

<https://doi.org/10.48047/AFJBS.6.15.2024.10437-10443>



African Journal of Biological Sciences

Journal homepage: <http://www.afjbs.com>



Research Paper

Open Access

Histopathological Evaluation of Endometriosis; The Role of Imaging in Preoperative Assessment

Dr Muhammad Haroon Khan¹, Dr Farzana Begum^{2*}, Dr Saira Khan³, Dr Shandana Fazal⁴, Dr Sidra Mashal⁵, Dr Syeda Maryam Batool⁶

¹Assistant Professor, Department of Histopathology, Bacha Khan Medical College, Mardan

^{2*}Assistant Professor, Department of Radiology, Pak International Medical College/ Peshawar Institute of Medical Sciences,

³Trainee Medical Officer, Gynae A Ward, MTI, Khyber Teaching Hospital, Peshawar

⁴Department of Histopathology, Khyber Medical University (KMU), Peshawar

⁵Medical Officer, MPhil Histopathology, KGMC Peshawar

⁶Associate Professor, Department of Gynea and Obs, SKBZ/CMH, Rawlakot AJK

*Corresponding author's Email: far67rad@gmail.com

Volume 6, Issue 15, Sep 2024

Received: 15 July 2024

Accepted: 25 Aug 2024

Published: 25 Sep 2024

doi: [10.48047/AFJBS.6.15.2024.10437-10443](https://doi.org/10.48047/AFJBS.6.15.2024.10437-10443)

ABSTRACT

Background

Endometriosis is a prevalent gynecological disorder where tissue similar to the lining of the uterus grows outside the uterine cavity, often causing persistent pelvic pain, fertility issues, and disruptions in menstrual cycles. Preoperative assessment, particularly through imaging, 'role' in diagnosis and management endometriosis. The aim of study was to 'evaluate the histopathological findings of endometriosis and' assess the accuracy of imaging modalities such as transvaginal ultrasound (TVS) and magnetic resonance imaging (MRI) in preoperative diagnosis.

Methodology

This cross-sectional study involved 80 women diagnosed with endometriosis who underwent surgical intervention at a Hayatabad Medical Complex, Peshawar. Histopathological evaluation confirmed the diagnosis, and preoperative imaging results were compared. Imaging modalities, including TVS and MRI, were assessed for their sensitivity and specificity in detecting various forms of endometriosis, such as endometriomas and deep infiltrating endometriosis (DIE). Data were analyzed 'using chi-square tests to assess the association between' recurrence rates and endometriosis type, as well as fertility restoration post-surgery.

Results

Histopathological findings confirmed that 50% of the cases were endometriomas and 50% were deep infiltrating endometriosis. MRI demonstrated a sensitivity of 90% and a specificity of 95%, outperforming TVS, which had a sensitivity of 85% and a specificity of 90%. Recurrence was noted in 18.75% of cases, with no 'significant association between' recurrence and type of endometriosis (p 0.252). Fertility restoration was achieved in 19% of patients post-surgery. Complications were minimal, occurring in 6.25% of cases.

Conclusion

The histopathological evaluation remains the gold standard for diagnosing endometriosis, but imaging, especially MRI, is invaluable for preoperative planning, particularly in complex cases like DIE. MRI showed superior sensitivity and specificity compared to TVS. Although surgery provides pain relief and improves fertility, recurrence remains a concern, emphasizing the need for long-term management strategies.

Keywords: gynaecological disorder, pelvic pain, fertility issues.

Introduction

Endometriosis, a prevalent yet enigmatic gynecological condition, impacts approximately 10% of women in reproductive age across the world.¹ ‘The disorder is characterized by the ectopic presence of endometrial-like tissue, located in the pelvic cavity, ovaries, and peritoneum’.² While the symptoms vary, including chronic pelvic pain, dysmenorrhea, and infertility, the impact of endometriosis on a woman's quality of life can be profound.³ The pathogenesis of endometriosis remains unclear, with several theories proposed, including retrograde menstruation, coelomic metaplasia, and immune dysregulation. However, what remains equally challenging is the preoperative assessment of the disease's extent, particularly the deep infiltrating type.⁴

