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DIAGNOSTIC ACCURACY OF LAPAROSCOPIC VISUAL INSPECTION OF PELVIC ENDOMETRIOSIS

By

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ABSTRACT

Background: Endometriosis is the presence of endometrial glands or stroma in sites other than reproductive lives. It is associated with symptoms such as pelvic pain, dysmenorrhea, painful sexual intercourse and infertility. Endometriosis can only objectively be confirmed by visualization. This is mainly done by laparoscopy or laparotomy. Laparoscopy allows inspection of the entire pelvis and the extent of disease recorded using a classification system.

Objective: To assess accuracy of visual diagnosis of laparoscopically excised visceral and peritoneal abnormalities suggestive of endometriosis in comparison to histopathological diagnosis.

Patients and methods: This were a cross sectional study for accuracy of a diagnostic test for diagnosis of pelvic endometriosis, conducted on 50 women at laparoscopy unit, Obstetrics and Gynecology Departments Al-Hussein University Maternity Hospital, during the period from July 2019 to October 2021. This study included women planned to undergo diagnostic or operative intervention laparoscopy for pain and/or infertility related to a suggestive diagnosis of pelvic endometriosis.

Results: Pelvic pain was the most frequent clinical presentation with a percentage of 68% as pelvic pain, dyspareunia 46%, dysmenorrhea 38% and infertility 24%. Endometriosis was found in about three quarters of cases of suspected cases. Our results pointed the diagnostic accuracy of visualization by laparoscopy in diagnosis of endometriosis. uterus was the most accurate site (96%), followed by right ovary, left ovary, right ovarian fossa with percentage (92%) each, Douglas pouch and peritoneum (88%) each and left ovarian fossa (86%).

Conclusion: Laparoscopy, particularly a first procedure served both diagnostic and therpeuatic purpose, the intial step was expolaration of pelvis and abdomen. Diagnosis of endometrisos by visual inspection of lesions at laparoscopy was considered satisfactory.

Keywords: Diagnostic accuracy of laparoscopic visual inspection, Pelvic Endometriosis, Histopathological diagnosis

INTRODUCTION

Endometriosis is a common gynecological disorder affecting at least 11% of reproductive-age women (Buck Louis et al., 2011), but increasing to approximately half of women experiencing pelvic pain or infertility *(Giudice, 2010)*.

The true incidence and prevalence at the population level remains unknown, in part because of variable clinical diagnostic proficiency *(Hsu et al., 2011)*.

Endometriosis is difficult to diagnose and is prone to misclassification given its differing symptomatology, paucity of consistent physical examination findings, unpredictable disease course, and lack of an identifying biomarker *(Nnoaham et al., 2012)*.

Despite the challenges, improving the diagnostic and staging accuracy of endometriosis in women with pelvic pain and infertility is paramount for effectively treating the resulting, sometimes physically or psychologically debilitating conditions *(Hsu et al., 2011)*.

Furthermore, proper evaluation of potential risk factors or investigational treatments is dependent on consistent diagnosis across clinical centers. Operative real-time laparoscopic findings using standardized staging systems are considered the current gold standard for diagnosing endometriosis and assessing its severity *(Practice Committee of the American Society for Reproductive, 2012)*.

In accordance with recent guidelines, *Dunselman et al. (2014)* histopathologic evaluation is recommended for diagnostic confirmation, but its true value had not been adequately quantified because non-standardized and unblended assessment had introduced bias to previous studies. Current advice notes that although positive histology can confirm the diagnosis of endometriosis, negative histology does not exclude it *(Dunselman et al., 2014)*.

Recording laparoscopic surgeries via digital imaging has become widely accepted among gynaecological surgeons for clinical, research, and medico-legal purposes; however, few studies had assessed the operating surgeon's findings with those of expert reviewers, particularly among a heterogeneous study population for whom laparoscopies were conducted by a diverse group of surgeons practicing at a variety of clinical centers *(Weijenborg et al., 2010)*.

The current gold standard for diagnosis of endometriosis is direct visualization of typical or subtle lesions under laparoscopy or laparotomy. Other diagnostic methods, which include serum markers and radiological imaging, are less reliable. There is no reliable test that can be applied to national screening *(Jin and Begeurie, 2014)*.

