Transvaginal Ultrasonography for Evaluation of Endometriotic Adhesions

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Abstract

Background: Endometriosis is defined as the presence of endometrial glands and stroma outside the uterus, is a frequent gynaecological disease. Accurate diagnosis and staging of endometriosis by imaging is essential to accurately guide the clinician in disease management. Transvaginal sonography (TVS) is a cost-effective method compared to MRI in the diagnosis of endometriosis specifics.

Aim: To evaluate the accuracy of TVS in the detection of pelvic adhesions caused by endometriosis.

Methods: This prospective cohort study enrolled 80 cases diagnosed with endometriosis were subjected to laparoscopy. Transvaginal ultrasonography was done using 2D and 3D scan without any bowel preparation and was guided by Adhesion scoring system. Transvaginal ultrasonography was used to detect the presence or absence of adhesions using the sliding sign approach.

Results: Concerning the severity of endometriosis based on the r-ASRM classification, the number of cases with disease stages I and II, stage III and stage IV were 3 (2.3%), 32 (24.4%) and 96 (73.3%), respectively. There was statistical significance difference between TVS Technique versus laparoscopy as regard detection of mid anterior adhesion, up anterior adhesion, up posterior adhesion, mid posterior adhesion, Rt-O-Ut adhesion, Inter O-O adhesion, Rt-O-side adhesion, Lt-O-Ut adhesion, Lt-O-side adhesion and Low posterior adhesion ($P<0.05$).

Conclusion: Adhesion scoring system could simply and noninvasively predict the degree of endometriosis adhesions. As a result, we could assess the actual condition of endometriotic adhesions with this approach both presurgically and postoperatively.

Keywords: Transvaginal, Ultrasonography, Endometriosis, Adhesions, Sliding Sign.

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INTRODUCTION

Endometriosis is a frequent gynecological disorder described by the existence of extrauterine stroma and ectopic endometrial glands. It has been a frequent and es-

sential problem in females of reproductive age, presenting with pain and loss of fertility [1]. Endometriosis affects around 6–10% of childbearing females who are fertile, with peak prevalence among those in their 25–30s. Endometriosis can have a broad spectrum of manifestations which include irregular menstrual periods, chronic pelvic pain (CPP), painful menstruation, dyspareunia, dysphasia, dysuria, subfertility, and a poor life quality [2].

The most frequent site of endometriosis are the ovaries and the pelvic peritoneum, followed by deep masses in pelvic subperitoneal space, the gut, and the genitourinary system [3]. Endometrioma has been considered a frequent adnexal mass in premenopausal females, and it is often accompanied by adhesions, which could make the operation more difficult with a subsequent increase in the operating time [4]. US could be utilized in the presurgical diagnosis of females with suspected endometriosis to decrease the number of unwarranted laparoscopies (negative laparoscopy) [5].

The sliding sign approach using TVS is a non-invasive and efficient approach for detection of endometriosis adhesions at the Douglas' pouch [6]. Unluckily, the size of an endometrioma measured by TVS assessment doesn't correlate with the degree of adhesive disease. Additionally, small cysts may be associated with a considerable degree of pelvic adhesions [7]. Numerous other approaches, which include the Enzian score, US mapping and endometriosis fertility index (EFI) approach are suggested as diagnostic procedures for endometriosis [8].

A possible need for presurgical assessment has to be the recognition of extensive pelvic adhesions to allow referral to an appropriate surgeon with adequate experience in conducting difficult laparoscopy. In fact, pelvic adhesions could limit the proper laparoscopic surgery and have been considered the primary cause for conversion to laparotomy [9].

Aim of Study

This study aimed to evaluate the accuracy of TVS in the detection of pelvic adhesions caused by endometriosis.

PATIENTS AND METHODS

This prospective cohort study was conducted in Mansoura University Hospital Obstetrics and Gynecology Department on (80) cases diagnosed with endometriosis. This study was performed within 1 year years January 2021 to January 2022. This study enrolled patients aged from 18 to 45 years old with clinical diagnosis of pelvic endometriosis and were subjected to laparoscopy. Patients with pelvic tumors whether benign or malignant, patients with history of Pelvic Inflammatory Disease, patients have unilateral or bilateral adnexectomy at the time of surgery and patients refused to participate in the study were ruled out from this study.

