Sonographic and laparoscopic findings in women presenting with chronic pelvic pain

Hasan S. Kamel[a,b], Ahmed M. Abu-Elhassan[a,b], Mahmoud A. Abdel-Aleem[a,b], Amany A. Ibrahim[b]

[a]OB-GYN Department, [b]Women's Health Hospital, Assiut University, Assiut, Egypt

Correspondence to Amany A. Ibrahim, MSc, Women's Health Hospital, Assiut University, Assiut, Egypt
Tel: +20882414616; Fax: +20882333327; e-mail: t_alaref@yahoo.com

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Objective
The aim of this study was to assess the value of transvaginal ultrasound (TVS) examination in predicting the etiological factors of chronic pelvic pain (CPP) in comparison with laparoscopic findings.

Patients and methods
This is a prospective observational study. This study was conducted in Women Health Hospital, Assuit University. A total of 40 patients, 20 with CPP and 20 seeking for fertility as a control group, undergoing TVS before diagnostic laparoscopy were included in the study. TVS examination was performed. Ultrasound hard markers were documented (anatomical abnormalities – e.g. endometrioma or hydrosalpinx). The woman was then assessed for the presence or absence of ultrasound soft markers (reduced ovarian mobility, site-specific pelvic tenderness, and the presence of loculated peritoneal fluid in the pelvis). Then diagnostic laparoscopy was performed. Assessment of the value of TVS in predicting the etiological factors of CPP in comparison with laparoscopic findings was the main outcome measure.

Results
Laparoscopy diagnosed pathological lesions in 18 (90%) CPP patients, of whom 10 (55.5%) patients had endometriosis, 10 (55.5%) had pelvic adhesions, 1 (5.5%) had ovarian cyst, 3 (16.6%) had tubal block, and 1 (5.5%) had subserous fibroids. The diagnostic accuracy of ultrasound hard marker examination of CPP was 30%, which increased to 80% by the addition of ultrasound soft marker examination.

Conclusion
Inclusion of site-specific pelvic tenderness, ovarian mobility, and the presence of loculated peritoneal fluid in the pelvis as indirect ultrasound-based markers of pelvic pathology improved diagnostic accuracy of TVS and hence improved the detection and exclusion of significant pathology in women with CPP and may lead to a reduction in the number of unnecessary laparoscopies carried out on women with CPP.

Keywords:
laparoscopy, pelvic pain, sonography

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Introduction

Although chronic pelvic pain (CPP) has been described in a variety of ways, it is most commonly defined as nonmenstrual pelvic pain of a duration of 6 months or more that is severe enough to cause functional disability or require medical or surgical treatment [1]. CPP is a disabling and distressing condition as it diminishes the quality of life of CPP patients. In addition, CPP is a public health crisis and is a burden on healthcare expenditure [2]. CPP is a common and significant disorder of women [1,3].

The prevalence of CPP varies; it is a chief complaint for patients in the primary care practice, with ~10–20% reporting chronic pain [3]. Despite the magnitude of this problem, CPP remains a poorly understood and difficult to be treated condition that often results in surgical intervention.

The etiology of CPP may be characterized as visceral or somatic [4].

Visceral disorders can arise in genitourinary or gastrointestinal organs (e.g. adhesions, endometriosis, pelvic inflammatory disease, malignancies, constipation, or irritable bowel syndrome); somatic pain often originates from pelvic bones, ligaments, fascia, and muscles [4].

CPP is a multifactorial condition and therefore quite often poorly managed [5].

The efficacy of ultrasonography for the assessment of women with CPP has not been widely evaluated.

Ozaksit and colleagues reported on the use of clinical examination, transvaginal ultrasound (TVS) scans, and laparoscopy in 45 women with CPP. The positive predictive value of an abnormal scan was 94%, and the negative predictive value of a normal scan was 60% [6].

An ultrasound scan will report the presence or absence of pathology such as ovarian cysts or hydrosalpinges. However, more subtle information is available about the state of the pelvis based on the degree of ovarian and uterine mobility, as well as tenderness [7].

