

Diagnostic Accuracy of Ultrasound in the Diagnosis of Adenomyosis

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ABSTRACT

Aim and background: There is no reliable method to diagnose adenomyosis preoperatively. Recently, ultrasound has been suggested as a method to diagnose adenomyosis. The purpose of this study was to find out the accuracy of ultrasound in the diagnosis of adenomyosis. The objective of the study was to find the diagnostic accuracy of various features mentioned in morphological uterus sonographic assessment (MUSA) criteria by ultrasonography.

Materials and methods: Patients undergoing hysterectomy for abnormal uterine bleeding over 12 months underwent the study. A transvaginal ultrasound was done preoperatively to diagnose adenomyosis using MUSA criteria. Postoperatively, histopathology was done to diagnose adenomyosis. All parameters mentioned in the MUSA criteria were analyzed to find the sensitivity and specificity of MUSA criteria in diagnosing adenomyosis.

Results: Among the MUSA criteria, the highest sensitivity was for sunray appearance (80.85%) and asymmetrical thickening of the myometrium (80.85%). The highest specificity was for subendometrial lines (96.55%), translesional vascularity (93.10%), and hyperechoic islands (93.10%).

Conclusion: Among the MUSA criteria, sunray appearance and asymmetrical thickening of myometrium are very sensitive markers of adenomyosis.

Clinical significance: The MUSA criteria are a good marker for diagnosing adenomyosis preoperatively.

Keywords: Adenomyosis, Classification, Morphological uterus sonographic assessment criteria transvaginal ultrasonography.

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INTRODUCTION

Adenomyosis is a common clinical problem and diagnosis suspected in women presenting with dysmenorrhea, pelvic pain and menorrhagia. Clinically, it is suspected when the uterus is regularly enlarged and sometimes tender on palpation.¹ Though adenomyosis has been typically reported in women 40–60 years of age now, it is increasingly seen in younger taxwomen.² It is essential to diagnose this, as it has a bearing on fertility. The incidence of adenomyosis in women undergoing hysterectomy ranges from 5 to 70%.³ It is challenging to diagnose adenomyosis from preoperative history and examination. Ultrasound has been increasingly used to diagnose Adenomyosis. The sensitivity of ultrasound to diagnose adenomyosis varied from 50 to 80% and specificity from 57 to 97%.^{4,5} Recently, the morphological uterus sonographic assessment (MUSA) has been used to diagnose adenomyosis by ultrasound. Morphological uterus sonographic assessment criteria include myometrial cysts, hyperechogenic islands, echogenic sub-endometrial lines, asymmetrical thickening, globular uterus, fan-shaped shadowing, translesional vascularity, irregular junctional zone and interrupted junctional zone.⁶ The purpose of this study was to find out the accuracy of MUSA criteria for diagnosing adenomyosis.

MATERIALS AND METHODS

This prospective observational study was undertaken at Kasturba Medical College, Manipal, India. Ethical committee clearance was obtained from the university (IEC2/487/2022), and the study was registered under CTRI (CTRI/2023/04/051340). The study was done over a period of 12 months. Patients with more than 3 cm of fibroids were excluded from this study. All women undergoing Hysterectomy underwent transvaginal sonography by a senior

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Gynecologist. The scan was done to find out the features of adenomyosis as defined by the MUSA criteria-myometrial cysts, hyperechogenic islands, echogenic subendometrial lines, asymmetrical thickening, globular uterus, fan-shaped shadowing, translesional vascularity, irregular junctional zone and interrupted junctional zone. After hysterectomy, the specimen was sent for histopathology. Analysis was done to determine the correlation between the findings on ultrasonography and the postoperative histopathological diagnosis of adenomyosis. The data analysis in the study was conducted using SPSS V24.0. Apple Pages V13.2 and Apple Numbers V13.2 were utilized to create graphs and tables. The threshold for statistical significance was established at a 5% level, implying that a *p*-value below 0.05 was considered statistically significant. Sensitivity and specificity were calculated.

RESULTS

Altogether, there were 105 patients. Of the 17 cases that had features of adenomyosis on the scan, there was no adenomyosis

(false positive) on the final histopathological examination. 13 cases had no features of adenomyosis on the scan, but had adenomyosis on examination (false negative) (Table 1). Among the MUSA criteria, the highest sensitivity was for sunray appearance (80.85%) and asymmetrical thickening of the myometrium (80.85%) (Table 2). The highest specificity was for sub-endometrial lines (96.55%), translesional vascularity (93.10%) and hyperechoic islands (93.10%) (Table 3). Poorly defined endo myometrial junction had the highest diagnostic accuracy (83.81%).