The present study aimed to assess accuracy of visual diagnosis of laparoscopically excised visceral and peritoneal abnormalities suggestive of endometriosis in comparison to histopathological diagnosis.

PATIENTS AND METHODS

This was a cross sectional study for accuracy of a diagnostic test for diagnosis of pelvic endometriosis, conducted on 50 women at laparoscopy unit, Obstetrics and Gynecology, Al-Hussein University Maternity Hospital, during the period from July 2019 to October 2021.

This study included women planned to undergo diagnostic or operative intervention laparoscopy for pain and/or infertility related to a suggestive diagnosis of pelvic endometriosis.

The study was designed to assess accuracy of visual diagnosis of laparoscopically excised visceral and peritoneal abnormalities suggestive of endometriosis in comparison to histopathological diagnosis.

An approval of the study was obtained from Al-Azhar University academic and ethical committee. Every patient signed an informed written consent for acceptance of the operation. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Sample size justification: A sample of 50 cases was calculated using epi info program using reliability of visual diagnosis of pelvic endometriosis 75% ±12% and CI 95% (Fernando et al., 2013).

Inclusion criteria: Patients aged 18-40 years undergoing laparoscopy operation for pelvic pain (dyspareunia – dysmenorrhea) and/or infertility causes.

Exclusion criteria: Medical or surgical disorders that contraindicated diagnostic or operative laparoscopy (e.g., respiratory, cardiac….etc.)

All patients were subjected to:

1. History taking:

a. Personal history including age and duration of marriage.

b. Menstrual history and regularity of the menstrual cycle.

c. Contraception and use of hormonal treatment in the three months previous to the laparoscopy.

d. History of their infertility and its duration and type (primary or secondary).

e. Sexual history.

f. Parity and gravidity.

g. History of general illnesses (e.g., thyroid disease).

h. Surgical history.

i. Past history of systemic diseases such as diabetes mellitus, hypertension, past pre-eclampsia, renal disease, infants with congenital anomalies, and of thyroid troubles.

j. Family history: diabetes mellitus, hypertension, twins and others.

2. Examination:

a. General examination:

- Height, weight and vital data (blood pressure, pulse, and temperature).
- The eye for jaundice and edema of the lids.
- Pallor, cyanosis, hirsutism and pigmentations.
- The neck for goiter enlarged lymph nodes and congested neck veins.
- Chest and heart examination.
- Breast examination for any abnormalities.
- Limb examination for edema, varicose veins.
- Back examination for any deformity.
- The body mass indexes (BMI) of the mothers were derived from weight and height using the usual formula.
- The BMI was categorized into:
- Normal (20-24.99).
- Overweight (25-29.99).
- Obese (30 and above).

b. Local gynecological examination (uterine size and mobility, adenexal masses, fullness of posterior fornix… etc.)

3. Preoperative laparoscopic investigations:

a. Complete blood picture (CBC).

b. Liver function test (SGOT, SGPT, ALP, and ALT).

c. Kidney function test, serum urea and creatinine.

d. Fasting serum blood sugar.

e. 2 hours post prandial serum blood sugar.

f. Coagulation profile PT, PTT, INR.

g. Complete urine analysis.

4. Pelvic ultrasound.

5. Hysterosalpingogram as a part of infertility work up.

6. Laparoscopy postmenstrual (during proliferative phase) for suitable candidates.

The pelvis and its structures was observed and checked for presence of endometriotic lesions (uterus, tubes, ovaries and ovarian fossae, uterosacral ligaments, Douglas pouch, uterovesical pouch, broad ligaments and lateral pelvic walls).

Endometriosis positive patients was then classified to stages I-IV according to the American Fertility Society scoring system for endometriosis.

Statistical Methods:

The collected data were coded, processed and analyzed using the SPSS (Statistical Package for the Social Sciences) version 22 for Windows® (IBM SPSS Inc, Chicago, IL, USA). Qualitative data were represented as frequencies and relative percentages. Quantitative data were expressed as mean ± SD (Standard deviation).

ROC-curve: Receiver Operating Characteristic curve analysis was used to calculated sensitivity, specificity, PPV and NPV (positive and negative protective values) and accuracy.

RESULTS

Pelvic pain was the most frequent clinical presentation. Grade I was the most frequent frade **(Table 1)**.