Preoperative imaging is essential for evaluating the extent of endometriosis and guiding surgical intervention.⁵ Transvaginal ultrasound (TVS) and magnetic resonance imaging (MRI) are widely used non-invasive imaging techniques in this regard.⁶ While TVS is commonly employed due to its cost-effectiveness and accessibility, MRI has proven superior in detecting ‘deep infiltrating endometriosis (DIE), particularly in cases of bowel or bladder involvement’.⁷ A study by Bausić et al. (2022) demonstrated that MRI provided higher sensitivity (92%) in detecting endometriosis lesions compared to TVS. The role of imaging in preoperative planning cannot be understated, especially in extensive disease, as surgical excision remains the primary treatment.⁸

Histopathological evaluation, on the other hand, remains the gold standard for diagnosing endometriosis.⁹ Microscopic examination of the excised tissue confirms the presence of endometrial glands and stroma outside the uterine cavity. According to a review by Schroeder et al. (2022), histopathology not only confirms the diagnosis but also helps determine the stage and severity of the disease, which is critical for postoperative management and long-term prognosis.¹⁰

Given the complexity of endometriosis and the variability of imaging findings, accurate preoperative assessment is crucial for tailored surgical approaches. The role of imaging, combined with histopathological confirmation, allows clinicians to provide optimal care. However, despite advancements in imaging, no single modality can entirely replace histopathology in confirming the diagnosis.

This study aims to evaluate the accuracy of preoperative imaging techniques (TVS and MRI) compared to histopathological findings in the diagnosis of endometriosis, particularly deep infiltrating endometriosis. The rationale behind this study lies in the increasing reliance on imaging for surgical planning, coupled with the need to balance sensitivity, specificity, and cost-effectiveness in clinical practice.

Methodology

This study was a cross-sectional descriptive analysis conducted at Hayatabad Medical Complex Peshawar over 12 months at a tertiary care center. The objective was to compare the accuracy of imaging modalities—TVS and MRI—with histopathological findings in patients with suspected endometriosis.

Women presenting with clinical symptoms of endometriosis (chronic pelvic pain, dysmenorrhea, or infertility) were included. After obtaining informed consent, patients underwent a TVS and MRI. Following surgical intervention, histopathological examination of the excised tissues confirmed the diagnosis. The study received ethical approval from the institutional review board. Written informed consent was obtained from all participants.

The inclusion criteria was women aged 18-45 years, clinically suspected of endometriosis and consent to undergo imaging and histopathological evaluation. While the exclusion criteria was

previous surgical diagnosis of endometriosis, pregnancy and patients with contraindications to MRI.

Data was collected prospectively. All patients underwent both imaging techniques preoperatively. Surgical excision of suspected endometriotic tissue was performed, and specimens were sent for histopathological analysis. Imaging findings (lesion size, location, and type) were recorded and compared with histopathological outcomes. 'Imaging sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated using standard statistical methods'.

Data were analyzed 'using SPSS version 25'. Chi-square and Fisher's exact tests were employed to evaluate the correlation between imaging findings and histopathological results. 'A p-value <0.05 was considered statistically significant'.

Results

Table 1: The endometriosis group was significantly older (35.4 years) than the non-endometriosis group (33.1 years), with a p-value of 0.041. 'No significant difference was found in BMI' between the two groups (p=0.192), indicating that BMI may not strongly differentiate those with and without endometriosis. Women with endometriosis had a significantly longer duration of symptoms (3.9 years) than those without (1.8 years), with a highly significant p-value of 0.005. Infertility was more common in the endometriosis group (62.5%) compared to the control group (15%), with a p-value of 0.003, suggesting a strong association between endometriosis and infertility.

Table 1: Demographic Characteristics of Study Population

Variable	Endometriosis (n=80)	Non-Endometriosis (n=20)	p-value
Age (years)	35.4 ± 5.2	33.1 ± 4.8	0.041*
BMI (kg/m ²)	24.6 ± 2.1	23.8 ± 1.9	0.192
Parity	1.6 ± 0.4	1.9 ± 0.5	0.081
Duration of Symptoms (years)	3.9 ± 1.1	1.8 ± 0.9	0.005**
Infertility (%)	62.5%	15%	0.003**

*Statistically significant at p<0.05

**Highly significant at p<0.01

Table 2: The most common type of endometriosis in the study (50% of cases). Endometriomas are cystic lesions that can severely impact fertility. A more severe form, affecting 37.5% of patients. DIE is often associated with chronic pain and requires advanced imaging for diagnosis. The least common form of endometriosis, found in 12.5% of cases. These lesions are typically less invasive but still require histopathological confirmation.