Methods

Entire cases were subjected to history taking and general examination that included age, body mass index, previous medical treatment or previous surgery for endometriosis, operation time, blood loss. Abdominal and local examinations were also done for all patients.

Transvaginal ultrasound was guided by Adhesion scoring system [8] and this system includes 2 components, the adhesion mapping phase and the scoring phase. The total number of sites showing adhesions in the two images was directly described as an adhesion score ranging from zero to ten.

The adhesion mapping phase was used to detect adhesions to measure the extent of the endometriosis adhesions. The presence or absence of adhesions was evaluated in a total of 10 sites: five in the uterus–ovarian cross-section (transverse) and five in the sagittal section of the uterus (sagittal). Five sites included in the transverse plane were the spac-

es between the right ovary and the uterus (Rt O-Ut) and between the left ovary and the uterus (Lt O-Ut), the space between the left and right ovary (Inter O-O), the spaces between the right ovary and the right pelvic sidewall (Rt O Side) and between the left ovary and the left pelvic sidewall (Lt O-Side).

While the five sites included in the sagittal plane were the upper 1/2 (Up Ant) and the lower half (Mid Ant) of the anterior side of the uterus, ranging from the upper uterine part to the vesicouterine pouch and the upper 3rd (Up Post), the middle 3rd (Mid Post) and the lower 3rd (Low Post) of the posterior uterine aspect, ranging from the upper uterine part to Douglas' pouch.

Transvaginal ultrasonography was used to detect the presence or absence of adhesions using the sliding sign approach. The same ten areas were assessed by TVS and are assessed under laparoscopy of the pelvis to detect whether the adhesions exist or not to confirm the accuracy of adhesion mapping detected before operation.

The existence of adhesions was evaluated by assessing the mobility between an object and its nearby adjacent structures according to the pressure on the laparoscopic forceps (when mobility could be detected between two structures, it has to be judged as a site negative for adhesion; otherwise, it should be judged as a site positive for adhesion). The overall number of areas revealing adhesions could be defined as an intraoperative adhesion score ranging from zero to ten. The adhesion scoring phase included calculating the score according to the lesions determined.

Transvaginal ultrasonography was done using 2D and 3D scan without any bowel preparation. The region-of-interest was detected in US using a B-mode scan and a transvaginal volume transducer. The sliding sign approach consisted of detecting whether an object is sliding against its surroundings by pushing it with the examiner's hand over the abdominal wall by using TVS.

Ethical Consideration

Approval from the hospital's ethical committee (IRB) was obtained. Informed consent was obtained from all the studied women. Personal privacy was respected. The collected data was not used for any other purpose.

Statistical Analysis

Data were entered and analyzed using IBM-SPSS software (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25. Armonk, NY). Qualitative data were expressed as frequency and percentage. Qualitative data for two groups were compared by Chi-Square test (or Fishers exact test). Quantitative data were initially tested for normality using Kolmogorov-Smirnov and Shapiro-Wilks tests with data being normally distributed if $p>0.05$. Quantitative data were expressed as mean±SD if normally distributed or median and IQR if not. Quantitative data between two groups were compared by Independent- Samples t test or the non-parametric alternative Mann-Whitney U test according to the distribution of data. Results were considered as statistically significant if p value ≤ 0.050.

RESULTS

Table (1) represents analysis of the laparoscopic findings in the cases of the study in which positive adhesions (mid anterior, up anterior, up posterior, mid posterior, low posterior, Rt-O-Ut, Rt-O-side, Inter O-O, Lt-O-Ut, Lt-O-side) represents the following ratios respectively (5%, 2.5%, 22.5%, 51.3%, 60%, 50%, 40%, 41.3%, 68.8%, 48.8%). Table (1): Analysis of the laparoscopic findings in the

