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REVIEW ARTICLE

Are sonographers the future ‘gold standard’ in the diagnosis of endometriosis?

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Abstract

Diagnosis of endometriosis has traditionally relied on laparoscopic surgery, which was considered the ‘gold standard’ diagnostic tool. This is not ideal as surgery carries risk, is expensive, is difficult to access, and disrupts patients work or education due to the recovery time needed. As such, imaging has been investigated as a potential method for non-invasive diagnosis, with transvaginal ultrasound showing high diagnostic accuracy for ovarian endometriomas and deep endometriosis. The advances in imaging capability led to recent international guidelines suggesting laparoscopy is no longer the ‘gold-standard’ for diagnosis and encouraging clinicians to utilise medical imaging as part of their diagnostic work-up for endometriosis. Imaging is emerging as not only a tool for planning endometriosis surgery but increasingly as the first approach for initial diagnosis. Given that transvaginal ultrasound is the primary imaging modality for assessment of gynaecological conditions, it is inevitable that sonographers will have a significant future role in endometriosis diagnosis. This moves away from endometriosis diagnosis being the exclusive realm of laparoscopic surgeons and increasingly involves medical imaging specialists. This review article will describe the origins of endometriosis ultrasound and the current capabilities of transvaginal ultrasound in this field. The expectations of sonographers in this evolving space will be explored, as well as recent novel research findings to gain insight into what the future of endometriosis diagnosis with ultrasound may look like.

KEYWORDS

diagnosis, endometriosis, sonographer, surgery, transvaginal ultrasound

1 | INTRODUCTION

Endometriosis is a complex, chronic condition, which typically arises within the pelvis. Defined as the presence of lesions similar to endometrial glands and stroma outside of the uterus,¹ it typically presents with chronic pelvic pain, dysmenorrhoea, dyspareunia, dyschezia and

abnormal bleeding.² The spectrum of symptoms however is broad, with less common symptoms such as fatigue, bloating and nausea reported.² In some cases, the condition will be completely asymptomatic. Latest Australian data suggests endometriosis affects as many as 1 in 7 women and people assigned female at birth,³ and the average Australian with endometriosis experiences a diagnostic delay of

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6.4 years.⁴ Endometriosis manifests in three ways; superficial endometriosis (SE), ovarian endometriosis (endometriomas) or deep endometriosis (DE), with the latter being the most severe and clinically challenging to manage.¹

Although not malignant and as such, often dismissed as a less serious disease, endometriosis can lead to severe complications such as infertility,² recurrent miscarriage,⁵ bowel obstruction,⁶ ureteric constriction leading to renal failure⁶ and mental health conditions such as depression.⁷ Furthermore, people with endometriosis experience higher rates of cancer,⁸ autoimmune conditions,⁹ and cardiovascular disease¹⁰ than those without endometriosis. As such, it is not surprising that people with endometriosis advocate against using the term 'benign' to describe the condition.¹¹

As there is currently no cure for endometriosis, all available therapies aim to provide symptomatic relief to improve quality of life. Laparoscopy surgery to excise lesions is a commonly employed therapy. However, given the risks associated with surgery, particularly repeated operations, and the high rates of recurrence reported after surgical procedures,¹² modern opinion suggests a more holistic approach to treatment involving excisional surgery along with medical (hormonal) treatments, pain management strategies as well as allied and complementary health techniques.¹³

The current consensus produced by the World Endometriosis Society (WES) suggests people with severe disease should be managed in centralised specialist endometriosis centres.¹³ In 2022, the Australian Federal Government initiated funding for 20 primary care facilities specialising in endometriosis management.¹⁴ Such centres will be extremely valuable to people with endometriosis and further heighten the need for reliable diagnostic tests to ensure timely triage to such services.

The aim of this review is to explore the origins, evolution, and current capabilities of transvaginal ultrasound (TVUS) for endometriosis. The expectations of sonographers in this changing space will be explored, as well as some exploration into emerging techniques within the literature to gain insight into what the future of endometriosis diagnosis with ultrasound may look like.

2 | THE ORIGINS AND EVOLUTION OF ENDOMETRIOSIS ULTRASOUND

Historically, diagnosis of endometriosis was only available through direct visualisation of the lesions (+/– histological confirmation) via laparoscopic surgery (Figure 1). Whilst this carries a high detection rate, surgery as a diagnostic test is not ideal due to cost and associated risks. Furthermore, surgery is invasive, and is disruptive to people's lives due to the need for time away from work or education to recover. In cases of DE, extensive adhesion of the pelvic organs, not discovered until the time of surgery, can make full visualisation and removal of the disease very challenging (Figure 2). This is particularly significant if the bowel or urinary tract are involved, as this requires an advanced laparoscopic surgeon along with a multidisciplinary surgical team to fully treat.¹⁵ Because of this, the typical standard of care

