

Luteal phase transvaginal scan examinations have better diagnostic potential for showing focal subendometrial adenomyosis

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Abstract The objective of this preliminary observational study was to monitor changes in focal cystic and non-cystic subendometrial lesions reminiscent of adenomyosis seen during the luteal phase of the cycle by repeating transvaginal ultrasound scan examinations during the follicular phase. Five patients who presented with abnormal uterine bleeding with or without dysmenorrhoea showed such lesions, following luteal phase transvaginal scanning. All lesions became smaller and less conspicuous, or an indeterminate endometrial/myometrial interface was seen in the suspected areas during the follicular phase. Midcycle scanning of one patient showed enhancement of the irregular subendometrial area, but still without reaching the same size, or attaining an echogenic pattern as seen during the initial luteal phase examination. We hypothesise that luteal phase transvaginal scan examinations of the uterus may have better potential for diagnosing focal subendometrial adenomyosis than follicular phase scanning. This is because of the echogenic characteristics of a secretory endometrium relative to the neighbouring inner myometrium. More work is needed to verify these findings and to test our hypothesis.

Keywords Focal adenomyosis · Luteal ultrasound · Endometrial myometrial junction

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Background

Adenomyosis is a common cause of abnormal uterine bleeding and menstrual pain. Both magnetic resonance imaging (MRI) and transvaginal ultrasound scanning (TVS) have been used for its diagnosis, and had good correlation to the histological examination results. However, MRI findings are less observer-dependent than TVS, but still rely on the experience of the MRI observer in gynaecological imaging [1]. Furthermore, findings could fluctuate in response to hormonal changes [2]. Selective hysteroscopic resection could be helpful to remove lesions up to 3-mm deep in patients presenting with excessive uterine bleeding [3]. To facilitate such resection, accurate pre surgical localisation of these lesions is essential. Trans-abdominal uterine biopsy performed with an ultrasound-directed biopsy gun had 100% accuracy in diagnosing myometrial disease [4]. This is in contrast to blind myometrial needle biopsies, which showed very low sensitivity for the diagnosis of subendometrial adenomyosis, even with multiple biopsies as reported by Brosens and Barker [5]. Two random myometrial biopsies picked 2.3% of adenomyotic lesions within the inner third of the myometrium, and eight biopsies were only 9.0% sensitive for diagnosing similar lesions as shown by the same authors. MRI proved to be very sensitive in this respect. It could show diffuse or focal thickening of the junctional zone, punctate foci of high-signal intensity, and ill-defined areas of low-signal intensity in the myometrium on T2-weighted imaging [2]. However, MRI is not readily available in many developing countries, and when present, services are usually prioritised to deal with more urgent medical and surgical problems. Even within the independent sector, the fees for having MRI examination are usually prohibitively high. Accordingly, efforts should be

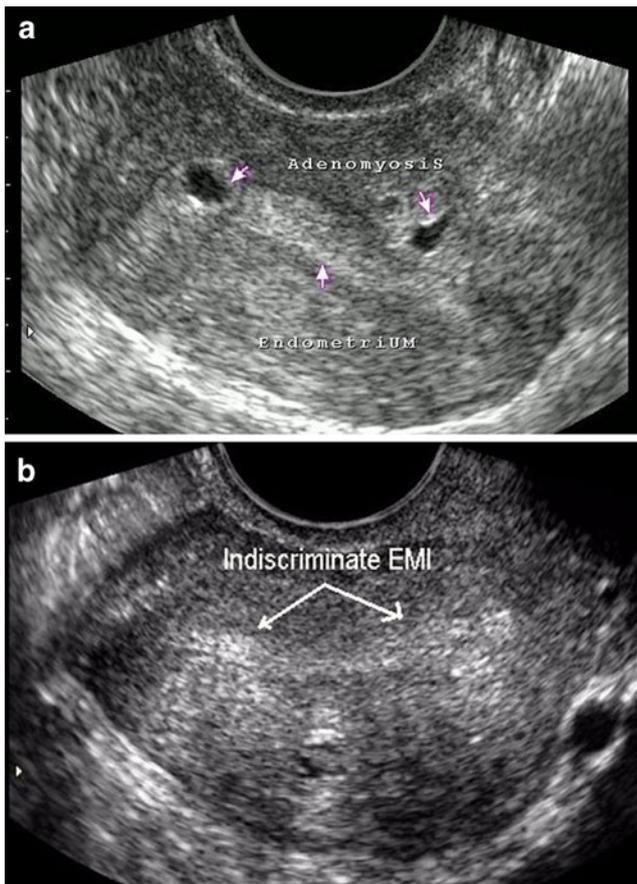


Fig. 1 **a** Shows an oblique transvaginal ultrasound scan view of a uterus during the luteal phase. Subendometrial cysts with echogenic margins are seen on the right side and in front of the left edge of a similarly echogenic endometrium. **b** Shows a similar view of the same specimen depicted in **a**. It reveals indiscriminate EMI during the early follicular phase. The cystic areas with echogenic margins seen in **a** are no longer visible

