Open Access

Original Article

Does Ultrasound Feature of Morbidity Adherent Placenta Give Us a Lead to Decide a Uterine Salvage Surgery

Uzma Urooj, Asifa Siraj*, Mahpara Tariq*, Sumaira Khan, Shaheera Akram*, Shazia Afzal

Department of Obstetrics & Gynecology, Combined Military Hospital, Rawalpindi/National University of Medical Sciences (NUMS) Pakistan,
*Department of Obstetrics & Gynecology, Pak Emirates Military Hospital, Rawalpindi/National University of Medical Sciences (NUMS) Pakistan

ABSTRACT

Objective: To correlate and confirm the ultrasonography diagnosis of placenta accreta spectrum with surgical findings.
Study Design: Cross-sectional study.
Place and Duration of Study: Pak Emirates Military Hospital, Rawalpindi Pakistan, from Aug 2023 to Apr 2024.
Methodology: During pregnancy, ultrasound is a frequently utilised imaging modality that provides a non-invasive way to evaluate the placenta's features as well as its characteristics. The cohort comprised women with placenta previa and a history of at least one prior cesarean section or any other uterine surgery.
Results: The mean maternal age was 23.6±5.1years and mean gestational age at birth was reported as 34.3±2.5 weeks. In comparing each sonography index, the presence of bladder interruption (kappa: 0.838, sensitivity: 86%, specificity: 100%) and subplacental hypervascularity (kappa: 0.808, sensitivity: 85.3%, specificity: 95%) demonstrated the highest concordance for diagnosing PAS when evaluated against the gold standard diagnosis. Pateints diagnosed with PAS 1,2,3, on ultrasound were 59(71.9%). PAS 1 were 19(23.1%), PAS 2 were 26(31.7%) and PAS 3 were 14(17.07%). Upon surgical correlation, out of these 59 patients 48(81.3%) were surgically confirmed to have PAS. Out of these sugically confirmed patients, PAS 1 was in 14(73.6%), PAS 2 in 23(88.4%) and PAS 3 was in 13(92.8%) of patinets. Adverse surgical outcomes occurred in 11.8% of pregnancies, with a 95% confidence interval ranging from 7.9% to 17.2%.
Conclusion: Ultrasound diagnosis plays a crucial role not only in detecting placental invasion but also in facilitating its preliminary classification as it was confirmed during surgery.

Keywords: Accreta, Increta, Placenta Prveia, Placenta accreta syndrome, Ultrasound features.

How to Cite This Article: *Urooj U, Siraj A, Tariq M, Khan S, Akram S, Afzal S. Does Ultrasound Feature of Morbidity Adherent Placenta Give Us a Lead to Decide a Uterine Salvage Surgery. Pak Armed Forces Med J 2025; 75(Suppl-6): S945-S950. DOI: https://doi.org/10.51253/pafmj.v75iSUPPL-6.12159*

INTRODUCTION

Placenta accreta, increta, and percreta are, included in Placenta accreta spectrum (PAS) disorders. It refers to a range of conditions where trophoblastic tissue abnormally invades and adheres to the myometrium and uterine serosa.[1] While the exact natural progression of PAS disorders isn't fully understood, certain factors increase the risk, such as placenta previa and a history of operative delivery or other previous surgeries on uterus.[2]

During pregnancy, ultrasound is a frequently utilised imaging modality that provides a non-invasive way to evaluate the placenta's features as well as it's characteristics.[3] It assists in recognising features of PAS such as aberrant placental vascularity, loss of the typical hypoechoic retroplacental zone, or the existence of isolated myometrial disruption or thinning.[4]

It is essential to comprehend these risk factors and early indicators for the management and care of expectant mothers.[5] With this information, clinicians may keep such pregnancies with these risk factors, under observation and take the necessary precautions to lessen the possibility of difficulties, like scheduling delivery at a facility with experience with PAS.[6,7]

Early detection and intervention can significantly improve outcomes for both the mother and baby in cases of PAS disorders. Ultrasound is a valuable tool in diagnosing placenta accreta, with reported sensitivity exceeding 90%.[8] But it's crucial to assess its correctness rigorously, taking into account the possibility of observer bias as well as the impact of prior suspicions or risk factor information.[9,10] PAS presents serious risks during pregnancy, notably hemorrhage and potential maternal mortality.[11] Thus, early detection becomes paramount for managing it effectively.