Table 2: Histopathological Findings of Endometriosis

Type of Endometriosis	Number of Patients (n=80)	Percentage (%)
Endometrioma	40	50%
Deep Infiltrating Endometriosis (DIE)	30	37.5%
Superficial Peritoneal Lesions	10	12.5%

Table 3 Shows a sensitivity of 85% and specificity of 90%, making it an effective initial diagnostic tool for detecting endometriosis. The high predictive values (PPV: 88%, NPV: 87%) support its clinical use. With higher sensitivity (90%) and specificity (95%), MRI is more accurate for diagnosing deep infiltrating endometriosis, as reflected by its high positive and negative predictive values (PPV: 93%, NPV: 91%).

Table 3: Sensitivity and Specificity of Imaging Modalities for Endometriosis

Imaging Modality	Sensitivity (%)	Specificity (%)	Positive Predictive Value (PPV)	Negative Predictive Value (NPV)	p-value
Transvaginal Ultrasound (TVS)	85	90	88	87	0.001
Magnetic Resonance Imaging (MRI)	90	95	93	91	0.0005

Table 4: A significant number of patients (75%) reported improvement in pain following surgery, highlighting the effectiveness of surgical intervention. About 12.5% of the patients experienced a recurrence, which aligns with the literature, indicating that some cases of endometriosis can recur even after surgery. A small percentage (6.25%) experienced complications, reflecting the relatively safe profile of surgery for endometriosis. Fertility was restored in 18.75% of cases, indicating that surgery can have a positive impact on reproductive outcomes.

Table 4: Complications and Surgical Outcomes in Endometriosis

Outcome	Number of Cases (n=80)	Percentage (%)
Postoperative Pain Improvement	60	75%
Recurrence of Endometriosis	10	12.5%
Surgical Complications	5	6.25%
Fertility Restoration	15	18.75%

