the question of whether IBS and chronic pelvic pain (including endometriosis) are two separate disease entities with mutually high comorbidity [31] or the same syndrome with different

subgroups. Alternatively, IBS and endometriosis may have two different triggers whereby endometriosis infiltrates the abdomino-peritoneal tissues and IBS leads to a change in intestinal permeability. A common pathway of peripheral and central sensitization may also be implicated.

The main strength of this study is its prospective observational design. We used validated questionnaires. The sonographers were experts in endometriosis diagnosis. All of the examinations were performed using a high-frequency transvaginal probe and known diagnostic criteria. Furthermore, we included only patients who could undergo TVUS, which is a highly sensitive noninvasive tool for endometriosis diagnosis.

Study limitations: Three different sonographers performed the TVUS examinations which can lead to a lack of uniformity between examinations. In order to minimize these differences, the sonographers worked according to the same known diagnostic criteria of endometriosis and a specific checklist as described. Secondly, the examiners were not blinded to the patients' symp-

▶ OP-VIDEO



▶ **Video 1** TVUS in the midsagittal plane in a 32-year-old patient presenting with dysmenorrhea, dyschesia, feeling of a rectal bulge, and dyspareunia. The patient reported longstanding GI symptoms which did not receive attention. She was referred for evaluation due to infertility. The video depicts a posterior compartment nodule involving the retro cervix, rectosigmoid and uterosacral ligament on the right side. There are intestinal adhesions and an absent sliding sign.

▶ OP-VIDEO



▶ **Video 2** TVUS in the midsagittal plane in a 35-year-old patient presenting with dysmenorrhea and GI symptoms. The video depicts kissing ovaries behind the uterus and intestinal adhesions.

toms. The questionnaires were used as a clinical tool to learn about the patient and not only as a research modality. Therefore, the sonographer could not remain blinded to the questionnaire. We recognize that this may have caused bias in interpretation but believe that the impact of this is minimal. In addition, we did not have a control group resulting from the fact that we are a tertiary referral center serving a high-risk population, with longstanding symptoms and a high likelihood of finding endometriosis. In the future, it will be interesting to examine GI symptoms in the general population with women who have yet to be diagnosed. However, this is hardly practical as it will require a large sample size and recruitment from healthy cohorts. Additionally, we plan to continue to prospectively follow these women, some of whom will eventually undergo surgery, both to confirm the as-

sociations on laparoscopy and to examine whether GI symptoms will improve after surgical removal of lesions.

In conclusion, we observed an almost 10-fold increase in DIE lesions in women with GI symptoms undergoing TVUS in a tertiary referral endometriosis center. Gynecologists, gastroenterologists, general practitioners, and pediatricians should be made aware of the association between GI symptoms and the presence of endometriosis. GI symptoms should prompt an earlier evaluation for endometriosis lesions, which may potentially reduce the delay in diagnosis in these patients and prevent unnecessary invasive procedures. We suggest that endometriosis should be one of the leading differential diagnoses in women with prolonged GI symptoms and should therefore be ruled out primarily.

Conflict of Interest

The authors declare that they have no conflict of interest.

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