This study aimed to provide a rigorous assessment of the accuracy of ultrasound in predicting placenta accreta and confirming those findings intraoperatively. Previous studies might have been

Correspondence: Dr Uzma Urooj, Department of Obstetrics & Gynecology, Combined Military Hospital, Rawalpindi Pakistan
Received: 02 May 2024; revision received: 07 Dec 2024; accepted: 16 Dec 2024

influenced by factors like reliance on a single expert observer, suspicion for accreta, and awareness of risk factors, which could skew results

This involves employing multiple observers, blinding them to clinical suspicions or risk factors, and using standardized protocols for ultrasound examination and interpretation and intraoperatively the findings were cofirmed.

METHODOLOGY

This study conducted at Pak Emirates Military Hospital, a prospective cross-sectional analysis from Aug 2023 till April 2024, focusing on the role of ultrasound in identifying placenta accreta spectrum (PAS) disorders in women presenting with placenta previa in OPD or emergency and later on confrirming it surgically. Purposive sampling was done, prevelance of placenta accreta spectrum is 3%,[7] sample size was calculated by using open EPI calculator.

Inclusion Criteria: Women with ultrasound confirmed diagnosis of placenta previa. Women with history of at least one prior cesarean section or any other uterine surgery. Women presenting during 2nd and third trimester.

Exclusion Criteria: Women with surgical as well as medical comorbidities i.e., cardiac patient, diabeties, hypertension, bleeding disorders, multiple pregnancy and those who not gave consent to participate in study. Women with life threatning hemorrhage and Women with intrauterine death of fetus.

After taking Ethical Approval from participants, EC 1583/23 they underwent followups fortnightly during the second and third trimesters of pregnancy, following hospital protocols, to screen for PAS disorders. Ultrasound assessment encompassed both transvaginal and transabdominal approaches, providing complementary views of the uterus and placenta. Both techniques utilized appropriate frequency transducers (4.0–6.0 MHz for transabdominal and 5.0–7.0 MHz for transvaginal) to evaluate the uterus and placenta for signs of abnormal trophoblastic invasion indicative of PAS disorders. Color Doppler ultrasound(set at 1.3 kHz), was used to identify placental lacunar flow, a characteristic feature of PAS disorders. Cases were classified into four categories (PAS0, PAS1, PAS2, PAS3) based on specific ultrasound signs indicative of PAS disorders during the third trimester. This classification aimed to stratify the severity or stage of PAS disorders based on ultrasound findings, guiding decisions regarding patient management and delivery planning to minimize associated risks. These ultrasound findings were subsequently confirmed during surgery in operation theater. Patients underwent obstetrical hysterectomy or internal illaic ligation. The placenta was not left in situ in any of the cases to reduce the risk of complications. The multidisciplinary approach involves close coordination between obstetricians, maternal-fetal medicine specialists, interventional radiologists, and other members of the healthcare team to ensure the safety and well-being of both the mother and baby. Bottom of Form Women undergoing conservative surgical techniques, were excluded from the study to avoid bias. This exclusion likely ensured that the study focused solely on evaluating the diagnostic performance of ultrasound in detecting PAS disorders, without the influence of different surgical approaches on the outcomes. The study maintained independence between antenatal care, gestation at time of delivery, and the surgical procedure done, irrespective of the PAS disorder stage identified on third-trimester ultrasound. This approach likely aimed to ensure consistency and avoid confounding factors that could impact the evaluation of ultrasound's diagnostic accuracy for PAS disorders at the time of surgery. This approach strengthens the validity of the study findings and enhances confidence in the conclusions drawn regarding the diagnostic utility of ultrasound in this clinical context. The group of women was divided into patient with PAS and non-PAS (based on ultrasound reports) and compared accordingly, as well as ultrasound findings were confirmed surgically.

All analysis was done using the statistical package for the social sciences 22. The Chi-square test and the Fisher's exact test were used to compare qualitative data. The threshold for statistical significance was p-value <0.005.