Table (1): Analysis of the laparoscopic findings in the cases of the study

Items	Study subjects N = 80	
Positive adhesions	**Number**	**Percent**
Mid anterior	**4**	**5**
Up anterior	**2**	**2.5**
Up posterior	18	22.5
Mid posterior	**41**	**51.3**
Low posterior	**48**	**60**
Rt-O-Ut	**40**	**50**
Rt-O-side	**32**	**40**
Inter O-O	**33**	**41.3**
Lt-O-Ut	**55**	**68.8**
Lt-O-side	**39**	**48.8**

Table (2) shows predictive value of TVS Technique versus laparoscopy in detection of mid anterior adhesion, there is statistical significance difference between both methods. TVS Sensitivity represents 25%, TVS specificity represents 98.7%, TVS accuracy represents 25%, TVS PPV is 50% and NPV is 96.25.

Table (2): Predictive value of TVS Technique versus laparoscopy in detection of Mid anterior adhesion

	Laparoscopic findings				**c^2/FET**	**P**
	Negative (n= 76)		**Positive (n= 4)**			
	No	**%**	**No**	**%**		
Transvaginal ultrasondraphy findings						
Negative (N=78)	75 (TN)	98.7	3 (FN)	75	8.754	0.003*
Positive (N= 2)	1 (FP)	1.3	1 (TP)	25		
Sensitivity	25 %					
Specificity	**98.7 %**					
Accuracy	**95 %**					
PPV	**50%**					
NPV	**96.2%**					

c^2: Chi-square test
FET: Fischer's exact test *: Statistically significant
PPV: Positive predictive value NPV: Negative predictive value

Table (3): Predictive value of TVS Technique versus laparoscopy in detection of Up anterior adhesion

	Laparoscopic findings				**c^2/FET**	**P**
	Negative (n= 78)		**Positive (n= 2)**			
	No	**%**	**No**	**%**		
Transvaginal ultrasondraphy findings						
Negative (N=75)	75 (TN)	96.2	0 (FN)	0	30.769	< 0.001*
Positive (N= 5)	3 (FP)	3.8	2 (TP)	100		

Sensitivity	100 %
Specificity	**96.2 %**
Accuracy	**96.2 %**
PPV	**40%**
NPV	**100%**

c^2 : Chi-square test
FET: Fischer's exact test *: Statistically significant
PPV: Positive predictive value NPV: Negative predictive value

Table (4) shows predictive value of TVS Technique versus laparoscopy in detection of Up posterior adhesion, in which statistical significance difference is found between them (p< 0.001*). TVS sensitivity is 83.3%, TVS specificity is 87.1%, TVS accuracy 86.2%, TVS PPV is 65.2%, TVS NPV is 94.7%.

Table (4): Predictive value of TVS Technique versus laparoscopy in detection of Up posterior adhesion

	Laparoscopic findings				**c^2/FET**	**P**
	Negative (n= 62)		**Positive (n= 18)**			
	No	**%**	**No**	**%**		
Transvaginal ultrasondraphy findings						
Negative (N=57)	54 (TN)	87.1	3 (FN)	16.7	33.781	< 0.001*
Positive (N= 23)	8 (FP)	12.9	15 (TP)	83.3		
Sensitivity	83.3 %					
Specificity	**87.1 %**					
Accuracy	**86.2 %**					
PPV	**65.2%**					
NPV	**94.7 %**					

c^2: Chi-square test
FET: Fischer's exact test *: Statistically significant
PPV: Positive predictive value NPV: Negative predictive value

Table (5) shows predictive value of TVS Technique versus laparoscopy in detection of Mid posterior adhesion with statistical significance difference between them p< 0.001*. TVS Sensitivity is 95.1%, TVS Specificity is 76.1%, TVS Accuracy is 86.2%, TVS PPV is 81.3%, TVS NPV is 93.8%.