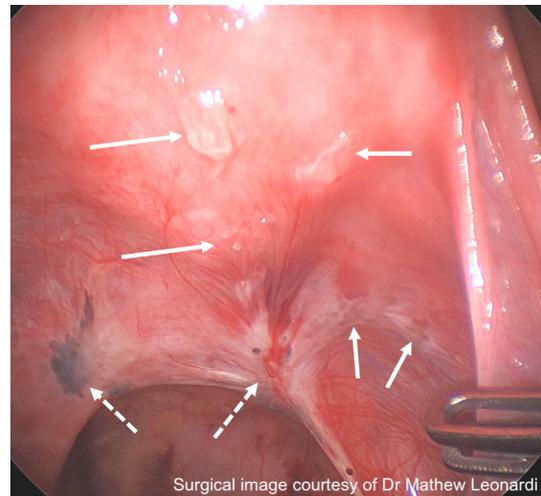


FIGURE 1 A laparoscopic image in which superficial and deep endometriosis exhibited. Superficial endometriosis (white arrows) can be seen lining the posterior uterine serosa and right pelvic sidewall. Deep endometriosis (dashed arrows) exhibited infiltrating both uterosacral ligaments.

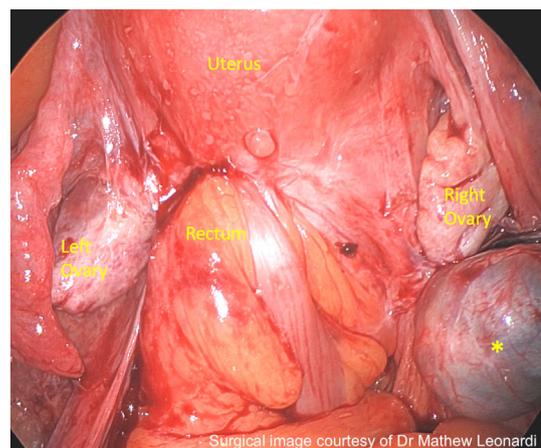


FIGURE 2 Laparoscopic image of severe endometriosis with obliteration of the pouch of Douglas. The bowel is specifically tethered to left uterosacral ligament and torus uterinus. The ovaries are normal appearing but affected by adhesions. A right paratubal cyst is also noted (*).

historically, when severe DE was discovered at diagnostic laparoscopy, was to abandon the procedure and perform a second surgery, once a suitable team could be established.¹⁵

Early in the twenty-first century, reports began appearing within published literature as to the utility of TVUS for the detection of pelvic endometriosis.¹⁶ The objective of TVUS in this early work was detecting DE prior to surgery, avoiding the need to perform multiple surgeries and reduce the number of laparoscopies being performed. After many years of research and refinement of the technique, multiple diagnostic test accuracy studies (DTAs), which have been synthesised into systematic reviews and meta-analyses have been published in the literature.^{17–21} In 2016, the International Deep Endometriosis Analysis (IDEA) group published their consensus paper

TABLE 1 The systematic, four-step approach as proposed by the International Deep Endometriosis Analysis (IDEA) consensus to perform transvaginal ultrasound for the detection of endometriosis including the anatomy assessed in each step. For further clarity, we have separated the fourth step into two parts.

Step	Assessment performed	Pathology detected
1	Uterus and ovaries	<ul style="list-style-type: none"> • Adenomyosis • Ovarian endometriomas
2	Ovarian mobility and site-specific tenderness	<ul style="list-style-type: none"> • Ovarian adhesions • Sites of tenderness which may indicate endometriosis
3	Uterine sliding sign	<ul style="list-style-type: none"> • Obliteration of the pouch of Douglas
4a	Anterior compartment <ul style="list-style-type: none"> • Bladder • Ureters • Vesicouterine space 	<ul style="list-style-type: none"> • Nodules of deep endometriosis within the anterior compartment
4b	Posterior compartment <ul style="list-style-type: none"> • Posterior vaginal wall • Uterosacral Ligaments • Rectosigmoid colon • Pouch of Douglas • Rectovaginal septum 	<ul style="list-style-type: none"> • Nodules of deep endometriosis within the posterior compartment

outlining the systematic approach which sonographers can utilise to perform a scan to detect DE (Table 1).²² The method proposed by the IDEA consensus is based on extensive literature from the decade up to 2016 and has since been validated.²³ Examples of endometriosis as it appears on TVUS can be seen in Figures 3 and 4.