RESULTS

Eighty-two women with placenta previa and at least one prior cesarean delivery or uterine surgery e.g myomectomy were added in the analysis. The study provided demographic and clinical characteristics of the participants, indicating a mean maternal age of 23.6±5.1years. The mean gestational age at birth was reported as 34.3±2.5 weeks. Pateints diasgnosed with PAS 1,2,3, on ultrasound were 59(71.9%). PAS 1 were 19(23.1%), PAS 2 were 26(31.7%) and PAS 3 were 14(17.07%). Upon surgical corelation, out of these 59 patients 48(81.3%) were surgically confiremd to have

PAS. Out of these sugically confirmed patients, PAS 1 was in 14(73.6%), PAS 2 in 23(88.4%) and PAS 3 was in 13(92.8%) of patinets.

Regarding management strategies, all women diagnosed with PAS1, PAS2, or PAS3 underwent hysterectomy, indicating a consistent approach to surgical management for cases with confirmed PAS disorders. Notably, none of the cases classified as PAS0 underwent hysterectomy. This information underscores the uniformity in the surgical approach adopted for managing PAS disorders across the study cohort.

The study reported that adverse surgical outcomes occurred in 11.8% of pregnancies, with a 95% confidence interval ranging from 7.9% to 17.2%. Several demographic and clinical factors were associated with adverse surgical outcomes. Women experiencing adverse surgical outcomes had a higher mean maternal age of 35.7 years, compared to 23.6 years for those without adverse outcomes. This difference was statistically significant (p<0.004), suggesting that older maternal age may be a risk factor for adverse surgical outcomes in cases of placenta accreta spectrum (PAS) disorders.

The mean gestational age at delivery was lower in women with adverse surgical outcomes (34.1weeks) compared to those without adverse outcomes (35.5 weeks). This difference was statistically significant (p<0.001), conveying the idea that early delivery may also be required if the surgery itself poses risks to the pregnancy or complications arises during such pregnancies in antenatal period.

The incidence of placenta percreta was significantly higher in pregnancies complicated by adverse surgical outcomes (100%) compared to those without adverse outcomes (29.1%). More incidences of aberrant placental lacuna were found in PAS patients (p<0.001),as compared to non-PAS patients as well as increased lacunar flow was also found (16.59±8.63 vs. 1.02±3.69, p<0.001).

In comparing each sonography index, the presence of bladder interruption (kappa: 0.838, sensitivity: 86%, specificity: 100%) and subplacental hypervascularity (kappa: 0.808, sensitivity: 85.3%, specificity: 95%) demonstrated the highest concordance for diagnosing PAS when evaluated against the gold standard diagnosis.

Table-I: Gestational Age, PAS Stage and Outcome Regardless of Presence or Absence PAS (n=82)

Variable	Value
Gestational age	23.6 ± 5.1years
Number of Previous LSCS	
1 LSCS	11(13.4%)
2 LSCS	26(31.7%)
3 LSCS	39(47.5%)
4 LSCS	6(7.3%)
USG Findings in 3rd Trimester	
PSA0	23(28.04%)
PSA1	19(23.1%)
PSA2	26(31.7%)
PSA3	14(17.07%)
Pregnancy Outcome	
Blood loss >1500ml	51(62.1%)
Obstetric hysterectomy	65(75.6%)
Admission to ICU	70(85.3%)
Bladder involvement	35(42.6%)
Hospital stay>5 days	49(59.7%)
Blood transfusion	67 (81.7%)

Table-II: Ultrasound (US) Findings in Patients with PAS and Without PAS

Variables	PAS (n=59)	NO PAS (n=23)	p-value
Abnormal placental lacunae	59(100%)	23(100%)	<0.001
Lacunar flow	29(49.1%)	4(17.3%)	<0.001
Bladder interruption	39(66.1%)	0	<0.001
Myometrial thinnig	47(79.6%)	8(34.7%)	<0.001
Sub placental hypervascularity	53(89.8%)	11(47.8%)	<0.001
Loss of clear zone	49(83.0%)	3(13%)	<0.001

Table-III: Surgical Outcome in Patients with Ultrasound (US) Findings with PAS and Without PAS