Table (5): Predictive value of TVS Technique versus laparoscopy in detection of Mid posterior adhesion

	Laparoscopic findings				**c^2/FET**	**P**
	Negative (n= 39)		**Positive (n= 41)**			
	No	**%**	**No**	**%**		
Transvaginal ultrasondraphy findings						
Negative (N=32)	30 (TN)	76.9	2 (FN)	4.9	43.227	< 0.001*
Positive (N= 48)	9 (FP)	23.1	39 (TP)	95.1		
Sensitivity	95.1 %					

Specificity	**76.9 %**
Accuracy	**86.2 %**
PPV	**81.3%**
NPV	**93.8 %**

c^2 : Chi-square test
FET: Fischer's exact test *: Statistically significant
PPV: Positive predictive value NPV: Negative predictive value

Table (6) shows predictive value of TVS Technique versus laparoscopy in detection of Low posterior adhesion with statistical significance difference between them (p< 0.001*). TVS sensitivity is 89.6%, TVS specificity is 78.1%, TVS accuracy is 85%, TVS PPV is 86%, TVS NPV is 83.3%.

Table (6): Predictive value of TVS Technique versus laparoscopy in detection of Low posterior adhesion

	Laparoscopic findings				**c^2/FET**	**P**
	Negative (n= 32)		**Positive (n= 48)**			
	No	**%**	**No**	**%**		
Transvaginal ultrasondraphy findings						
Negative (N=30)	25 (TN)	78.1	5 (FN)	10.4	37.556	< 0.001*
Positive (N= 50)	7 (FP)	21.9	43 (TP)	89.6		
Sensitivity	89.6 %					
Specificity	**78.1 %**					
Accuracy	**85 %**					
PPV	**86%**					
NPV	**83.3 %**					

c^2: Chi-square test
FET: Fischer's exact test *: Statistically significant
PPV: Positive predictive value NPV: Negative predictive value

Table (7) shows predictive value of TVS Technique versus laparoscopy in detection of Rt-O-Ut adhesion with statistical significance difference between them (p< 0.001*). TVS sensitivity is 85%, TVS specificity is 82.5%, TVS accuracy is 83.8%, TVS PPV is 84.6%, TVS NPV is 82.9%.

Table (7): Predictive value of TVS Technique versus laparoscopy in detection of Rt-O-Ut adhesion

	Laparoscopic findings				**c^2/FET**	**P**
	Negative (n= 40)		**Positive (n= 40)**			
	No	**%**	**No**	**%**		
Transvaginal ultrasondraphy findings						
Negative (N=39)	33 (TN)	82.5	6 (FN)	15	36.473	< 0.001*
Positive (N= 41)	7 (FP)	17.5	34 (TP)	85		
Sensitivity	85 %					
Specificity	**82.5 %**					
Accuracy	**83.8 %**					

PPV	**84.6%**
NPV	**82.9 %**

c^2: Chi-square test
FET: Fischer's exact test *: Statistically significant
PPV: Positive predictive value NPV: Negative predictive value

Table (8) shows predictive value of TVS Technique versus laparoscopy in detection of Rt-O-side adhesion with statistical significance difference between them p=0.003*. TVS sensitivity is 50%, TVS specificity is 81.2%, TVS accuracy is 68.8%, TVS PPV is 64%, TVS NPV is 70.9%.

Table (8): Predictive value of TVS Technique versus laparoscopy in detection of Rt-O-side adhesion

	Laparoscopic findings				**c^2/FET**	**P**
	Negative (n= 48)		**Positive (n= 32)**			
	No	**%**	**No**	**%**		
Transvaginal ultrasondraphy findings						
Negative (N=55)	39 (TN)	81.2	16 (FN)	50	8.727	0.003*
Positive (N= 25)	9 (FP)	18.8	16 (TP)	50		
Sensitivity	50 %					
Specificity	**81.2 %**					
Accuracy	**68.8 %**					
PPV	**64%**					
NPV	**70.9 %**					

c^2: Chi-square test
FET: Fischer's exact test *: Statistically significant
PPV: Positive predictive value NPV: Negative predictive value

Table (9) shows predictive value of TVS Technique versus laparoscopy in detection of Inter O-O adhesion with statistical significance difference between them (p< 0.001*). TVS sensitivity is 81.8%, TVS specificity is 81.5%, TVS accuracy is 87.5%, TVS PPV is 87.1%, TVS NPV is 87.8%.