Laparoscopies have proved most useful as a diagnostic tool in the evaluation of pelvic pain originating from visceral pathology and provide surgical treatment with minimally invasive techniques if necessary while avoiding the morbidity of a laparotomy. It is one of the most common surgical diagnostic tools used, and there has been a progressive increase in the number of diagnostic laparoscopies over the years [8]. Despite these advantages, and its usefulness in confirming certain diagnosis associated with CPP, significant controversy remains regarding the selection of patients for laparoscopy.

Patients and methods

This study was carried out at the period between August 2016 and April 2017; 40 women were included in this study in two groups:

(1) Group A: patients with CPP
(2) Group B (control group): patients without CPP underwent laparoscopy seeking for fertility.

The study included patients who met the CPP criteria defined by ACOG, 2004, as noncyclic pain that lasts 6 months or more; is localized to the pelvis, the anterior abdominal wall at or below the umbilicus, or the buttocks; and is of sufficient severity to cause functional disability or require medical care [9]. The exclusion criteria were current pregnancy, acute pelvic infection, and proven chronic bowel, urinary, or psychological diseases.

A detailed medical history was taken, with special concerns to the following:

(1) Pain history: the site, character, duration, frequency, radiation of the pain, precipitating and modifying factors, the relation of pain to sexual activity and menstrual cycle, and the presence of other types of pain as dysuria
(2) Menstrual history: history of associated dysmenorrhea and if the pain aggravated with menstrual cycle, history suggestive of possible adhesions formation – for example previous pelvic or abdominal surgery, history suggestive of pelvic infections, or use of intrauterine device. History suggestive of possible involvement of the gastrointestinal and urinary system – for example dysuria, dyschezia or altered bowel habits.

Clinical examination

Patient was examined generally for signs of systemic illness or malignancy.

Abdominal examination was performed while the patient was in supine position; all quadrants of the abdomen were examined for skin scars, tenderness, or abdominal masses.

Pelvic examination was performed while the patient was in the lithotomy position. Inspection of the vulva was done for localized lesions (redness, discharge, abscess formation, or signs of trauma). Patient was examined for localized tenderness by gentle palpation of the vulva, vaginal side walls, and fornices.

Uterine mobility and cervical motion tenderness were tested by observing the movement of the cervix against the anterior rectal wall.

The bimanual examination was performed gently, checking for uterine and adnexal tenderness or limited mobility.

Transvaginal ultrasound examination

The study patients were evaluated using TVS device (Medison 3D with 4–9 MHz vaginal probe; Samsung Medison Co., Seoul, South Korea), while the patient was in the lithotomy position.

Longitudinal and transverse views of the uterus and adnexa were obtained.

The ultrasound scan results were initially reported as normal or abnormal based on the presence or absence of any structural abnormality – for example an endometrioma or hydrosalpinx. These conventional findings were termed as hard markers for pelvic pathology [7]; if one or more hard markers were present, the scan was described as abnormal, and in the absence of any hard markers the scan was described as normal.

The pelvis was also assessed by TVS for the presence or absence of the following soft markers:

(1) Site-specific pelvic tenderness:

The transvaginal probe was used to palpate the cervix, vaginal fornices, and vaginal vault and the patient was asked to indicate points of tenderness during the

examination. The presence of tenderness on TVS was described as positive.

(2) Ovarian mobility:

Ovarian mobility was assessed by gentle pressure with transvaginal probe. Freely mobile ovary was defined when it glided freely with gentle pressure applied to it with the transvaginal probe when the uterus is anteverted, whereas limited ovarian mobility was defined if the ovary did not glide freely when pressure was applied with the probe.

(3) Presence of loculated peritoneal fluid in the pelvis.

The presence of loculated fluid in the pouch of Douglas was recorded as positive.

The ultrasound scan results were described as normal if there were no soft markers detected, whereas scan results were described as abnormal if pelvic tenderness, limited ovarian mobility, or the presence of loculated peritoneal fluid in the pelvis were detected.

Laparoscopic examination

All women underwent laparoscopy; the surgeon was blind to the ultrasound findings.