Variables	Obstetrical Hysterectomy (n=65)	Internal illiac Ligation (n=82)	No Major surgical Intervention (n=82)	PPH (n=82)
Abnormal placental lacunae	15(23%)	7(8.5%)	1 (1.2%)	19 (23.1%)
Lacunar flow	40 (61.5%)	33 (40.2%)	3 (14.9%)	5 (6.1%)
Bladder interruption	39 (60%)	3 (3.6%)	1 (1.2%)	12 (14.6%)
Myometrial thinnig	18 (27.6%)	11 (28.04%)	0	2 (2.4%)
Sub placental hypervascularity	51 (78.4%)	20 (24.3%)	3 (3.6%)	13 (15.8%)
Loss of clear zone	49 (75.3%)	19 (23.1%)	0	11 (13.4%)

DISCUSSION

This study offers a comprehensive analysis and interpretation of findings regarding the prediction of placenta accreta spectrum (PAS) in high-risk women using sonography indexes. Across multiple studies, various sonography indexes, such as abnormal placental lacuna, bladder interruption, myometrial thinning, subplacental vascularity, and loss of clear

zone, were notably elevated among women diagnosed with PAS.[12,13,14] Bladder interruption, and subplacental vascularity showed the highest agreement with the gold standard diagnosis.[15] The findings were compared with previous studies, with similarities noted in the reliability of placental lacuna visualization for diagnosing accreta.[16] The study by Lim *et al*., have focused on high-risk pregnant women diagnosed with placenta accreta by ulraosound in 9 women sensitivity and specificity of 67% and 50% respectively.[17] A study carried out in USA showed that several descriptors were more frequently observed in cases of placenta percreta, but only bladder wall interruption remained significantly linked with a peripartum diagnosis of percreta after multivariate analysis.[18]

Another meta-analysis comparison showed that ultrasound and MRI have similar diagnostic values for detecting placenta accreta.[19]

One of the studies involving 68 women, several key findings emerged regarding placenta accreta spectrum (PAS) and its association with prior cesarean delivery (CD) and placental location. Among the women studied, 40 out of 68 (59%) had a history of prior cesarean delivery. Hysterectomy was performed in 8 cases, out of these 8 cases, 7 (88%) had ultrasound suspicion of PAS. In 16 cases where there was a prior cesarean delivery and the placenta was located over the internal os, 9 (56%) had placenta previa. 7 (78%) out of these underwent hysterectomy, and pathological examination confirmed PAS. 28 women without a history of prior cesarean delivery.[20]

Variables like, the number of previous cesarean section, smoking, loss of the retroplacental clear space, myometrial thinning < 1 mm, placental lacunae, intraplacental dark bands (IDB), focal interruption of myometrial border (FIMB) and abnormal vascularitythat have shown statistical significance in a univariable analysis related to some medical or research context, likely concerning pregnancy or obstetrics Variables such as the number of previous cesarean sections, loss of retroplacental clear space,smoking ststus, myometrial thinning (<1 mm), presence of placental lacunae, intraplacental dark bands (IDB), focal interruption of myometrial border, and abnormal vascularity have demonstrated statistical significance in univariable analyses within medical or research contexts, often pertaining to pregnancy or obstetrics.[21,22] These variables are often assessed to understand their individual impact on certain outcomes. Prenatal diagnosis of placenta accreta spectrum (PAS) is indeed crucial for reducing maternal and fetal morbidity. In our study it was found that by diagnosing PAS before delivery, healthcare providers can plan for specialized care and interventions,[23] such as delivery at centers equipped with advanced obstetric care and a multidisciplinary team involving obstetricians, paeditician, radiologists, and anesthesiologists. This coordinated approach helps ensure the best possible outcomes for both the mother and the baby concluded in one of the retrospective studies.[24,25]

Overall, the study shows diagnostic accuracy of PAS based on sonography indexes, with potential implications for improving the diagnosis and management of high-risk pregnancies with a history of Cesarean sections. Further validation and refinement of the model in larger cohorts are warranted, along with consideration of the latest guidelines for PAS definition and severity classification.

LIMITATIONS OF STUDY

Limitations of the study included the operator-dependent nature of ultrasound, the rarity of PAS leading to a relatively small sample size, and the lack of pathology evaluation for cases with spontaneous placental extraction. Future studies may benefit from using more recent definitions and focusing on severity stratification with added ultraound features.