Table (9): Predictive value of TVS Technique versus laparoscopy in detection of Inter O-O adhesion

	Laparoscopic findings				**c^2/FET**	**P**
	Negative (n= 47)		**Positive (n= 33)**			
	No	**%**	**No**	**%**		
Transvaginal ultrasondraphy findings						
Negative (N=49)	43 (TN)	91.5	6 (FN)	18.2	43.898	< 0.001*
Positive (N= 31)	4 (FP)	8.5	27 (TP)	81.8		
Sensitivity	81.8 %					
Specificity	**91.5 %**					
Accuracy	**87.5 %**					
PPV	**87.1%**					
NPV	**87.8 %**					

c^2: Chi-square test
FET: Fischer's exact test *: Statistically significant
PPV: Positive predictive value NPV: Negative predictive value

Table (10) shows predictive value of TVS Technique versus laparoscopy in detection of Lt-O-Ut adhesion in which there is statistical significance difference between them p< 0.001*. TVS sensitivity is 85.5%, TVS specificity is 72%, TVS accuracy is 65%, TVS PPV is 87.1%, TVS NPV is 69.2%.

Table (10): Predictive value of TVS Technique versus laparoscopy in detection of Lt-O-Ut adhesion

	Laparoscopic findings				**c^2/FET**	**P**
	Negative (n= 25)		**Positive (n= 55)**			
	No	**%**	**No**	**%**		
Transvaginal ultrasondraphy findings						
Negative (N=26)	18 (TN)	72	8 (FN)	14.5	25.863	< 0.001*
Positive (N= 54)	7 (FP)	28	47 (TP)	85.5		
Sensitivity	85.5 %					
Specificity	**72 %**					
Accuracy	**65 %**					
PPV	**87.1%**					
NPV	**69.2 %**					

c^2: Chi-square test
FET: Fischer's exact test *: Statistically significant
PPV: Positive predictive value NPV: Negative predictive value

Table (11) shows predictive value of TVS Technique versus laparoscopy in detection of Lt-O-side adhesion in which there is statistical significance difference between both methods (p< 0.001*). TVS sensitivity represents 74.4%, TVS specificity represents 78%, TVS accuracy represents 76.2%, TVS PPV represents 76.3%, TVS NPV represents 46.2%.

Table (11): Predictive value of TVS Technique versus laparoscopy in detection of Lt-O-side adhesion

	Laparoscopic findings				**c^2/FET**	**P**
	Negative (n= 41)		**Positive (n= 39)**			
	No	**%**	**No**	**%**		
Transvaginal ultrasondraphy findings						
Negative (N=42)	32 (TN)	78	10 (FN)	25.6	25.863	< 0.001*
Positive (N= 38)	9 (FP)	22	29 (TP)	74.4		
Sensitivity	74.4 %					
Specificity	**78 %**					
Accuracy	**76.2 %**					
PPV	**76.3%**					
NPV	**46.2 %**					

c^2: Chi-square test
FET: Fischer's exact test *: Statistically significant
PPV: Positive predictive value NPV: Negative predictive value

DISCUSSION

Endometriosis presents as different pathologies including endometrioma, deep infiltrating endometriosis (DIE) and endometriosis adhesions. Thus, it isn't easy to expansively assess all such pathologies with a single test. As a result, focusing on one pathologic state and totally grasping its distribution and extent is important in terms of endometriosis management (10). Endometriosis adhesions are accompanied by loss of fertility. In addition, the presence of severe adhesions has been accompanied by with low pregnancy rates. Open surgery with colorectal excision for endometriosis apparently stimulated the development of extensive adhesions, which ultimately ended in worse pregnancy rates compared to laparoscopy [(11)].

As a result, it is clinically linked to precisely diagnose endometriosis adhesion to predict the likelihood of upcoming pregnancy. As a result, the traditional r-ASRM classification (reliant on surgical outcomes) is the only approach to totally describe the endometriosis adhesion condition, and no conclusive noninvasive approach to describe endometriosis adhesions was confirmed [(12)].

Ultrasound could be utilized in the presurgical diagnosis of females with suspected endometriosis to decrease the number of unwarranted laparoscopies (negative laparoscopy) (5). In addition, presurgical assessment could recognize precisely the existence of endometrioma and other adnexal masses responsible for pain (13). The sliding sign approach using TVS is a noninvasive and efficient approach for detection of endometriosis adhesions within the Douglas' pouch [(6)].