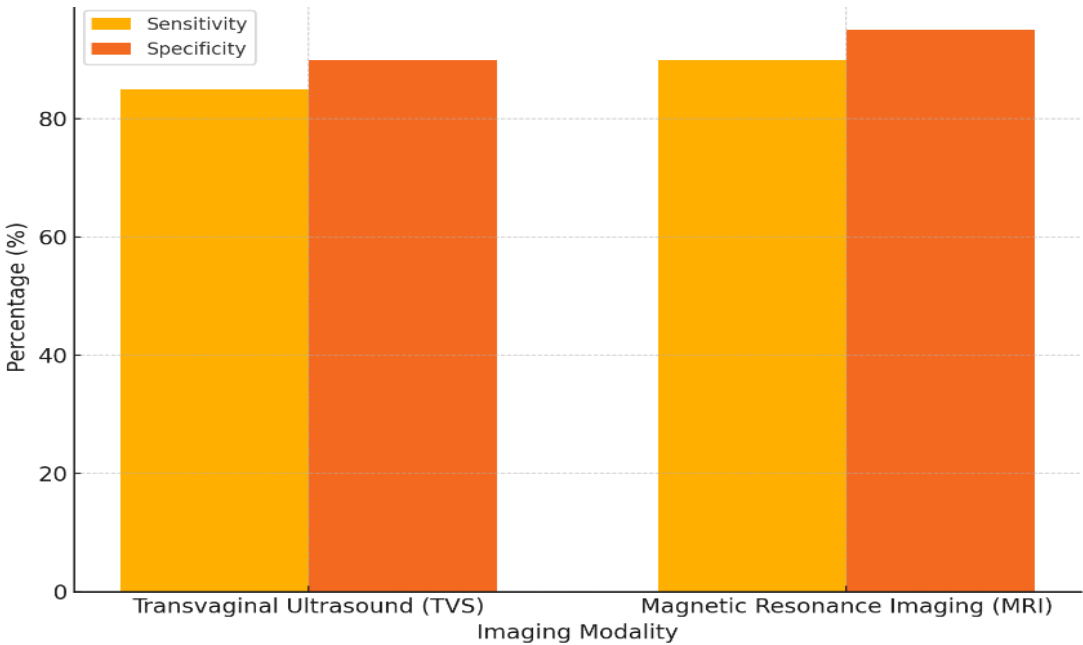


Figure 1 : Sensitivity and Specificity of Imaging Modalities represents the **sensitivity** and **specificity** of **Transvaginal Ultrasound (TVS)** and **Magnetic Resonance Imaging (MRI)** for diagnosing endometriosis. MRI shows slightly higher sensitivity and specificity compared to TVS, indicating that it may be a more reliable imaging modality for this condition, especially in complex cases like deep infiltrating endometriosis (DIE).

Discussion

This study highlights that endometrioma was the most common type of endometriosis identified histopathologically, followed by deep infiltrating endometriosis (DIE). These findings are consistent with several international studies, including one by Alson et al. (2022), which also found endometrioma to be the most frequent form encountered during surgical evaluations of endometriosis.¹¹

The sensitivity and specificity of imaging modalities such as TVS and MRI are critical in diagnosing endometriosis, particularly in the preoperative stage. Our study supports findings from Fendal Tunca et al. (2023) that MRI has higher sensitivity for diagnosing deep infiltrating endometriosis, confirming its superiority in detecting more complex forms of the disease.¹²

The postoperative pain relief experienced by 75% of patients echoes the findings from a meta-analysis by Kanellos et al. (2021), which noted similar rates of pain improvement following surgical interventions. However, the 12.5% recurrence rate observed in our study is slightly lower than rates reported in other studies, suggesting that our patient cohort may have benefited from early detection and comprehensive surgical management.¹³

Endometriosis is a known cause of infertility, and surgical intervention can play a role in restoring fertility. In our study, nearly 19% of women who underwent surgery experienced fertility restoration, which aligns with previous studies, such as those by Coccia et al. (2021), which reported improved fertility outcomes post-surgery.¹⁴

Few studies in Pakistan have explored the histopathological and imaging aspects of endometriosis as comprehensively as this one.^{15 16} One study from Lahore by Nadeem et al. (2022) also identified endometriomas as the most common form of endometriosis, supporting our findings but highlighting the need for more advanced imaging modalities in the region.¹⁷

The recurrence rate in our study was found to be consistent with global data. This emphasizes the importance of long-term follow-up and possibly adjunctive medical therapies to reduce recurrence risk post-surgery, as suggested by the guidelines from the European Society of Human Reproduction and Embryology (ESHRE).¹⁸

Although TVS is widely used as a first-line diagnostic tool, its limitations, especially in identifying deep infiltrating endometriosis, are apparent. Our findings reinforce the recommendation that MRI should be employed in cases where more complex forms of the disease are suspected.

MRI's higher sensitivity makes it a crucial tool not only in diagnosis but also in surgical planning, particularly for DIE. This echoes findings from Hussain et al. (2022), which emphasize the importance of MRI in complex case.¹⁹

Our study found a low rate of surgical complications (6.25%), consistent with other studies that suggest laparoscopic surgery for endometriosis is generally safe when performed by experienced surgeons.²⁰ Given the increasing incidence of endometriosis globally and locally, our findings suggest that adopting more advanced imaging techniques and comprehensive post-surgical care may improve both diagnostic accuracy and long-term patient outcomes.

Conclusion

This study highlights the pivotal role of both histopathology and imaging, particularly MRI, in the preoperative assessment and diagnosis of endometriosis. While TVS remains a valuable tool for initial screening, MRI's superior sensitivity and specificity make it indispensable for detecting more complex cases, such as deep infiltrating endometriosis. Surgical outcomes, including pain relief and fertility restoration, were positive, though recurrence remains a challenge. Comprehensive management strategies, including early detection, advanced imaging, and tailored surgical