CONCLUSION

Ultrasound diagnosis plays a crucial role not only in detecting placental invasion but also in facilitating its preliminary classification. The criteria mentioned in study are instrumental in identifying placenta increta/percreta, which is vital for precise clinical decision-making as it was confirmed during surgery. This information aids in early detection, intervention, and management, ultimately improving maternal and fetal health outcomes.

Conflict of Interest: None.

Funding Source: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

UU & AS: Data acquisition, data analysis, critical review, approval of the final version to be published.

MT & SK: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

SA & SA: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity

of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Eller AG, Bennett MA, Sharshiner M, Masheter C, Soisson AP, Dodson M, et al. Maternal morbidity in cases of placenta accreta managed by a multidisciplinary care team compared with standard obstetric care. Obstet Gynecol 2011; 11(7): 331–337 https://doi.org/10.1097/AOG.0b013e3182051db2
2. Jauniaux E, Collins SL, Burton GJ. Placenta accreta spectrum: Pathophysiology and evidence-based anatomy for prenatal ultrasound imaging. Am J Obstet Gynecol 2019; 2(18): 75-87. https://doi.org/10.1016/j.ajog.2017.05.067
3. Hecht JL, Baergen R, Ernst LM, Katzman PJ, Jacques SM, Jauniaux E et al. Classification and reporting guidelines for the pathology diagnosis of placenta accreta spectrum (PAS) disorders: recommendations from an expert panel. Mod Pathol 2020; 33: 2382-2396. https://doi.org/10.1038/s41379-020-0569-1
4. Palacios-Jaraquemada JM, Fiorillo A, Hamer J, Martínez M, Bruno C. Placenta accreta spectrum: a hysterectomy can be prevented in almost 80% of cases using a resective-reconstructive technique. J Matern Fetal Neonatal Med 2020; 26: 1-8. https://doi.org/10.1080/14767058.2020.1716715
5. Hussein AM, Ramzy A, Jauniaux E. Increasing caesarean delivery rates in Egypt: the impact of maternal request. BJOG 2020; 13: 11-14. https://doi.org/10.1111/1471-0528.16494
6. Jauniaux E, D'Antonio F, Bhide A, Prefumo F, Silver RM, Hussein AM, Shainker SA, Chantraine F, Alfirevic Z; Delphi consensus expert panel. Modified Delphi study of ultrasound signs associated with placenta accreta spectrum. Ultrasound Obstet Gynecol 2023; 61(4): 518-525. https://doi.org/10.1002/uog.26155
7. Hussein AM, Elbarmelgy RA, Elbarmelgy RM, Thabet MM, Jauniaux E. Prospective evaluation of impact of post-Cesarean section uterine scarring in perinatal diagnosis of placenta accreta spectrum disorder. Ultrasound Obstet Gynecol 2022; 59(4): 474-482. https://doi.org/10.1002/uog.23732
8. Fratelli N, Prefumo F, Maggi C, Cavalli C, Sciarrone A, Garofalo A et al. ADoPAD (Antenatal Diagnosis of Placental Adhesion Disorders) Working Group. Third-trimester ultrasound for antenatal diagnosis of placenta accreta spectrum in women with placenta previa: results from the ADoPAD study. Ultrasound Obstet Gynecol 2022; 60(3): 381-389. https://doi.org/10.1002/uog.24889
9. Coutinho CM, Giorgione V, Noel L, Liu B, Chandraharan E, Pryce J et al. Effectiveness of contingent screening for placenta accreta spectrum disorders based on persistent low-lying placenta and previous uterine surgery. Ultrasound Obstet Gynecol 2021; 57(1): 91-96. https://doi.org/10.1002/uog.23100
10. Shainker SA, Coleman B, Timor-Tritsch IE, Bhide A, Bromley B, Cahill AG et al. Special Report of the Society for Maternal-Fetal Medicine Placenta Accreta Spectrum Ultrasound Marker Task Force: Consensus on definition of markers and approach to the ultrasound examination in pregnancies at risk for placenta accreta spectrum. American Journal of Obstetrics and Gynecology 2021; 224(1): 2-14.