DISCUSSION

Adenomyosis is a common finding in the histopathological examination of specimens after hysterectomy. However, there is no good way to diagnose adenomyosis preoperatively. Morphological uterus sonographic assessment criteria are now being used to diagnose adenomyosis. Our study aims to determine the accuracy of ultrasound findings in MUSA criteria for diagnosing adenomyosis. We did a survey to assess the sensitivity and specificity of each parameter defined by the MUSA criteria for diagnosing adenomyosis. Before the implementation of MUSA criteria, criteria used to diagnose adenomyosis were nonspecific, and one study reported a sensitivity of 84%, and specificity of 44% to diagnose adenomyosis.⁷ In a structured meta-analysis Tellum et al. found a

very high sensitivity of 74% and specificity of 76% when ultrasound was used to diagnose adenomyosis.⁸

Some of the criteria described in MUSA are not specific to adenomyosis. Myometrial cysts may be seen in degenerated fibroids. Fan-shaped shadowing can occur in fibroids. Irregular or interrupted endometrial junction can be seen in endometrial cancer. There is a lack of studies on different criteria used in adenomyosis to diagnose adenomyosis. This study was done to determine the sensitivity of various criteria in MUSA to diagnose adenomyosis. In a prospective study, the most typical finding associated with adenomyosis was asymmetrical myometrial thickness.⁹ A study by Exacoustos et al., myometrial cysts were the most specific finding in diagnosing adenomyosis. The most sensitive finding was heterogeneous myometrium.¹⁰ Andres et al. in a meta-analysis found the highest sensitivity for heterogeneous myometrium and the highest specificity for a poor junctional zone for diagnosing adenomyosis.¹¹ Sun YL reported the highest sensitivity for sub-endometrial lines in diagnosing adenomyosis.¹² In a prospective study, globular uterus, sub-endometrial linear striations and myometrial cysts were associated with a diagnosis of adenomyosis.¹³ In our study, we found that among the MUSA criteria the highest sensitivity was sunray appearance (80.85%) and asymmetrical thickening of the myometrium (80.85%). The highest specificity was for sub endometrial lines (96.55%), translesional vascularity (93.10%) and hyperechoic islands (93.10%) (Table 3). Poorly defined endometrial-myometrial junctions had the highest diagnostic accuracy (83.81%).

CONCLUSION

Sunray appearance and asymmetrical thickening of the myometrium are the most sensitive markers of adenomyosis. Sub-endometrial lines, translesional vascularity, and hyperechoic islands are the

Table 1: Adenomyosis on TVS and histopathology

| TVS adenomyosis | Histopathologically proved Adenomyosis | | |
|-----------------|--|----|-------|
| | Yes | No | Total |
| Yes | 34 | 17 | 51 |
| No | 13 | 41 | 54 |
| Total | 47 | 58 | 105 |

Table 2: Comparison of each diagnostic parameter in MUSA criteria

| Variable | Adenomyosis n = 47 | | No adenomyosis n = 58 | | Z-statistic | p-value |
|--|--------------------|--------------------|-----------------------|--------------------|-------------|----------|
| | Observed n (%) | Not observed n (%) | Observed n (%) | Not observed n (%) | | |
| Poorly maintained endometrial lining | 9 (19.15%) | 38 (80.85%) | 6 (10.34%) | 52 (89.66%) | 1.26 | 0.2076 |
| Sunray appearance | 38 (80.85%) | 9 (19.15%) | 18 (31.03%) | 40 (68.97%) | 5.31 | <0.00001 |
| Globular uterus | 33 (70.21%) | 14 (29.79%) | 11 (18.97%) | 47 (81.03%) | 5.40 | <0.00001 |
| Sub endometrial lines | 28 (59.97%) | 19 (40.43%) | 2 (3.45%) | 56 (96.55%) | 6.40 | <0.00001 |
| Asymmetrical thickening of myometrium | 38 (80.85%) | 9 (19.15%) | 18 (31.03%) | 40 (68.97%) | 5.31 | <0.00001 |
| Poorly defined endomyometrial junction | 36 (76.60%) | 11 (23.40%) | 6 (10.34%) | 52 (89.66%) | 7.01 | <0.00001 |
| Translesional vascularity | 25 (53.19%) | 22 (46.81%) | 3 (5.17%) | 55 (94.83%) | 5.55 | <0.00001 |
| Myometrial cysts | 22 (46.81%) | 25 (53.19%) | 2 (3.45%) | 56 (96.55%) | 5.37 | <0.00001 |
| Hyperechoic islands | 23 (48.94%) | 24 (51.06%) | 2 (3.45%) | 56 (96.55%) | 5.55 | <0.00001 |