Table (1): Demographic charactersitcs, clinical presentation and grades of suspected endometriosis by laparoscopy of the studied cases (N=50)

Variables	Mean±SD	Range
Age (years)	28.7±4.5	20.0–39.0
BMI (kg/m^2)	28.5±3.0	22.8–35.1
Parity	1.8±1.0	0.0–3.0
Clinical presentation	**N**	**%**
Dysmenorrhea	19	38.0
Pelvic pain	34	68.0
Dyspareunia	23	46.0
Bowel symptoms	17	34.0
Bowel pain	15	30.0
Infertility	12	24.0
Ovarian mass	11	22.0
Dysuria	6	12.0
Sites (N=42)		
Grade I	14	33.3
Grade II	7	16.7
Grade III	10	23.8
Grade IV	11	26.2

Douglas pouch and peritoneum were the most frequent sites, while uterus was the least frequent site **(Table 2)**.

Table (2): Endometriosis by laparoscopy and histopathology in different sites (N=50)

Sites	Laparoscopy	Histopathology
Uterus	4 (8.0%)	4 (8.0%)
Right ovary	4 (8.0%)	5 (10.0%)
Left ovary	5 (10.0%)	7 (14.0%)
Right ovarian fossa	7 (14.0%)	7 (14.0%)
Left ovarian fossa	10 (20.0%)	7 (14.0%)
Douglas pouch	10 (20.0%)	10 (20.0%)
Peritoneum	10 (20.0%)	10 (20.0%)

There was a significant moderate agreement between laparoscopy visualization and histopathology in diagnosis of endometriosis in uterus **(Table 3)**.

Table (3): Agreement between laparoscopy visualization and histopathology in diagnosis of endometriosis in uterus

Histopathology / Visualization	Abnormal	Normal	Total
Abnormal	3 (6.0%) **TP**	1 (2.0%) **FP**	4 (8.0%)
Normal	1 (2.0%) **FN**	45 (90.0%) **TN**	46 (92.0%)
Total	4 (8.0%)	46 (92.0%)	50 (100.0)
Diagnostic characteristics		**Value**	**95% CI**
Kappa (P<0.001)		0.728	18.3–97.6
Diagnostic accuracy (DA)		96.0%	88.0%–99.6%
Sensitivity		75.0%	24.9%–97.8%
Specificity		97.8%	93.5%–99.8%
Positive Predictive value (PPV)		75.0%	24.9%–97.8%
Negative Predictive value (NPV)		97.8%	93.5–99.8
Positive likelihood ratio (LR+)		34.5	3.8–505.2
Negative likelihood ratio (LR-)		0.26	0.02–0.80
Diagnostic odd ratio (LR)		135.0	4.7–>1000.0

Percentages were from the total (100), TP: True positive, TN: Truenegative, FP: False positive, FN: Falsenegative, CI: Confidence interval

There was a significant moderate agreement between laparoscopy visualization and histopathology in diagnosis of endometriosis in Douglas pouch **(Table 4)**.

Table (4): Agreement between laparoscopy visualization and histopathology in diagnosis of endometriosis in Douglas pouch

Histopathology / Visualization	Abnormal	Normal	Total
Abnormal	7 (14.0%) **TP**	3 (6.0%) **FP**	10 (20.0%)
Normal	3 (6.0%) **FN**	37 (74.0%) **TN**	40 (80.0%)
Total	10 (20.0%)	40 (80.0%)	50 (100.0)
Diagnostic characteristics		**Value**	**95% CI**
Kappa (P<0.001)		0.625	0.250–0.863
Diagnostic accuracy (DA)		88.0%	76.0%–95.6%
Sensitivity		70.0%	40.0%–89.0%
Specificity		92.5%	85.0%–97.3%
Positive Predictive value (PPV)		70.0%	40.0%–89.0%
Negative Predictive value (NPV)		92.5%	85.0%–97.3%
Positive likelihood ratio (LR+)		9.3	2.7–32.4
Negative likelihood ratio (LR-)		0.32	0.11–0.71
Diagnostic odd ratio (LR)		28.8	3.8–286.8

Percentages are from the total (100), TP: True positive, TN: Truenegative, FP: False positive, FN: Falsenegative, CI: Confidence interval

There was a significant moderate agreement between laparoscopy visualization and histopathology in diagnosis of endometriosis in peritoneum **(Table 5)**.