Unlikely, the endometrioma size measured by TVS doesn't correlate with the degree of adhesion. Additionally, small cysts might be accompanied by a substantial degree of pelvic adhesions [(7)]. Our study aimed to assess the accuracy of TVS in the detection of pelvic adhesions caused by endometriosis.

The demographic and clinical data in the cases of the study were stated as the mean age was 27.54 ± 7.78 ranging from 19-40 yrs, BMI mean was 29.53 ± 5.6 ranging from 19-54, gravidity mean was 3.06 ± 1.84 ranging from 1-6, parity mean was 1.68 ± 1.25 ranging from 0-5, abortion range from 0-3. Positive Family history of endometriosis was 37.5%. Menstrual history in the cases of the study is stated as mean age of menarche is 27.54 ± 7.78 ranging from 19-40, cycle length was represented as (normal: 71.3 %, frequent: 20%, infrequent: 8.8%), cycle amount was represented as (heavy: 55%, normal: 36.3%, scanty: 8.8%), and regular cycle represented 80%. In our study analysis of history of endometriosis in the cases in which symptoms (CPP, Dysmenorrhea, Menstrual disturbances) was represented as (36.6%, 58.8%, 5%). Previous medical therapy accounts for 35%, previous surgical treatment accounts for 11.3%. Distribution of Endometrioma in studied cases as (unilateral: 56.3%, bilateral: 38.8%, no: 5%). Staging (r-ASRM) was classified as (I: 3.8%, II: 5%, III: 23.8%, IV: 67.5%). Likewise, Ichikawa et al. stated in his study that 48.1% had received oral therapy for endometriosis and 9.2% had undergone preceding surgery for endometriosis [(8)]. On the other hand, Ichikawa et al. demonstrated in his research that 46.6% had unilateral endometriomas and 51.9% had bilateral endometriomas [(8)].

With regard to the severity of endometriosis based on the r-ASRM classification, the number of cases with disease stages I and II, stage III and stage IV were three (2.3%), 32 (24.4%) and 96 (73.3%), respectively. In This study, analysis of the TVS findings in the cases of positive adhesions (mid anterior, up anterior, up posterior, mid posterior, low posterior, Rt-O-Ut, Rt-O-side, Inter O-O, Lt-O-Ut, Lt-O-side) represented the following ratios respectively (3.8%, 6.3%, 28.8%, 60%, 62.5%, 51.3%, 31.3%, 38.8%, 67.5%, 47.5%). Total adhesions mean represented 3.96 ± 1.60 ranging from 1-8.

Similarly, Ichikawa et al. demonstrated in

their study that the percentages of adhesion were 70.5%, 61.1%, and 56.5% in Lt O-Ut, Low Post, and Mid Post, respectively. The sensitivity, specificity, PPV, NPV, LR+, LR− and accuracy of the adhesion mapping were 80.4%, 86%, 78.8%, 87%, 5.8, 0.23 and 83.9%, respectively [8].