made to improve the accuracy of ultrasound scanning, which is the natural first-choice imaging technique for investigation of abnormal uterine bleeding and pelvic pain. This would also help with accurate selection of the right sites for needle biopsies, or hysteroscopic resection, when indicated. This is especially so as ultrasound machines are more readily available and cheaper to use than MRI for that purpose. The objective behind this observational study was to monitor changes in focal subendometrial lesions reminiscent of adenomyosis seen during the luteal phase of the cycle, by repeating the scan examinations during the follicular phase.

Method

Five patients who showed subendometrial focal lesions reminiscent of adenomyosis during luteal phase transvaginal ultrasound scan examinations were re-examined

during the follicular phase. Changes in the size and echotexture of the focal lesions were noted. All patients had their initial scan because of recent episodes of abnormal uterine bleeding, with or without painful menstruation. There was no evidence of endometrial polyps or intracavitary uterine fibroids.

Findings

Luteal phase transvaginal ultrasound scan examination showed echogenic endometrium in all five cases, with subendometrial cysts with echogenic margins or non-cystic echogenic lesions reminiscent of focal adenomyosis. This picture was represented by Figs. 1a, 2a, 3a and 4a in four different patients. Follow-up scans during the follicular phase showed diminution in the size or loss of these subendometrial lesions in all cases. Instead, the lesions were represented by indiscriminate EMI or by small

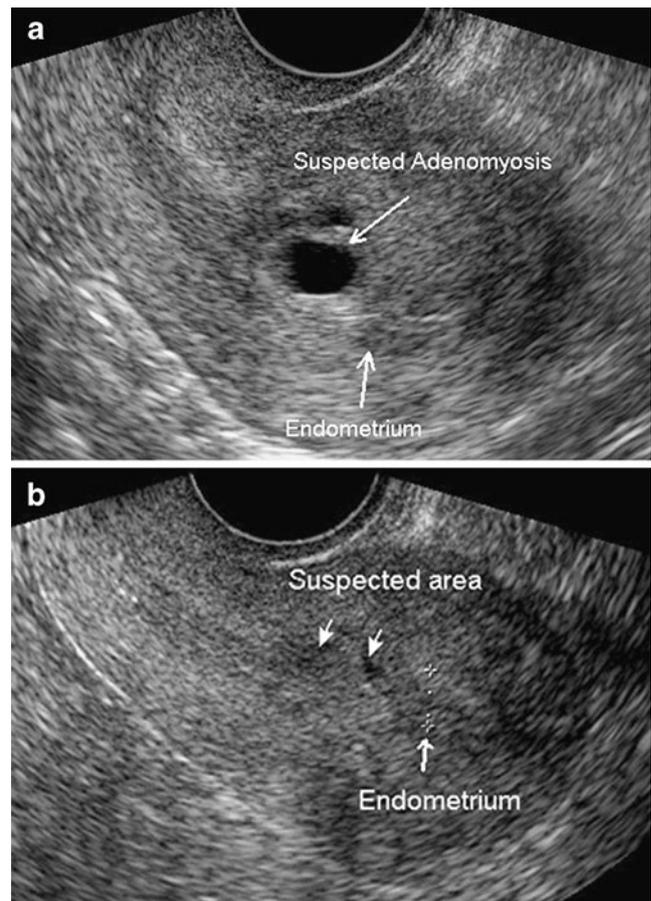


Fig. 2 **a** Shows an anterior/posterior transvaginal ultrasound view of a uterus with a large hypoechoic cyst with an echogenic margin in front of the endometrial echo. Examination was done during the late luteal phase of the cycle. **b** Shows an early follicular phase ultrasound picture of the same specimen depicted in **a**. The abnormal cystic area is represented by indiscriminate EMI marked by two arrows