Table (5): Agreement between laparoscopy visualization and histopathology in diagnosis of endometriosis in peritoneum

Histopathology / Visualization	Abnormal	Normal	Total
Abnormal	7 (14.0%) **TP**	3 (6.0%) **FP**	10 (20.0%)
Normal	3 (6.0%) **FN**	37 (74.0%) **TN**	40 (80.0%)
Total	10 (20.0%)	40 (80.0%)	50 (100.0)
Diagnostic characteristics		**Value**	**95% CI**
Kappa (P<0.001)		0.625	0.250–0.863
Diagnostic accuracy (DA)		88.0%	76.0%–95.6%
Sensitivity		70.0%	40.0%–89.0%
Specificity		92.5%	85.0%–97.3%
Positive Predictive value (PPV)		70.0%	40.0%–89.0%
Negative Predictive value (NPV)		92.5%	85.0%–97.3%
Positive likelihood ratio (LR+)		9.3	2.7–32.4
Negative likelihood ratio (LR-)		0.32	0.11–0.71
Diagnostic odd ratio (LR)		28.8	3.8–286.8

Percentages were from the total (100), TP: True positive, TN: Truenegative, FP: False positive, FN: Falsenegative, CI: Confidence interval

Findings of false-suspected left ovary and right ovarian fossa endometriosis by laparoscopy showed equal percentages of non-specific inflammation and no abnormality (50%) each. Findings of false-suspected left ovarian fossa endometriosis by laparoscopy showed (40%) non-specific inflammation and (60%) no abnormality. Findings of false-suspected douglas pouch and peritoneum endometriosis by laparoscopy showed (66.7%) non-specific inflammation and (33.3%) no abnormality **(Table 6)**.

Table (6): Histopathology finding of false-suspected endometriosis by laparoscopy

Sites	N	%
Uterus (Total=1)		
Hyperplasia	1	100.0
Right ovary (Total=1)		
None specific inflammation	1	100.0
Left ovary (Total=2)		
None specific inflammation	1	50.0
No abnormality	1	50.0
Right ovarian fossa (Total=2)		
None specific inflammation	1	50.0
No abnormality	1	50.0
Left ovarian fossa (Total=5)		
None specific inflammation	3	60.0
No abnormality	2	40.0
Douglas pouch (Total=3)		
None specific inflammation	2	66.7
No abnormality	1	33.3
Peritoneum (Total=3)		
None specific inflammation	1	33.3
No abnormality	2	66.7

DISCUSSION

Results of the present study showed that, pelvic pain was the most frequent clinical presentation with a percentage of 68% of pelvic pain, dyspareunia 46%, dysmenorrhea 38% and infertility 24%. Endometriosis was found in about three quarters of cases of suspected cases. *Bulletti et al., (2010)* found that the most common symptoms of endometriosis were dysmenorrhea 60-80%, pelvic pain and dyspareunia 40-50%, infertility 30-50%. *Salehpour et al. (2010)* showed that patients presented with a primary complaint of chronic pelvic pain (13.3%) dysmenorrhea (40%), primary infertility (70%) and secondary infertility (26%). Fassbender et al. (2013) study laparoscopy revealed endometriosis in 40% (21/53) of cases. In endometriosis cases, most frequent symptoms described by patients were dysmenorrhea and dyspareunia followed by vibration pain, urinary symptoms and lowered fertility.

In our study, studying the grades of suspected endometriosis by laparoscopy revealed that, grade one was the most frequent grade 33.3%, followed by grade four 26.2%, grade three 23.8% and grade two 16.7%. *de Almeida Filho et al. (2015)* showed that 45.9% were classified

presenting endometriosis grades I and II, and 336 patients (54.1%) with grades III and IV. *Fassbender et al. (2013)* found in all cases the stage of the endometriosis was grade I (N = 15) or grade II, which indicated minimal disease. *Mettler et al. (2012)* found that the majority of patients, (59.8%), had stage I endometriosis, (8.5%) had stage II, (17%) stage III, and (14.6%) stage IV endometriosis. The majority of patients, (67.7%), were found to have multiple lesions, and (32.3%) had single lesions.