From its initial origins as a tool to help reduce the incidence of repeated surgeries, endometriosis transvaginal ultrasound (eTVUS) has now evolved into a means of providing a non-surgical diagnosis of endometriosis, delivering validation of suffering to patients.²⁴ This change has likely been motivated by the high prevalence of the disease and its significant diagnostic delay, along with opening a pathway to non-surgical therapy as is becoming more frequent. Additionally, laparoscopy is by no means a perfect diagnostic tool. Multiple studies have highlighted that the 'gold standard' of laparoscopy is not faultless.^{25–27} In addition to the potential risks outlined previously, there is also the risk of false negative results due to subperitoneal lesions that may be occult at laparoscopy, and a false negative histopathologic result if disease has undergone surgical diathermy during the laparoscopy.²⁴ In addition, from a health economics perspective, there are significant costs with diagnostic laparoscopy, which can be reduced if non-invasive diagnostic options are available.²⁸

Due to the factors outlined above, a substantial change in diagnostic algorithms for endometriosis occurred in 2022 when the European Society for Human Reproduction and Endocrinology (ESHRE) endometriosis guideline²⁹ was updated to state that laparoscopy is no longer considered the 'gold standard' in the diagnosis of endometriosis. Instead, it is now suggested that imaging (whether eTVUS or magnetic resonance imaging [MRI]), be part of the diagnostic work up and that if that imaging reveals endometriosis, surgery is not required to confirm the diagnosis. It is explicitly stated within these guidelines however, that a negative imaging examination does not exclude endometriosis.²⁹

3 | LATEST LITERATURE AND TRANSLATION INTO THE CURRENT EXPECTATION OF AUSTRALASIAN SONOGRAPHERS IN THEIR CLINICAL PRACTICE

Early studies into eTVUS typically used inconsistent terminology and descriptors which made comparing studies and pooling results difficult.¹⁷ Since the publication of the IDEA consensus, most modern-day DTAs now utilise IDEA methodology in their ultrasound assessments.^{23,30–32} This shift both benefits our understanding of the research, as direct comparisons of studies are now simpler but has also allowed for refinement of the technique, which will translate into clearer understanding of the expectations of sonographers implementing these techniques. A comprehensive eTVUS, as proposed by the IDEA consensus, involves assessing the uterus and ovaries, as per a routine TVUS, as well as an assessment of the ovarian mobility, site specific tenderness, the uterine 'sliding sign', the anterior pelvic compartment (bladder, ureters and vesicouterine space) and posterior pelvic compartment (rectosigmoid colon, uterosacral ligaments (USLs), rectovaginal septum, pouch of Douglas (POD) and posterior vaginal wall) (Table 1).²² An example of how this is performed can be seen in Video S1. Many systematic reviews and meta-analyses have been performed on this subject confirming high levels of diagnostic accuracy for the assessment of the structures of the anterior and posterior compartment.^{17–21,33} When performed confidently, and in a systematic manner, eTVUS has been shown to exhibit sensitivities and specificities 88% and 96% for rectosigmoid endometriosis,³⁴ 94% and 96% for POD obliteration,³⁵ and 83%–100% and 100% for the uterosacral ligaments.³⁶ In the years following publication of the IDEA consensus, literature has emerged proposing the assessment of additional anatomical structures such as the parametrium³⁷ and the sacral nerve roots,³⁸ signifying that a comprehensive eTVUS may, in the future, become an even more detailed examination than that required today.

In addition to diagnostic accuracy, prevalence of disease per location has been reported within the literature, consistently showing DE to be detected on eTVUS most commonly within the USLs, ovaries (endometriomas) and rectosigmoid colon,^{23,32,36,39} which is in keeping with established beliefs from older literature.⁴⁰ This is helpful for sonographers who are upskilling to perform eTVUS for several reasons. Firstly, focus can be placed on first learning to assess these structures, which means that even if confidence has not been gained in all aspects of a comprehensive eTVUS, sonographers can be confident they are likely to detect disease, if present, by focusing on the most affected structures. If more disease is suspected, further referral to an expert sonographer or sonologists could then occur to both provide the patient with a complete examination and potentially, provide valuable feedback to sonographers during the upskilling phase.

It is not clear what exactly the expectation of Australian sonographers is regarding performing eTVUS currently. Despite international guidelines advocating for eTVUS for the diagnosis of endometriosis,²⁹ the Australasian guidelines for the performance of gynaecological ultrasound do not currently suggest routine inclusion of an