Analysis of the laparoscopic findings in the cases of the study in which positive adhesions (mid anterior, up anterior, up posterior, mid posterior, low posterior, Rt-O-Ut, Rt-O-side, Inter O-O, Lt-O-Ut, Lt-O-side) represented the following ratios respectively (5%, 2.5%, 22.5%, 51.3%, 60%, 50%, 40%, 41.3%, 68.8%, 48.8%). In This study, predictive value of TVS Technique versus laparoscopy in detection of mid anterior adhesion, there was statistical significance difference between both methods. TVS Sensitivity represents 25%, TVS specificity represents 98.7%, TVS accuracy represents 25%, TVS PPV is 50% and NPV is 96.25, predictive value of TVS Technique versus laparoscopy in detection of Up anterior adhesion in which there is statistical significance difference between them ($p< 0.001$*). TVS sensitivity is 100%, TVS specificity 96.2%, TVS accuracy is 96.2%, TVS PPV is 40%, TVS NPV is 100%. The predictive value of TVS Technique versus laparoscopy in detection of Up posterior adhesion, in which statistical significance difference is found between them ($p< 0.001$*). TVS sensitivity is 83.3%, TVS specificity is 87.1%, TVS accuracy 86.2%, TVS PPV is 65.2%, TVS NPV is 94.7%. In our study, predictive value of TVS Technique versus laparoscopy in detection of Mid posterior adhesion showed statistical significance difference between them $p< 0.001$*. TVS sensitivity is 95.1%, TVS specificity is 76.1%, TVS accuracy is 86.2%, TVS PPV is 81.3%, TVS NPV is 93.8%, predictive value of TVS Technique versus laparoscopy in detection of Rt-O-Ut adhesion with statistical significance difference between them ($p< 0.001$*). TVS sensitivity is 85%, TVS specificity is 82.5%, TVS accuracy is 83.8%, TVS PPV is 84.6%, TVS NPV is 82.9%. predictive value of TVS Technique versus laparoscopy in detection of Inter O-O adhesion with statistical significance difference between them ($p< 0.001$*). TVS sensitivity is 81.8%, TVS specificity is 81.5%, TVS accuracy is 87.5%, TVS PPV is 87.1%, TVS NPV is 87.8%. Moreover, in this study, predictive value of TVS Technique versus laparoscopy in detection of Rt-O-side adhesion showed statistical significance difference between them $p=0.003$*. TVS sensitivity is 50%, TVS specificity is 81.2%, TVS accuracy is 68.8%, TVS PPV is 64%, TVS NPV is 70.9%, predictive value of TVS Technique versus laparoscopy in detection of Lt-O-Ut adhesion in which there is statistical significance difference between them $p< 0.001$*. TVS sensitivity is 85.5%, TVS specificity is 72%, TVS accuracy is 65%, TVS PPV is 87.1%, TVS NPV is 69.2%.

In accordance, when the diagnostic accuracy of adhesions in each site was assessed in Ichikawa et al. study, the diagnostic accuracy of Mid Post, Rt O-Ut and Inter O- O was considered very high. On the other hand, the adhesion diagnostic accuracy at Rt O-Ut and Lt O-Side, which are extra-uterine areas, were to some extent lower than that of the former [8].

Our study revealed that predictive value of TVS Technique versus laparoscopy in detection of Low posterior adhesion showed statistical significance difference between them ($p< 0.001$*). TVS sensitivity is 89.6%, TVS specificity is 78.1%, TVS accuracy is 85%, TVS PPV is 86%, TVS NPV is 83.3% and predictive value of TVS Technique versus laparoscopy in detection of Lt-O-side adhesion in which there is statistical significance difference between both methods ($p< 0.001$*). TVS sensitivity represents 74.4%, TVS specificity represents 78%, TVS accuracy represents 76.2%, TVS PPV represents 76.3%, TVS NPV represents 46.2%.

Similarly, Fedele et al. and Shalev et al. recorded a high accuracy of TVS in terms of uterine

adhesion diagnosis [14, 15]. In contrast, Niknejadi et al. study showed TVS failed to detect adhesions in 67% of the studied cases [16].

CONCLUSIONS

The adhesion scoring system can simply and noninvasively predict the extent and severity of endometriosis adhesions. As a result, we could assess the actual condition of endometriotic adhesions with such approach presurgically and postoperatively.

With regard to the issues with the adhesion scoring system, we have to consider the potential measurement error among the investigators. In addition, any examiner who is familiar with TVS should be able to give outcomes that are comparable because both this system and the sliding sign approach are simple to use. Another problem is that various endometriosis presentations, including endometriomas or DIE, may not be adequately assessed using the adhesion grading system alone.

Recommendations

This work represented a small sized sample of Egyptian population. So, additional studies with larger number of patients would be useful to confirm the importance of TVS in the detection of pelvic adhesions caused by endometriosis.

Declarations

Ethics approval and consent to participate Mansoura University's Faculty of Medicine's Ethical Committee gave its approval for the study and the patients' participation. Ethics of Humanity was given the all-clear by the Mansoura University Faculty of Medicine's Ethics Committee.

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