The surgeon was required to comment on the presence or absence of pathology.

Laparoscopy was done while the patient was under general anesthesia in the Trendelenburg position. Laparoscopic entry was done through the umbilical area with lifting the anterior abdominal wall.

A thorough, standardized examination was performed; a panoramic view of the pelvis, with the uterus anteverted, allowed a general survey.

A manipulating instrument was inserted, through a 5-mm secondary port, and the bowel, appendix, liver, diaphragm, and upper abdomen were inspected.

The manipulating instrument is used to mobilize pelvic structures to visualize all peritoneal surfaces, the ovaries, ovarian fossae, and the cul-de-sac of Douglas, as well as the anterior cul-de-sac.

The ovary was described as mobile if it was possible to rotate the ovary and to expose the ovarian fossa.

The instrument was used to probe areas of tenderness reported by the patient on pelvic examination.

The varied appearances of endometriotic spots were searched for on the surface of the ovaries, ovarian fossae, uterosacral ligaments, the cul-de-sac of Douglas, the anterior cul-de-sac, as well as chocolate cysts on the surface of the ovaries; biopsy for histologic confirmation was recommended.

Pelvic adhesions were diagnosed. Filmy adhesions were described as thin stretched scar tissue, whereas dense adhesions were described as thick, extensive, vascularized scar tissue including not directly adjacent organs distorting the anatomy up to frozen pelvis [10].

Diagnosis of ovarian pathology – for example ovarian cyst or polycystic ovary – was performed.

Uterus was evaluated for the presence of any pathology – for example subserous fibroids.

Fallopian tubes were evaluated for the presence of any pathology, for example hydrosalpinges; methylene blue test was performed for evaluation of the tubal patency.

Detailed and complete operation records were available for all cases.

The operation findings were correlated with the ultrasound findings. Data were entered on Microsoft access database and analyzed using the Statistical Package for Social Science (SPSS, version 19; SPSS Inc., Chicago, Illinois, USA). Data were presented as frequency and percentage. χ^2 and Fisher's exact tests were used to compare between qualitative variables. For analysis, P value less than 0.05 was considered to indicate a statistically significant difference.

Results

There were no statistically significant differences between patients of both groups regarding age, marital status, previous parity, previous use of intrauterine devices, previous gynecological infection, and previous abdominal surgery [Table 1].

Ultrasound hard markers were diagnosed in five (25%) CPP patients compared with seven (35%) control patients, whereas ultrasound soft markers were detected in 17 (85%) CPP patients compared with seven (35%) control patients. There were overlaps between diagnoses of both hard and soft markers in some patients.

The ultrasound hard markers that were diagnosed in five (25%) CPP patients included four (20%) patients with endometriomas, and one (5%) patient with ovarian cyst, whereas the ultrasound hard markers that were diagnosed in seven (35%) control patients included four (57%) patients with polycystic

Table 1 Sociodemographic features of the study patients (*n*=40)

	Group A chronic pelvic pain (*n*=20) [*n* (%)]	Group B control group (*n*=20) [*n* (%)]	*P*
Age groups (years)			
<30 years	12 (60.0)	12 (60.0)	1.000
(≥30 years	8 (40.0)	8 (40.0)	1.000
Married	19 (95.0)	20 (100.0)	1.000
Previous parity	11 (55.0)	12 (60.0)	0.749
Previous use of IUD	0 (0.0)	1 (5.0)	1.000
Previous gynecological infection			
Vaginal infection	14 (70.0)	16 (80.0)	0.465
History suggestive of PID	2 (10.0)	3 (15.0)	0.633
Previous Abdominal surgery	12 (60.0)	7 (35.0)	0.113

IUD, intrauterine devices; PID, pelvic inflammatory disease.

ovary and three (42.9%) patients with hydrosalpinges [Table 2].

The ultrasound soft markers that were detected in 17 (85%) CPP patients included pelvic tenderness in 16 (94%), limited ovarian mobility in nine (52.9%), and presence of fluid in Douglas pouch (DP) in two (11.8%), whereas the ultrasound soft markers that were detected in seven (35%) of control patients included pelvic tenderness in five (71.4%), limited ovarian mobility in five (71.4%), and the presence of fluid in DP in one (14.3%).