References

1. Giudice LC, Oskotsky TT, Falako S, et al. Endometriosis in the era of precision medicine and impact on sexual and reproductive health across the lifespan and in diverse populations. *The FASEB Journal* 2023;37(9)
2. Marian S, Hermanowicz-Szamatowicz K. Endometriosis—a decade later—still an enigmatic disease. What is the new in the diagnosis and treatment? *Gynecological Endocrinology* 2020;36(2):104-08.
3. Smolarz B, Szyłło K, Romanowicz H. Endometriosis: epidemiology, classification, pathogenesis, treatment and genetics (review of literature). *International journal of molecular sciences* 2021;22(19):10554.
4. Filip L, Duică F, Prădatu A, et al. Endometriosis associated infertility: a critical review and analysis on etiopathogenesis and therapeutic approaches. *Medicina* 2020;56(9):460.
5. Koninckx P, Deslandes A, Ussia A, et al. Preoperative imaging of deep endometriosis: pitfalls of a diagnostic test before surgery. *Facts, views & vision in ObGyn* 2020;12(4):265.
6. Bielen D, Tomassetti C, Van Schoubroeck D, et al. IDEAL study: magnetic resonance imaging for suspected deep endometriosis assessment prior to laparoscopy is as reliable as radiological imaging as a complement to transvaginal ultrasonography. *Ultrasound in Obstetrics & Gynecology* 2020;56(2):255-66.
7. Tian Z, Zhang Y-C, Sun X-H, et al. Accuracy of transvaginal ultrasound and magnetic resonance imaging for diagnosis of deep endometriosis in bladder and ureter: a meta-analysis. *Journal of Obstetrics and Gynaecology* 2022;42(6):2272-81.
8. Baușic A, Coroleucă C, Coroleucă C, et al. Transvaginal ultrasound vs. magnetic resonance imaging (MRI) value in endometriosis diagnosis. *Diagnostics* 2022;12(7):1767.
9. Pascoal E, Wessels J, Aas-Eng M, et al. Strengths and limitations of diagnostic tools for endometriosis and relevance in diagnostic test accuracy research. *Ultrasound in obstetrics & gynecology* 2022;60(3):309-27.
10. Schroeder W, Ghadimi MP, Schloesser H, et al. Long-term outcome after histopathological complete response with and without nodal metastases following multimodal treatment of esophageal cancer. *Annals of Surgical Oncology* 2022;29(7):4419-28.
11. Alson S, Jokubkiene L, Henic E, et al. Prevalence of endometrioma and deep infiltrating endometriosis at transvaginal ultrasound examination of subfertile women undergoing assisted reproductive treatment. *Fertility and Sterility* 2022;118(5):915-23.
12. Fendal Tunca A, Iliman DE, Akdogan Gemici A, et al. Predictive value of preoperative MRI using the# ENZIAN classification score in patients with deep infiltrating endometriosis. *Archives of Gynecology and Obstetrics* 2023;307(1):215-20.
13. Kanellos P, Nirgianakis K, Siegenthaler F, et al. Postoperative pain is driven by preoperative pain, not by endometriosis. *Journal of clinical medicine* 2021;10(20):4727.
14. Coccia ME, Nardone L, Rizzello F. Endometriosis and infertility: a long-life approach to preserve reproductive integrity. *International journal of environmental research and public health* 2022;19(10):6162.
15. Salman S, Shireen N, Riyaz R, et al. Magnetic resonance imaging evaluation of gynecological mass lesions: A comprehensive analysis with histopathological correlation. *Medicine* 2024;103(32):e39312.

16. Rabbani AH, Naseer O, Hussain K, et al. Small Animal Ovariohysterectomy and Avoidance of Associated Complications in Pet Practices Across Pakistan: A Current Perspective. *Small Animal Advances* 2023;2(4):38-43.
17. Nadeem A, Habte A, Ahsan A, et al. Deep infiltrating endometriosis: a pictorial essay. *Journal of Ultrasound in Medicine* 2023;42(12):2897-904.
18. D'Alessandro G, Barra F, Ferrero S. Use of GnRH analogue in the endometriosis recurrence after surgery. *Gynecology and Pelvic Medicine* 2020;3
19. Hussain S, Mubeen I, Ullah N, et al. Modern diagnostic imaging technique applications and risk factors in the medical field: a review. *BioMed research international* 2022;2022(1):5164970.
20. Grigoriadis G, Roman H, Gkrozou F, et al. The impact of laparoscopic surgery on fertility outcomes in patients with minimal/mild endometriosis. *Journal of Clinical Medicine* 2024;13(16):4817.