It is obvious from our results that Douglas pouch and peritoneum were the most frequent sites (20%) for each, while uterus was the least frequent site represented 8% among studied cases when studying endometriosis by laparoscopy and histopathology. *Schrager et al. (2013)* correlated the diagnosis of endometriosis on the basis of visualization at laparoscopy with the pathologic diagnosis in a prospective study the mean prevalence of abnormalities visually consistent with endometriosis was 36%, with 18% confirmed histologically. The positive predictive value was 45%; sensitivity, 97%; negative predictive value, 99%; and specificity, 77%; for visual versus histologic diagnosis of endometriosis. Thirty-six percent of the diagnoses were downstage on the basis of histologic findings. Sourial et al. (2014) reported the clinical characteristics of adolescent patients with endometriosis monitored in a tertiary hospital. The age ranged from 17.95 ± 1.48 years, the sites affected were ovarian (38%), peritoneal (47.6%) and retrocervical (23.8%). Dysmenorrhea was found in 80.9 % of adolescents (severe in 33.3% of cases) and chronic pelvic pain in 66.6%. *Mettler et al. (2014)* determined the prevalence of endometriosis among women with proven fertility in Santiago de Chile. Endometriosis was found in 14 of the 287 women (4.9%). In spite of being asymptomatic, five of the 14 women with endometriosis were classified as severe, due to the presence of at least one endometrioma. In order of frequency, the most commonly affected anatomical sites were the ovary, the peritoneum, the posterior cul-de-sac and uterosacral ligaments.

Regarding agreement between laparoscopy visualization and histopathology in diagnosis of endometriosis in uterus, there was a significant moderate agreement between laparoscopy visualization and histopathology in diagnosis of endometriosis in uterus. Our study showed significant moderate agreement between laparoscopy visualization and histopathology in diagnosis of endometriosis in left ovary, right ovarian fossa, left ovarian fossa, Douglas pouch and peritoneum. *Mehedintu et al. (2014)* determined the correlation between visual and histologic findings of endometriosis at laparoscopy. Laparoscopy was confirmed to be in 100% diagnostic accordance with pathology for patients with endometriosis. 80.3% of ovarian endometriotic cysts diagnosed by laparoscopy were confirmed histologically with 43.6% in the left, 27.3% in the right; and 29.1% in both sides of the ovary. In addition, 18.5% of normal-appearing peritoneal biopsy were identified as endometriosis by pathological examination. According to *Acien et al. (2012)*, laparoscopic visualization of endometriosis does not always correlate with histopathologic

diagnosis; several other lesions may mimic endometriosis on histopathologic examination.

Our results pointed the diagnostic accuracy of visualization by laparoscopy in diagnosis of endometriosis, uterus was the most accurate site (96%), followed by right ovary, left ovary, right ovarian fossa with percentage (92%) each, douglas pouch and peritoneum (88%) each and left ovarian fossa (86%). *Mettler et al. (2012)* analyzed the accuracy of laparoscopic visualization in diagnosing the various endometriotic sites as confirmed histologically. The most accurate diagnosis was in lesions on the parietal peritoneum of the pelvis, confirmed in 100%. The ovarian fossa, confirmed in 66.7%, and the uterosacral ligaments and posterior surface of the broad ligament, confirmed in 60.1%. As for the other sites, the histologic confirmation rates in the ovarian surface, bowel serosa, and vesico uterine fold of the peritoneum were 48%, 40%, and 13%, respectively.

This study revealed the histopathology findings of false-suspected endometriosis by laparoscopy: Findings of false-suspected left ovary and right ovarian fossa endometriosis by laparoscopy showed equal percentages of non-specific inflammation and no abnormality (50%) each. Findings of false-suspected left ovarian fossa endometriosis by laparoscopy showed (40%) non-specific inflammation and (60%) no abnormality. Findings of false-suspected douglas pouch and peritoneum endometriosis by laparoscopy showed (66.7%) non-specific inflammation and (33.3%) no abnormality.

In the study of *Florio et al. (2011)* in patients who underwent laparoscopy, 33% did not exhibit any signs of endometriotic disease during laparoscopic inspection of the pelvis. 60% did not reveal any pelvic abnormalities, whereas 11% observed macroscopically the features consistent with chronic pelvic inflammatory disease. Dense pelvic adhesions were observed 29%.