There were overlaps in diagnoses of soft markers; more than one soft marker was present in the same patient [Table 3].

By laparoscopic examination, pathological lesions were diagnosed in 18 (90%) CPP patients and 17 (85%) control patients.

Out of 18 positive laparoscopies among CPP patients, 10 (55.5%) patients had endometriosis, 10 (55.5%) had pelvic adhesions, one (5.5%) had ovarian cyst, three (16.6%) had tubal block, and one (5.5%) had subserous fibroids, whereas among control patients one (5.5%) patient had endometriosis, seven (41.2%) had pelvic adhesions, four (23.5%) had polycystic ovary, eight (47%) had tubal block, three (17.6%) had hydrosalpinges, and one (5.9%) had subserous fibroids [Table 4].

The current study compared pathological lesions diagnosed by TVS and laparoscopy. Results showed significantly more abnormalities diagnosed in ultrasound hard marker examination (N = 28, 70%), in comparison to laparoscopic examination (N = 5, 12.5%), while endometriosis, pelvic adhesions, and tubal block were diagnosed significantly more in laparoscopic examination compared with ultrasound hard markers examination.

There were no significant statistical differences between ultrasound hard markers and laparoscopic examination in diagnosis of polycystic ovary, ovarian cyst, hydrosalpinges, and subserous fibroids [Table 5].

Discussion

This prospective study has highlighted an approach to use TVS examination in the evaluation of patients with CPP that uses all the information made available by the scan.

Ultrasound hard markers were diagnosed in five (25%) CPP patients compared with seven (35%) control patients, whereas ultrasound soft markers were detected in 17 (85%) CPP patients compared with seven (35%) control patients.

By laparoscopic examination, pathological lesions were diagnosed in 18 (90%) CPP patients and 17 (85%) control patients. These findings agreed with those of the published data [11] where laparoscopy was performed in 39 patients and the cause of pain was identified in 35 (90%).

Pelvic endometriosis and pelvic adhesions were the most common laparoscopic findings in patients with CPP. These results agreed with those of the published data [12].

Three (17.6%) hydrosalpinges cases diagnosed with TVS were confirmed by laparoscopy, and this is in agreement with previous studies [13].

Ovarian cyst was diagnosed in only one (5.5%) CPP patients; this in agreement with previous studies [14] that stated that ovarian cyst rarely causes CPP.

The current study compared pathological lesions diagnosed by TVS and laparoscopy. Results showed that endometriomas, polycystic ovary, ovarian cyst, and hydrosalpinges diagnosed by ultrasound were confirmed by laparoscopy, whereas TVS could not diagnose pelvic endometritotic spots, pelvic adhesions, tubal block, and subserous fibroids; this in consistent with a previously published study [7].

Table 2 The ultrasound hard markers of the studied patients (*n*=40)

	Group A (*n*=20) [*n* (%)]	Group B (*n*=20) [*n* (%)]	*P*
Abnormal findings	5 (25.0)	7 (35.0)	0.490
Endometrioma	4 (20.0)	0 (0.0)	0.106
Ovarian pathology			
Polycystic ovary	0 (0.0)	4 (57.1)	0.081
Ovarian cyst	1 (20.0)	0 (0.0)	1.000
Hydrosalpinx	0 (0.0)	3 (42.9)	0.205

Table 3 Ultrasound soft markers of the studied patients (*n*=40)

	Group A (*n*=20) [*n* (%)]	Group B (*n*=20) [*n* (%)]	*P*
Abnormal findings	17 (85.0)	7 (35.0)	0.001*
Pelvic tenderness	16 (94.1)	5 (71.4)	0.194
Limited ovarian mobility	9 (52.9)	5 (71.4)	0.653
Fluid in Douglas pouch	2 (11.8)	1 (14.3)	0.865
*Statistically significant			

Table 4 Laparoscopic findings of the studied patients (*n*=40)