Table 3: Sensitivity, specificity, negative predictive value and positive predictive value (NPV, PPV) of various parameters in MUSA criteria

| Variable | Sensitivity | Specificity | PPV | NPV | Accuracy |
|--|-------------|-------------|--------|--------|----------|
| Poorly maintained endometrial lining | 19.15% | 89.66% | 60.00% | 57.14% | 57.14% |
| Sunray appearance | 80.85% | 68.97% | 67.86% | 81.36% | 74.29% |
| Globular uterus | 70.21% | 81.03% | 75.00% | 77.05% | 76.19% |
| Subendometrial lines | 59.57% | 96.55% | 93.33% | 74.67% | 80.00% |
| Asymmetrical thickening of myometrium | 80.85% | 68.97% | 67.86% | 81.63% | 74.29% |
| Poorly defined endomyometrial junction | 76.60% | 89.66% | 85.71% | 82.54% | 83.81% |
| Translesional vascularity | 53.19% | 94.83% | 89.29% | 71.43% | 76.19% |
| Myometrial cysts | 46.81% | 93.10% | 84.62% | 68.35% | 72.38% |
| Hyperechoic islands | 48.94% | 93.10% | 85.19% | 69.23% | 73.33% |



most specific areas for diagnosing adenomyosis. Poorly defined endo myometrial junctions had the highest diagnostic accuracy.

Clinical Significance

Morphological uterus sonographic assessment criteria is a practical investigation to diagnose adenomyosis preoperatively in cases of suspected adenomyosis.

REFERENCES

1. Aloudek C, Norris HJ. Mesenchymal tumors of the uterus. In: RJ Kurman, (Ed). Blaunstein's Pathology of the Female Genital Tract, New York: Springer-Verlag; 2002. pp. 487–527.
2. Puente JM, Fabris A, Patel J, et al. Adenomyosis in infertile women: Prevalence and the role of 3D ultrasound as a marker of severity of the disease. *Reprod Biol Endocrinol* 2016;14(1):60. DOI: 10.1186/s12958-016-0185-6.a.
3. Bergholt T, Eriksen L, Berendt N, et al. Prevalence and risk factors of Adenomyosis at Hysterectomy. *Hum Reprod* 2001;16(11):2418–2421. DOI: 10.1093/humrep/16.11.2418.
4. Fedele L, Bianchi S, Dorta M, et al. Transvaginal ultrasonography in the diagnosis of diffuse Adenomyosis. *Fertil Steril* 1992;58(1):94–97. PMID: 1624029.
5. Reinhold C, McCarthy S, Bret PM, et al. Diffuse Adenomyosis: Comparison of endovaginal US and MR imaging with histopathologic correlation. *Radiology* 1996;199(1):151–158. DOI: 10.1148/radiology.199.1.8633139.
6. Van den Bosch T, de Bruijn AM, de Leeuw RA, et al. Sonographic classification and reporting system for diagnosing Aadenomyosis. *Ultrasound Obstet Gynecol* 2019;53(5):576–582. DOI: 10.1002/uog.19096.
7. Hanafi M. Ultrasound diagnosis of adenomyosis, leiomyoma, or combined with histopathological correlation. *J Hum Reprod Sci* 2013;6(3):189–193. DOI: 10.4103/0974-1208.121421.
8. Tellum T, Nygaard S, Lieng M. Noninvasive diagnosis of adenomyosis: A structured review and meta-analysis of diagnostic accuracy in imaging. *J Minim Invasive Gynecol* 2020;27(2):408–418.e3. DOI: 10.1016/j.jmig.2019.11.001.
9. Pinzauti S, Lazzeri L, Tosti C, et al. Transvaginal sonographic features of diffuse adenomyosis in 18–30-year-old nulligravid women without endometriosis: Association with symptoms. *Ultrasound Obstet Gynecol* 2015;46(6):730–736. DOI: 10.1002/uog.14834.
10. Exacoustos C, Brienza L, Di Giovanni A, et al. Adenomyosis: Threedimensional sonographic findings of the junctional zone and correlation with histology. *Utrasound Obstet Gynaecol* 2011;37(4): 71–79. DOI: 10.1002/uog.8900.
11. Andres MP, Borrelli GM, Ribeiro J, et al. Transvaginal ultrasound for the diagnosis of adenomyosis: Systematic review and metanalysis. *J Minim Invasive Gynaecol* 2018;25(2):257–264. DOI: 10.1016/j.jmig.2017.08.653.
12. Sun YL, Wang CB, Lee CY, et al. Transvaginal sonographic criteria for the diagnosis of Adenomyosis based on histopathologic correlation. *Taiwan J Obstet Gynecol* 2010;49(1):40–44. DOI: 10.1016/S1028-4559(10)60007-1.
13. Kepkep K, Tuncay YA, Goynümer G, et al. Transvaginal sonography in the diagnosis of Adenomyosis: Which findings are most accurate? *Ultrasound Obstet Gynecol* 2007;30(3):341–345. DOI: 10.1002/uog.3985.