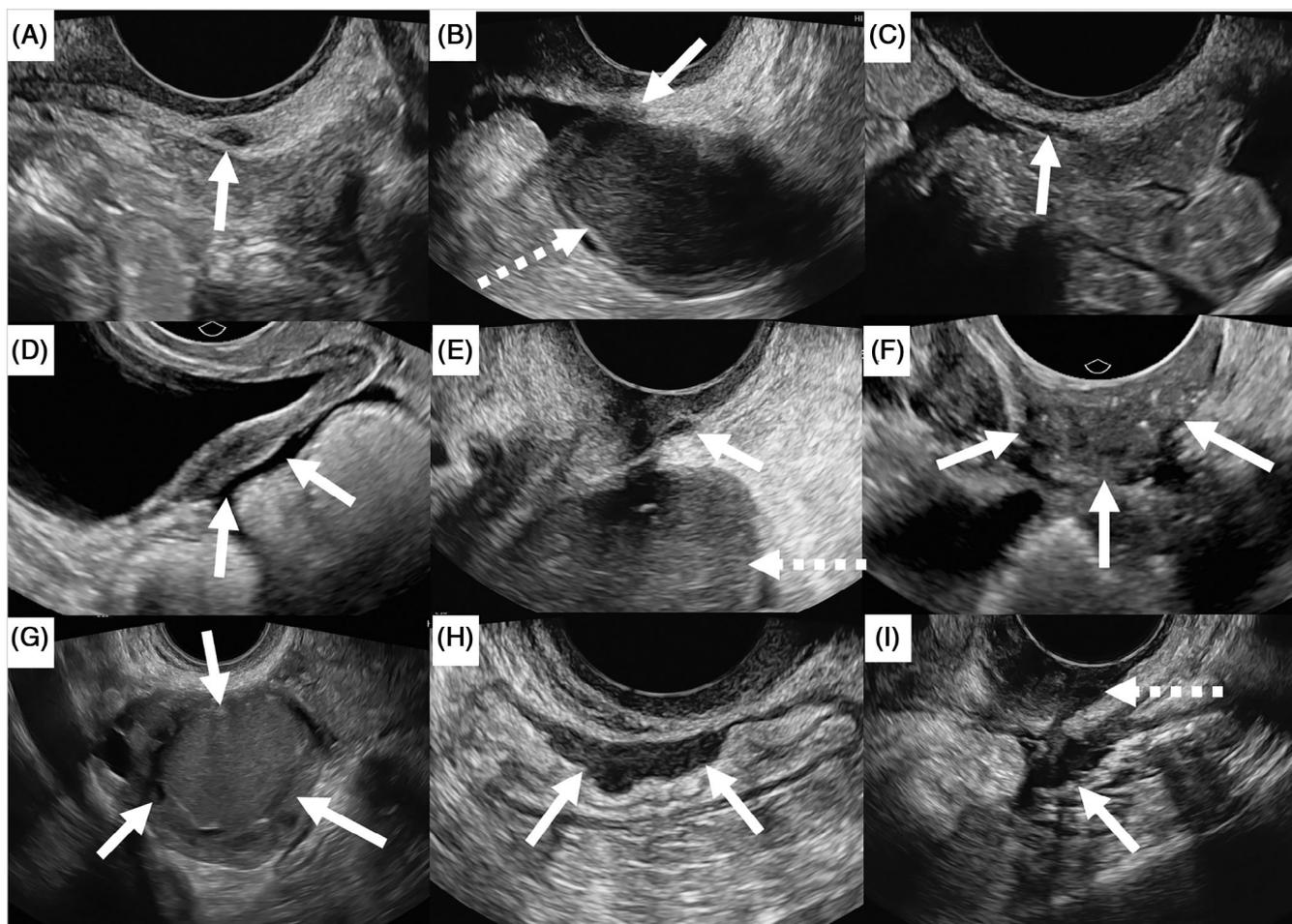


FIGURE 3 Various example of deep endometriosis as it can appear on transvaginal ultrasound at various anatomical locations as demonstrated by the white arrows. (A) Left uterosacral ligament nodule. (B) Left uterosacral ligament nodule. Note how this nodule is abutting an endometrioma within the left ovary (dashed arrow). (C) Right uterosacral ligament disease. (D) Bladder nodule presenting as fusiform thickening within the posterior bladder wall. (E) A small nodule within the pouch of Douglas abutting the posterior vaginal wall. (F) A large nodule within the posterior vaginal fornix. (G) An ovarian endometrioma showing the classic appearance of a unilocular cystic lesion containing ‘ground-glass’ internal echoes. (H) A nodule of endometriosis within the rectosigmoid colon. (I) A nodule of endometriosis which is adherent to a nodule of endometriosis within the posterior vaginal fornix (dashed arrow) sonographically presenting as a diablo lesion.

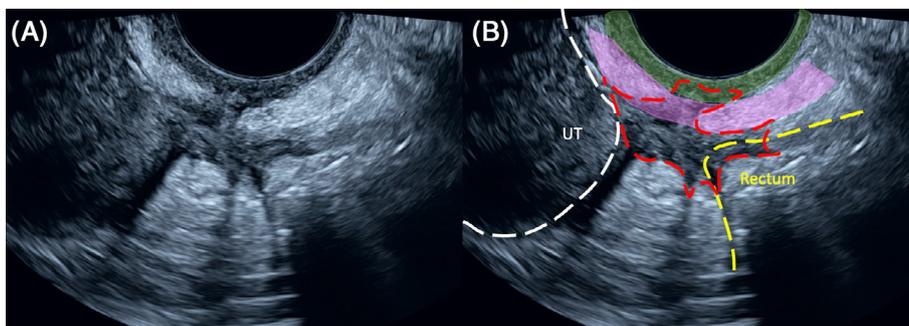


FIGURE 4 A transvaginal ultrasound image of a nodule of deep endometriosis originating within the right uterosacral ligament (A). Deep endometriosis will often infiltrate into surrounding anatomical structures. In this case, this lesion can be seen infiltrating into the vaginal wall, rectum and adhering to the uterus. Image (B) is the same image marked up to highlight the relevant anatomy. The nodule is demarcated with the red dashed line. Green = posterior vaginal wall, pink = uterosacral ligament, yellow dashed line = anterior rectal wall and white dashed line = uterine serosa.