	Group A (*n*=20) [*n* (%)]	Group B (*n*=20) [*n* (%)]	*P*
Abnormal findings	18 (90.0)	17 (85.0)	0.633
Pelvic adhesions	10 (55.5)	7 (41.2)	0.395
Filmy adhesions	2 (11.1)	5 (29.4)	0.228
Dense adhesions	8 (44.4)	2 (11.8)	0.60
Endometriosis	10 (55.5)	1 (5.9)	0.002*
Peritoneal endometritotic spots	6 (38.9)	1 (5.9)	0.041*
Ovarian endometrioma	4 (22.2)	0 (0.0)	0.104
Ovarian pathology			
Polycystic ovary	0 (0.0)	4 (23.5)	0.045*
Ovarian cyst	1 (5.5)	0 (0.0)	1.000
Tubal pathology			
Tubal block	3 (16.6)	8 (47.0)	0.053
Hydrosalpinx	0 (0.0)	3 (17.6)	0.104
Subserous fibroids	1 (5.5)	1 (5.9)	1.000
*Statistically significant			

Table 5 Relation of hard markers to laparoscopic findings of the studied patients (*n*=40)

	Hard markers [*n* (%)]	Laparoscopy [*n* (%)]	*P*
No abnormality	28 (70.0)	5 (12.5)	0.000*
Endometriosis	4 (10.0)	11 (27.5)	0.045*
Pelvic adhesions	0 (0.0)	17 (42.5)	0.000*
Ovarian pathology			
Polycystic ovary	4 (10.0)	4 (10.0)	1.000
Ovarian cyst	1 (2.5)	1 (2.5)	1.000
Tubal pathology			
Tubal block	0 (0.0)	11 (27.5)	0.000*
Hydrosalpinx	3 (7.5)	3 (7.5)	1.000
Uterine pathology			
Subserous fibroids	0 (0.0)	2 (5.0)	0.494
*Statistically significant			

TVS-based soft markers were detected in 17 of 20 (85%) CPP patients and were detected in seven of 20 (58.3%) control patients; the presence of pelvic pathology was confirmed by laparoscopy in patients with ultrasound-based soft markers. These pathological lesions consisted of pelvic adhesions and peritoneal endometriotic deposits, which challenges the assertion that pelvic sonography has no role in the detection of these conditions; these results agreed with those of the study of Friedman *et al*. [15].

Sensitivity of diagnosed hard markers in CPP patients was 22.22%, specificity was 100%, positive predictive value was 100%, negative predictive value was 12.5%, and diagnostic accuracy of ultrasound hard marker examination was 30%; these results agreed with those of a previously published study [7].

The use of hard markers alone in CPP patients resulted in a high false-negative rate. This is because peritoneal adhesions, endometriosis, and tubal block are generally not detected. In contrast, all four endometriomas diagnosed by TVS were confirmed by laparoscopy and histology, which is consistent with previously published data [16].

On addition of ultrasound soft marker examination, the sensitivity of diagnosed soft markers in CPP patients was 11.11%, specificity was 100%, positive predictive value was 100%, negative predictive value was 11.11%, and diagnostic accuracy of ultrasound soft marker examination was 80%.

In the current study, on the basis of hard markers alone, the diagnostic accuracy of ultrasound hard marker examination of chronic pelvic pain was 30% and increased by the addition of ultrasound soft marker examination to 80%.

In comparison with control patients, both hard and soft markers have the same sensitivity of 41.18%, specificity of 100%, positive predictive value of 100%, negative predictive value of 23.1%, and diagnostic accuracy of 50%.

Conclusion

Inclusion of site-specific tenderness, ovarian mobility, and the presence of fluid in the DP as indirect ultrasound-based markers of pelvic pathology improved diagnostic accuracy of TVS and hence improved the ability to predict or exclude the presence of pelvic pathology in women with CPP.

The use of both TVS-based hard and soft markers improves the diagnostic accuracy of TVS and may lead to a significant reduction in the number of diagnostic laparoscopies performed in patients with CPP.

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Conflicts of interest
There are no conflicts of interest.

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