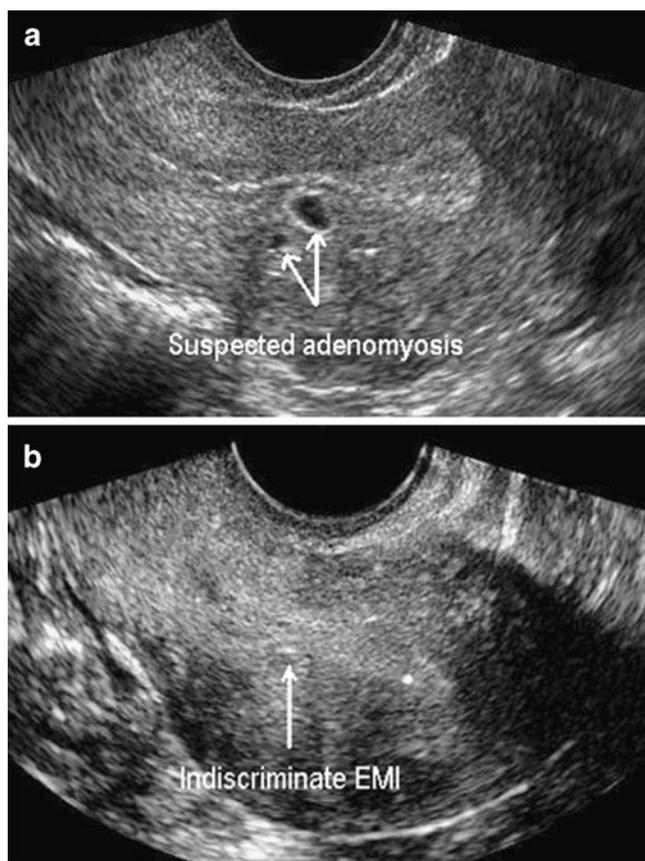


Fig. 3 **a** Image is an anterior/posterior view of a uterus showing subendometrial cysts with echogenic margin in the posterior uterine wall during the luteal phase of the cycle. **b** Image is a similar ultrasound view to the one shown in **a**. It shows early follicular phase indiscriminate EMI and disappearance of the cystic subendometrial lesions depicted in **a**

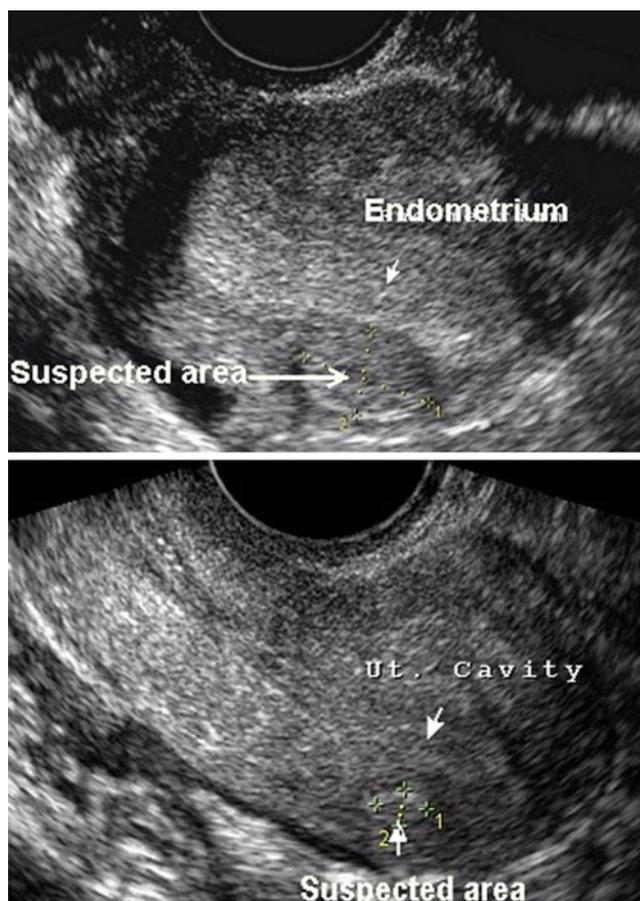


Fig. 4 **a** Shows an oblique view of a uterus during the luteal phase with 14.8×8.6 mm circumscribed area of similar texture and echogenicity to the overlying and adjacent endometrium, reminiscent of adenomyosis. **b** Shows early follicular phase anterior/posterior ultrasound picture of the same uterus depicted in **a**. The size of the suspected adenomyotic area shown in **a** is reduced to 5.3×3.8 mm

irregular areas, as seen in Figs. 1b, 2b, 3b and 4b respectively. Midcycle scanning of one patient showed enhancement of the irregular subendometrial area, but still without reaching the same size, or attaining an echogenic pattern as seen during the initial luteal phase examination. 3D rendering of the uterus during the luteal phase in the fifth patient revealed fundal adenomyotic striations which were not shown by the 2D sagittal or axial views, as shown in Fig. 5.