assessment of the anterior and posterior compartment for endometriosis, although it is stated that this can be done if needed.⁴¹ Currently in Australia, eTVUS is not available in all imaging centres and typically, patients must present to specialised practices to access eTVUS.^{42,43} As most published DTAs to date come from specialised endometriosis centres, with high prevalence of disease, it is unclear what the level of diagnostic accuracy is when eTVUS is performed within the general imaging setting, where prevalence of disease is lower and imaging is performed by sonographers who may not be specialists in endometriosis.^{17,32} As such, questions still remain as to whether scanning for endometriosis will be a technique which should be performed within general ultrasound departments, or whether it is best placed in specialised practices.¹⁷ Indeed, the current Australasian Competency Framework for sonographers lists scanning for endometriosis as an advanced skill in gynaecological ultrasound, rather than a core skill for all sonographers performing gynaecological ultrasound.⁴⁴ It has been demonstrated that obstetrics and gynaecology focused sonographers were able to perform eTVUS with comparable levels of diagnostic accuracy to those produced in specialised endometriosis centres.³² Although no published DTAs exists to show the accuracy achieved by general sonographers in the general radiology setting, it is the opinion of the authors that, given the high-level of education and skill Australian sonographers possess, eTVUS is a technique which all sonographers can achieve with adequate training. For instance, most general sonographers can perform fetal morphology scans, which are extremely technically complex, in a community setting to a high standard. Furthermore, some promoters of eTVUS have advocated for the inclusion of an endometriosis assessment into all TVUS examinations.⁴⁵ Given that Leonardi et al.⁴⁶ reported 28% of people presenting for gynaecological ultrasound, in a low-risk community, had symptoms suggestive of endometriosis and Chaggar et al.⁴⁷ reported 19% of people presenting to a gynaecology clinic had endometriosis visible on TVUS, the argument for eTVUS, or at least key elements of it, to become the routine gynaecological ultrasound examination is strong.

Implementing eTVUS into routine sonographic practice is not without its challenges. Firstly, performing eTVUS requires sonographers and radiologists to increase their skills and build upon their clinical knowledge, which may be lacking in endometriosis, given it has not been a large part of imaging historically. Thankfully, many freely accessible educational resources exist to aid in the upskilling on imaging professionals, such as 'How To' articles by Fang et al.⁴⁸ and Leonardi et al.⁴⁹ Furthermore, several studies have shown the learning curve associated with eTVUS to be achievable within a reasonable number of scans,⁵⁰⁻⁵² although this does differ between individual learners.⁵³ A limitation of these studies however is that they have all been conducted within specialised settings. As yet, no learning curve studies have been conducted within general imaging environments. It is reasonable to assume that the learning curve for those exposed to less disease would be longer than those who encounter endometriosis frequently. Given the highly dynamic nature of an eTVUS examination, it does not fit well into our established method of performing ultrasound in Australia in which sonographers capture still images for radiologists or sonologists to review offline. A solution to this has

been proposed by Young et al.⁵⁴ in the form of a protocol specifically for sonographer-acquired eTVUS which can be reported offline by radiologist. Additionally, when learning any new skill, receiving feedback is an essential part of the learning process which can be challenging if individual practices do not have staff members with enough experience to act as mentors for others.

Implementing eTVUS adds additional time to the examination. It has been shown that eTVUS takes, on average, 70% longer to perform than routine TVUS.⁴² As there is currently no additional remuneration from Medicare for performing eTVUS,⁵⁵ this additional time allocation may be cost prohibitive in some centres, especially those not charging gap payments. It has been suggested however, that changes could be made to gynaecological ultrasound protocols to reallocate time to an endometriosis assessment, by removing mandatory protocol inclusions with lower clinical value, such as routine kidney imaging in the general population⁵⁶ or extensive transabdominal scanning.⁴² It ought to be noted however, that while scanning the kidneys in every patient has been shown within the literature to be superfluous,⁵⁶ if DE is detected on TVUS, extending the scan to assess the kidneys for hydronephrosis is recommended as per the IDEA consensus to screen for ureteric compromise.²² In addition to the skill and knowledge progression of professionals, referring clinicians must also learn about the value of eTVUS and how it can be utilised in their care plan for patients, and evidence suggests there is still low awareness amongst gynaecologists about the value of eTVUS for endometriosis diagnosis,⁵⁷ although this is improving. These challenges, highlighted above, need to be addressed to expand access to this technique and allow more people with endometriosis to access a sonographic diagnosis.