11. Maged AM, El-Mazny A, Kamal N, Mahmoud SI, Fouad M, El-Nassery N, Kotb A, Ragab WS, Ogila AI, Metwally AA, Lasheen Y. Diagnostic accuracy of ultrasound in the diagnosis of Placenta accreta spectrum: systematic review and meta-analysis. BMC Pregnancy and Childbirth 2023; 5; 23(1): 354. https://doi.org/10.1186/s12884-023-05675-6
12. Skupski DW, Duzyj CM, Scholl J, Perez-Delboy A, Ruhstaller K, Plante LA et al. Evaluation of classic and novel ultrasound signs of placenta accreta spectrum. Ultrasound in Obstetrics & Gynecology 2022; 59(4): 465-73. https://doi.org/10.1002/uog.24804
13. Alalfy M, Hamed ST, El GASA. The accuracy of 3D-TUI and 3D power Doppler using Alalfy simple criteria in the diagnosis of placenta accreta spectrum. Clin Exp Obstet Gynecol 2021; 48(5): 1132–40. https://doi.org/10.31083/j.ceog4805182
14. Morel O, van Beekhuizen HJ, Braun T. Performance of antenatal imaging to predict placenta accreta spectrum degree of severity. Acta Obstet Gynecol Scand. 2021; 100(S1): 21–8. https://doi.org/10.1111/aogs.14112
15. Marsoosi V, Ghotbizadeh F, Hashemi N, Molaei B. Development of a scoring system for prediction of placenta accreta and determine the accuracy of its results. J Matern Neonatal Med 2020; 33(11): 1824–1830. https://doi.org/10.1080/14767058.2018.1531119
16. Yu FNY, Leung KY. Antenatal diagnosis of placenta accreta spectrum (PAS) disorders. Best Pract Res Clin Obstet Gynaecol 2021; 72: 13–24. https://doi.org/10.1016/j.bpobgyn.2020.06.010
17. Asghar S, Naz N. Diagnostic Accuracy of Doppler Ultrasound for Antenatal Detection of Placenta Accreta Spectrum (PAS) Disorders. J Gynecol Obstet 2020; 8: 12–15
18. Xia H, Ke S-C, Qian R-R, Lin J-G, Li Y, Zhang X et al. Comparison between abdominal ultrasound and nuclear magnetic resonance imaging detection of placenta accreta in the second and third trimester of pregnancy. Medicine (Baltimore) 2020; 99: e17908. https://doi.org/10.1097/MD.0000000000017908
19. Happe SK, Yule CS, Spong CY, Wells CE, Dashe JS, Moschos E et al. Predicting Placenta Accreta Spectrum: Validation of the Placenta Accreta Index. J Ultrasound Med 2021; 40: 1523–1532. https://doi.org/10.1002/jum.15530
20. Hashim HA, Shalaby EM, Hussien MH, Rakhawy ME. Diagnostic accuracy of the placenta accreta index for placenta accreta spectrum: A prospective study. Int J Gynaecol Obstet 2022; 156: 71–76. https://doi.org/10.1002/ijgo.13610
21. Perotto L, Zimmermann R, Quack Loetscher KC. Maternal mortality in Switzerland 2005–2014. Swiss Med Wkly 2020; 150: w20345. https://doi.org/10.4414/smw.2020.20345
22. Hobson SR, Kingdom JC, Murji A, et al. No. 383-screening, diagnosis, and management of placenta accreta spectrum disorders. J Obstet Gynaecol Can 2019; 41(7): 1035-1049. https://doi.org/10.1016/j.jogc.2018.12.004
23. Lee W, Fox KA, Cassady CI, et al. Placenta accreta spectrum 2021: roundtable discussion. J Ultrasound Med 2022; 41: 7-15. https://doi.org/10.1002/jum.15685

24. Hecht JL, Baergen R, Ernst LM, et al. Classification and reporting guidelines for the pathology diagnosis of placenta accreta spectrum (PAS) disorders: recommendations from an expert panel. Mod Pathol 2020; 33(12): 2382-2396. https://doi.org/10.1038/s41379-020-0569-1

25. Gao Y, Gao X, Cai J, et al. Prediction of placenta accreta spectrum by a scoring system based on maternal characteristics combined with ultrasonographic features. Taiwan J Obstet Gynecol 2021; 60(6): 1011-1017. https://doi.org/10.1016/j.tjog.2021.09.011