In the study of *de Almeida Filho et al. (2015)*, by taking the histopathological findings to be definitive for the diagnosis of endometriosis, the clinical suspicion and laparoscopic findings presented 97.68% sensitivity, 79.23% specificity, 72% positive predictive value, 98.42% negative predictive value, and 85.75% accuracy. False positive results were obtained in 27.99% of the tests, compared with false negative results in 1.57% of the tests.

In the study of *Moini et al. (2012)* at histopathology, the diagnosis of deep endometriosis was confirmed in 82/115 (71.3%) patients. The highest accuracy was for adenomyosis (100%) and endometriosis of utero-sacral ligaments (USLs) (98%), slightly lower for vagina-rectovaginal septum a colo-rectal walls (96%), and the lowest for bladder endometriosis (92%).

CONCLUSION

Laparoscopy, particularly a first procedure served both diagnostic and therpeuatic purpose, the intial step was expolaration of pelvis and abdomen. Diagnosis of endometrisos by visual inspection of lesions at laparoscopy was considered satisfactory.

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دقة تشخيص الفحص البصرى بالمنظار لبطانة الرحم المهاجرة فى الحوض

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خلفية البحث: داء البطانة الرحمية المهاجرة هي حالة مرضية غير سرطانية شائعة تصيب الجهاز التناسلي للمرأة وهي عبارة عن ظهور أنشجة لبطانة الرحم وغدد في أماكن خارج تجويف الرحم. يرتبط بأعراض مثل آلام الحوض وعسر الطمث والجماع الجنسي المؤلم والعقم. لا يمكن تأكيد الانتباذ البطاني الرحمي بشكل موضوعي إلا بالتخيل. يتم ذلك بشكل أساسي عن طريق تنظير البطن أو فتح البطن. يسمح تنظير البطن بفحص الحوض بالكامل ومدى المرض المسجل باستخدام نظام التصنيف.

الهدف من البحث: تقييم دقة التشخيص البصري للتشوهات الحشوية والبريتونية المستأصلة بالمنظار والتي توحي بداء البطانة الرحمية المهارجة مقارنة بالتشخيص النسيجي.

المريضات وطرق البحث: كانت هذه دراسة مقطعية لدقة إختبار تشخيصي لتشخيص بطانة الرحم المهاجرة في الحوض، أجريت على 50 امرأة في وحدة تنظير البطن بأمراض النساء والولادة بمستشفى الحسين الجامعي للولادة في الفترة من يوليو 2019 إلى أكتوبر 2021. تشمل هذه الدراسة النساء المخطط لهن الخضوع لعملية تنظير البطن التشخيصي أو الجراحي من أجل الألم و / أو العقم المرتبط بتشخيص موحي لانتباذ بطانة الرحم الحوضي.

نتائج البحث: كان ألم الحوض أكثر الأعراض السريرية شيوعا بنسبة 68٪ وعسر الجماع 46٪ وعسر الطمث 38٪ والعقم 24٪. تم العثور على بطانة

الـرحم فـي حـوالي ثلاثـة أربـاع الحـالات المشـتبه بهـا. أشـارت نتائجنـا إلـى الدقـة التشخيصـية للتصـور عـن طريـق تنظيـر الـبطن فـي تشـخيص بطانـة الـرحم، وكـان الـرحم هـو الموقـع الأكثـر دقـة (96٪)، يليـه المبـيض الأيمـن ، والمبـيض الأيسـر، وحفـرة المبـيض الأيمـن بنسـبة (92٪) لكـل منهمـا ، وكـيس دوغـلاس والصفاق. 88٪) ترك كل منهما حفرة مبيض (86٪).

الاسـتنتاج: يخـدم تنظيـر الـبطن، ولا سـيما الإجـراء الأول، كـلاً مـن الأغـراض التشخيصـية والعلاجيـة ، والخطـوة الأولـى هـي توسـع الحـوض والـبطن، ويعتبـر تشـخيص بطانـة الـرحم عـن طريـق الفحـص البصـري للآفـات فـي تنظيـر الـبطن مرضيًا.

الكلمـات الدالـة: الدقـة التشخيصـية للفحـص البصـري بالمنظـار، بطانـة الـرحم المهاجرة فى الحـوض، التشخيص التشريحي المرضي.