4 | THE ROLE OF ULTRASOUND ALONGSIDE OTHER IMAGING TECHNIQUES SUCH AS MRI

TVUS is the first-line tool in the investigation of gynaecological pathologies. When it comes to endometriosis, MRI is the other imaging modality which has been shown within literature to have high diagnostic value for endometriosis.^{31,33,58-60} A 2016 Cochrane review into imaging methods for endometriosis from Niesenblat et al.³³ reported the diagnostic accuracy of MRI to be comparable to that of eTVUS. To obtain this level of diagnostic accuracy however, the correct sequences to maximise endometriosis detection must be performed and the radiologist reading the MRI must be experienced and skilled in pelvic imaging and endometriosis. If they are not, the diagnostic accuracy will likely be reduced because, unsurprisingly, just as ultrasound is an operator dependant modality, MRI is dependent on the skill of the reader to attain high diagnostic accuracy.⁶¹

In 2022, Medicare rebates for gynaecological MRI became available for Australians.⁵⁵ This funding however is limited to specific clinical indications, such as suspected DE, known uterine masses and failed in-vitro fertilisation cycles. Furthermore, this rebate can only be claimed once in a two-year period and, to be eligible for a rebate, the

MRI must be referred by a gynaecologist rather than a general practitioner.⁵⁵ By contrast, the rebates for ultrasound have no such restrictions (although there is no rebate specifically for eTVUS).⁵⁵ Given the second-line nature of MRI as an imaging modality for endometriosis, it is important to think of MRI as a means of complementing, not replacing eTVUS. Berger et al.⁶² reported that routinely adding MRI after eTVUS to the diagnostic work-up of endometriosis did not add value and as such, if a sonographer can perform a high-quality eTVUS, an MRI is generally unnecessary. The addition of an MRI to the diagnostic work-up of suspected endometriosis may be beneficial for cases in which eTVUS could not be completed or was suboptimally diagnostic due to limitations (such as large fibroids limiting views). One clear advantage of MRI over eTVUS is in cases of suspected extra pelvic endometriosis due to its extended field of view.⁶²

5 | LIKELY FUTURE DEVELOPMENTS OF ULTRASOUND IN THE DIAGNOSIS OF ENDOMETRIOSIS

5.1 | Superficial endometriosis (SE)

Ultrasound for the diagnosis of endometriosis has, until recently, been confined to the diagnosis of DE and endometriomas, with the detection of SE reliant on non-specific soft markers²² with poor diagnostic accuracy.^{32,63} In 2020 however, Leonardi et al.⁶⁴ were able to accurately detect SE lesions directly within the POD sonographically. They did this through artificially infusing saline into the POD through the uterus and fallopian tubes (a technique they named 'sonoPODography'), enabling the lesions to be seen protruding into the fluid.

Although this technique is not feasible in routine sonographic practice, in 2023 Pedrassani et al.⁶⁵ built upon this work to demonstrate sonographic detection of SE with the presence of physiological fluid in the POD by scanning during menses or the luteal phase of the menstrual cycle. In the clinical experience of the authors of this paper, detection of SE sonographically by utilising physiological fluid in the pelvis is very achievable (Figure 5). Although the few DTAs regarding sonographic detection of SE are single-centre studies, and all are yet to be validated, it is our opinion that sonographic detection of SE is achievable in clinical practice, if scanning is performed during the luteal phase of the menstrual cycle when physiological free fluid is likely to be present. Future studies further expanding on the works published to date regarding SE are needed which can then guide clinical practice for diagnosis of this subtype of endometriosis. If further studies confirm the findings of these early works, in the future, this will probably become an expectation during eTVUS examinations although, it is unlikely that any imaging test in isolation will ever be able to rule out SE.

5.2 | Elastography

As elastography measures tissue stiffness, there exists potential that this could be beneficial in the assessment of endometriosis, which overtime, causes fibrotic change to tissue.² Currently, only a few studies have investigated elastography in relation to endometriosis, however a systematic review by Brunelli et al.⁶⁶ revealed elastography has a high sensitivity and specificity for DE. Although there is currently insufficient evidence to know the exact clinical benefit, elastography could be a future advance in the diagnosis of endometriosis and