Discussion

In a histologically verified ultrasound study, Kepkep et al. 2007 [6] found subendometrial linear striations, myometrial cysts and globular appearance of the uterus had very high accuracy for the diagnosis of adenomyosis. Subendometrial linear striations were the most specific sonographic feature (95.5%), and had the highest positive predictive value (80.0%). However, they stressed the point that transvaginal scan examination was more useful in excluding than

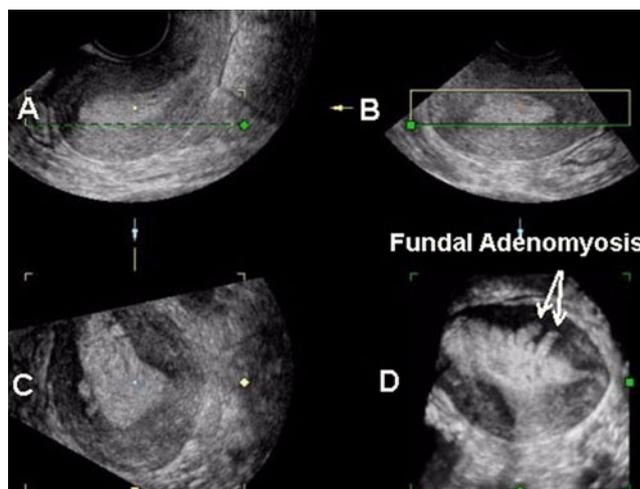


Fig. 5 Shows multiplanar views of a uterus with luteal phase echogenic endometrium. Sections *A* and *B* represent sagittal and axial views of the uterus, respectively and show no evidence of endometrial incursions into the myometrium. Fundal adenomyotic lesions are shown in section *D*, which is a rendered 3D view of the same uterus

confirming the diagnosis, as the negative and positive predictive values were 84.4% and 55.3% respectively. A higher negative predictive value of 96% for transvaginal scan examination was reported previously by Reinhold et al. in 1996 [7]. These authors found 2–6 mm myometrial cysts in 46% of the patients with histologically diagnosed adenomyosis. More important, none of the patients who proved histologically free from adenomyosis showed any myometrial cysts on presurgical transvaginal scan examination.

In this preliminary study, we used a reversed strategy, by following well-defined subendometrial cystic lesions with echogenic margins and non-cystic echogenic lesions seen during the luteal phase, to ascertain their echotexture and size during the follicular phase of the cycle. All lesions became less conspicuous, or an indeterminate EMI was seen instead in the affected area. Since an echogenic endometrium is a luteal phase ultrasound characteristic, it is expected that luteal phase scanning would be more sensitive to reveal areas of intramural echogenic endometrial growth or cystic areas with echogenic margins, against the non-echogenic inner myometrium, compared to examinations performed at other times of the cycle. Variations in the echotexture of these subendometrial lesions during the different phases of the cycle could be a factor in explaining the differences in the quoted statistical accuracy of ultrasound scanning in diagnosing adenomyosis, depending when the scans were performed. When available, 3D ultrasonography could help in making the diagnosis especially with fundal lesions which were not shown by routine 2D scanning, as shown in Fig. 5. With all this in mind, we put forward a hypothesis that scanning the uterus during the luteal phase might reveal focal subendometrial lesions reminiscent of adenomyosis and help with the diagnosis in patients presenting with abnormal uterine bleeding and inconclusive follicular phase ultrasound results. This could add to the diagnostic value of ultrasonography taking into account the very high specificity of both cystic and non-cystic lesions, and the high negative predictive value of ultrasound scanning [6, 7]. Alternative methods to help with the diagnosis in such cases are either too expensive (MRI), insensitive (hysteroscopy) or unavailable in certain areas. In agreement with a statement made by Margit and Erik in 2007 [1], MRI would be needed only

when transvaginal ultrasound scan examination gives indefinite findings and in difficult cases with coexisting other uterine abnormalities. .

Conclusion

Focal cystic and non-cystic subendometrial lesions reminiscent of adenomyosis were detected more readily during luteal rather than follicular phase transvaginal ultrasound scanning in this small study. More work is needed to verify this finding and to test our hypothesis regarding the value of luteal phase transvaginal scanning of the uterus in the diagnosis of focal subendometrial adenomyosis. Positive findings would improve the accuracy of needle biopsies for histological diagnosis, and facilitate hysteroscopic resection when indicated. This is especially important in countries where MRI is not readily available or too expensive to afford.

Declaration of interest The authors report no conflicts of interest.

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