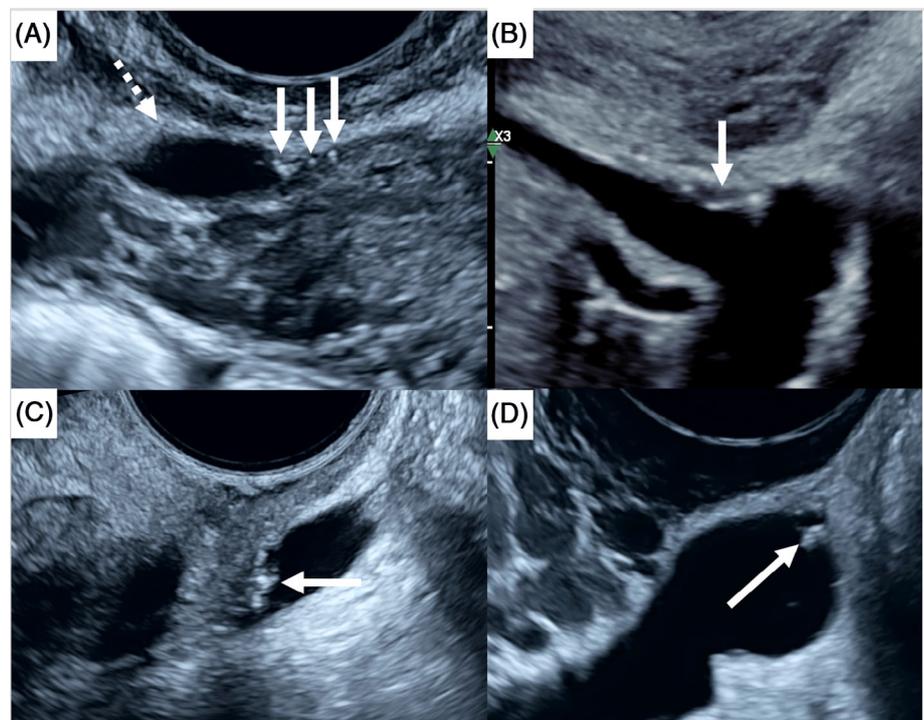


FIGURE 5 Examples for superficial endometriosis as they appear sonographically. (A) A cystic lesion on the anterior/right surface of the uterus (dashed arrow) with a subtle adjacent area of isoechoic tissue contain echogenic foci (solid arrows). Echogenic foci are a typical feature of superficial endometriosis on ultrasound. (B) A hypoechoic lesion arising from the surface of the peritoneum in the pouch of Douglas, again with associate echogenic foci. (C and D) Echogenic projections seen from the peritoneum in the pouch of Douglas protruding into the physiological free fluid (D).

future research is needed to guide how elastography may assist in the diagnosis of endometriosis.

5.3 | Artificial intelligence (AI)

No discussion of the future of sonographic practice would be complete without a mention of the role of artificial intelligence (AI). Reports of AI in the detection of endometriosis with ultrasound are at this stage, limited. Maicas & Leonardi et al.⁶⁷ reported high diagnostic accuracy when using a deep learning technique (Resnet(2 + 1)D) to detect POD obliteration from videos of the sonographic 'sliding sign'. Further work by Balica et al.⁶⁸ found an accuracy of 80% when augmenting endometriosis analysis from ultrasound with deep learning, although it is unclear exactly how this was achieved. This study was further limited by the very small data set ($n = 100$) used in this study.

Guerriero et al.⁶⁹ assessed the diagnostic accuracy of multiple machine learning algorithms in detecting rectosigmoid endometriosis, by analysing several indirect signs which may be detected on routine gynaecological ultrasound studies. This work is very preliminary in nature and, most importantly, was not able to replicate the accuracy of an experienced ultrasound expert. It is worth noting that these studies are all based on a relatively small sample sizes from single centres only. As a result, there may be limitations regarding the generalisability of these AI models, with external validation involving larger data sets needed. Furthermore, there is currently no discussion on how these AI models could fit into the workflow of a sonographer. It is likely however that in the future, AI analysis of 'big data' will be playing a much larger role diagnostic prediction. Future research further investigating AI will guide what exactly this role is.

6 | CONCLUSION

The utility of eTVUS has evolved over the last two decades from a surgical planning instrument to a wide-spread diagnostic tool, with contemporary guidelines suggesting a move away from laparoscopic diagnosis towards imaging for the purpose providing a diagnosis of endometriosis. Given the role of TVUS as the first-line imaging modality for gynaecological conditions, it is inevitable that sonographers will play key role in endometriosis diagnosis into the future. However, there are challenges which exist in learning the skills required to perform eTVUS and implementing eTVUS into general sonography practice as outlined within this review.

As imaging professionals, if we can rise to these challenges and expand ultrasound diagnosis, this will reduce health costs, complex pain and infertility complications and the morbidity of surgery, whilst optimising care and facilitating treatment options for people suffering with endometriosis.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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QUESTIONNAIRE

A24(25)

Are sonographers the future 'gold standard' in the diagnosis of endometriosis?

INSTRUCTIONS

- Read through the article and answer the multiple-choice questions provided below.
- **Some questions may have more than one correct answer;** in which case you must mark **all** the correct answers.

Abstract

Question 1: While diagnosis of endometriosis has traditionally relied on laparoscopic surgery, there were disadvantages to this method. Which of the following is **NOT TRUE** about the surgery involved?

Surgery:

- A:** Carries risk
- B:** Is inexpensive
- C:** Is difficult to access
- D:** Disrupts patients work or education due to the recovery time needed

Introduction

Question 2: Endometriosis is which of the following?

- A:** Complex
- B:** Temporary
- C:** Not typically within the pelvis
- D:** Defined as the presence of lesions

Question 3: Which of the following are less common symptoms with which endometriosis can present?

- A:** Abnormal bleeding
- B:** Fatigue
- C:** Chronic pelvic pain
- D:** Dysmenorrhoea
- E:** Bloating

Question 4: Which of the following ways in which endometriosis manifests is the most severe and clinically challenging to manage?

- A:** Endometriosis(SE)
- B:** Ovarian endometriosis (endometriomas)
- C:** Deep endometriosis(DE)

The origins and evolution of endometriosis ultrasound

Question 5: The objective of transvaginal ultrasound (TVUS) early in the twenty-first century was **NOT** which of the following?

- A:** Avoiding the need to perform multiple surgeries
- B:** To increase the number of laparoscopies being performed
- C:** Detecting DE prior to surgery

Question 6: Endometriosis transvaginal ultrasound (eTVUS) has now evolved from its initial origins into which of the following?

Mark all correct options.

- A:** A tool to help reduce the incidence of repeated surgeries
- B:** A means of providing a non-surgical diagnosis of endometriosis
- C:** A means to validate suffering of patients

Latest literature and translation into the current expectation of Australasian sonographers in their clinical practice

Question 7: Which of the following is proposed by the International Deep Endometriosis Analysis (IDEA) consensus to be done as per a **routine** TVUS?

- A:** An assessment of the ovarian mobility
- B:** Site specific tenderness
- C:** Assessing the uterus and ovaries
- D:** The uterine 'sliding sign'
- E:** The anterior pelvic compartment

Question 8: When performed confidently, and in a systematic manner, eTVUS has been shown to exhibit sensitivities and specificities of for rectosigmoid endometriosis.

- A:** 94% and 96%
- B:** 83%–100%
- C:** 88% and 96%
- D:** 100%

Question 9: Is it **TRUE** that sonographers and radiologists need to increase their skills and build upon their clinical knowledge before Implementing eTVUS into routine sonographic practice?

- A: YES
- B: NO

The role of ultrasound alongside other imaging techniques, such as MRI

Question 10: To obtain a level of diagnostic accuracy for the Magnetic resonance imaging(MRI) to be comparable to that of eTVUS, which of the following is pivotal?

- A: The correct sequences to maximise endometriosis detection
- B: The skill of the reader to attain high diagnostic accuracy

Likely future developments of ultrasound in the diagnosis of endometriosis

Question 11: Which of the following has been achieved by artificially infusing saline into the Pouch of Douglas (POD) through the uterus and fallopian tubes?

- A: The diagnosis of DE and endometriomas, with the detection of SE reliant on non-specific soft markers
- B: Accurate and direct detection of endometriosis lesions

Question 12: Is it **TRUE** or **FALSE** that there exists potential that elastography, by measuring tissue stiffness, could be beneficial in the assessment of endometriosis?

- A: TRUE
- B: FALSE

Question 13: The diagnostic accuracy of multiple machine learning algorithms in detecting rectosigmoid endometriosis which may be detected on routine gynaecological ultrasound studies was assessed by

- A: *Maicas & Leonardi et al*
- B: *Balica et al*
- C: *Guerriero et al*

Conclusion

Question 14: Given the role of TVUS as the first-line imaging modality for gynaecological conditions, is it **TRUE** that sonographers will play a key role in endometriosis diagnosis in future?

- A: YES
- B: NO

Question 15: Imaging professionals can expand ultrasound diagnosis and reduce which of the following?

- A: The morbidity of surgery
- B: Optimising care
- C: The facilitating of treatment options for persons suffering with endometriosis
- D: Complex pain and infertility complications
- E: Health costs

THE END



MEMBER INFO

(Complete sections marked with an asterisk *)

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I hereby declare that the completion of this document is my own effort without any assistance.

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DATE:

This activity is accredited for **THREE (3) CLINICAL** CEU'S. You have to achieve **70%** to pass this activity.

ANSWER SHEET

A24(25)

Are sonographers the future 'gold standard' in the diagnosis of endometriosis?

	*Time spent on activity						hour					min				
	A	B	C	D	E		A	B	C	D	E	A	B	C	D	E
1						9										
2						10										
3						11										
4						12										
5						13										
6						14										
7						15										
8																

How relevant was the content of this activity to your scope of practice?			
			
Not at all	Somewhat	Mostly	Extremely

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