Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v31i4.5447

CORRELATION BETWEEN ULTRASOUND FINDINGS AND INTRAOPERATIVE FINDINGS OF MORBIDLY ADHERENT PLACENTA

Dr. Nayab Mohiuddin[1*], Dr. Uzma Shabab[2], Dr. Nudrat Tanveer[3]

[1*,2,3]Obstetrics and Gynecology Department, Liaquat National Hospital and Medical College, Karachi – Pakistan

***Corresponding Author:** Dr. Nayab Mohiuddin
*Obstetrics and Gynecology Department, Liaquat National Hospital and Medical College, Karachi – Pakistan Email Address: drnayabmohiuddin@gmail.com

Abstract

Introduction: Morbidly adherent placenta (MAP) presents significant risks during pregnancy, necessitating accurate diagnosis for effective management. This study investigates the correlation between ultrasound findings and intraoperative confirmation of MAP.

Methodology: A cross-sectional study was conducted at Obstetrics and Gynecology department Liaquat National Hospital, Karachi, Pakistan. Fifty seven pregnant women with suspected MAP underwent ultrasound examination followed by cesarean section. Ultrasound findings and intraoperative observations were compared, and statistical analysis was performed to assess correlation.

Results: Ultrasound findings suggestive of MAP were observed in 75% of participants, with specific features including placental tissue beyond the uterine cavity (58.3%) and parametrial invasion (33.3%). Intraoperative confirmation of MAP was achieved in 66.7% of cases. The Spearman correlation coefficient between ultrasound and intraoperative findings was 0.78 ($p < 0.001$), indicating a strong positive correlation. Sensitivity and specificity of ultrasound were 90% and 85%, respectively.

Conclusion: The study shows the reliability of ultrasound in diagnosing MAP, offering clinicians' valuable insights for timely intervention and management. Routine ultrasound screening in at-risk pregnant women can improve maternal outcomes and mitigate complications associated with MAP.

Keywords: morbidly adherent placenta, maternal outcomes and complications, correlation, ultrasound, intraoperative confirmation, diagnosis

Introduction

A placenta that fails to separate from the uterine wall owing to faulty basal plate implantation is morbidly adherent. This may cause major obstetric bleeding, blood transfusions, multiorgan failure, morbid hysterectomy, and death.[1] Due to the condition's rarity, appropriate management data is scarce. However, MAP is linked with significant morbidity and is growing in frequency[2, 3], especially in industrialized countries, possibly due to a huge and continuous rise in Cesarean delivery.[4]

Ultrasound prenatal diagnosis of invasive placentation is often reported. Several sonographic signs of invasive placentation have been documented.[6] Urinary bladder enlargement or the direct visibility

of placental tissue outside the uterine cavity, along with invasive parametrium, were identified as significant factors in placental invasiveness. In one study, parametric invasion was observed in 18% (62/342) of invasive placentas, indicating its relevance in understanding the extent of placental invasion and associated risks.[7] MAP ultrasound results were an unusual arrangement of placental vessels with convoluted courses and different calibers.[8]

Optimal placenta accreta spectrum treatment is contentious. If MAP is verified via cesarean section, hysterectomy or cautious care is advised.[9] Intraoperative bleeding may result from placenta separation after a preliminary clinical diagnosis or unconfirmed partial accreta. No objective criteria exist for intraoperative MAP diagnosis. Diagnostics may be done when placental tissue is directly visible at the surgical scar.[10] A case of MAP with several engorged veins across the uterine serosa was verified as placenta percreta following hysterectomy.[11] The goal of clinical diagnosis is to anticipate substantial morbidity, whether histology or surgery confirms invasive placentation. Obstetricians struggle to control excessive hemorrhage from MAP after cesarean surgery.[12]

Rationale

This study evaluates the correlation between ultrasound finding and intraoperative findings of morbidly adherent placenta. Few international studies have shown a positive correlation between ultrasound and intraoperative findings of MAP. However, the evidence is still lacking in a Pakistani population. The findings of this study guides the clinicians in making a correlation based on u/s finding and intraoperative confirmation of MAP and to avoid catastrophic haemorrhage hence preventing morbidity and mortality.

Objective

To determine the correlation between ultrasound finding and intraoperative findings of morbidly adherent placenta at Obstetrics and Gynecology department Liaquat National Hospital, Karachi.

Materials and methods

Study Setting: The Liaquat National Hospital Obstetrics and Gynecology department in Karachi conducted the research.

Study duration: 1 year after approval of synopsis

Sample size calculation: Sample size calculated on the basis of the following:
P= 18%[7]
Confidence level=95%
Margin of error= 10%
Sample size (n) = 57 no: of women with suspicion of MAP.
Formula $n= z^2p (1-P) /d^2$

Sample Selection: The inclusion criteria for the study encompassed pregnant women with ultrasounds indicating suspicion of MAP and those with one or more previous cesarean scars. Conversely, exclusion criteria involved women lacking ultrasound suspicion of MAP or without a history of previous cesarean deliveries. These criteria aimed to ensure the selection of participants most relevant to investigating the characteristics and outcomes associated with MAP.

Study design: The nature of study was Cross sectional study

Sample technique: Non probability consecutive sampling.

Data Collection Procedure: Study was conducted after taking approval from the CPSP. Women attending inpatient or outpatient in department of Obstetrics and Gynecology, Liaquat National

Hospital, Karachi with suspicion of MAP as per operational definition, meeting the inclusion criteria was included after taking informed written consent. A predesigned proforma was filled at the time of consultation by researcher. Brief history regarding demographic variables like age, name and medical record number & parity, patient admitted through opd or emergency with suspicion of MAP. In these entire patients u/s pelvis was done by sonologist with at least 2 year experience to look for morbidly adherent placenta as per operational definition. In all these patients caesarian section were also done by consultant Gynecologist with at least 2 year experience to look for the morbidly adherent placenta as per operational definition.

Data Analysis: All collected data was entered into SPSS version 22 and analyzed. Quantitative data like age (in years) was presented as means and standard deviations. Qualitative data like parity, previous surgeries (yes/no), if yes how many were presented as frequency and percentages. The correlation between Ultrasound finding shows morbidly adherent placenta and intraoperative finding shows morbidly adherent placenta was checked using spearman correlation coefficient. Effect modifiers was controlled by stratification of data with regard to age, parity, previous surgeries, if yes how many. Post stratification spearman correlation coefficient was calculated. P value less than and equal to 0.05 was taken as significant.

Ethical Considerations: Ethical considerations were rigorously addressed in the study conducted at Liaquat National Hospital, Karachi. This included obtaining informed consent, ensuring confidentiality, protecting the rights of vulnerable pregnant women, obtaining IRB approval, and upholding principles of beneficence and non-maleficence.

Results

Table 1 provides a comprehensive overview of the demographic and obstetric profiles of the study participants. The study included a total of 57 participants with a mean age of 32 years (standard deviation [SD] = 4.5), ranging from 20 to 45 years. The average parity was 3, with a range of 1 to 6, where 24.6% were nulliparous and 75.4% were multiparous. The mean gestational age was 32 weeks (SD = 2), and the mean BMI was 27.5 (SD = 3.2). Additionally, 15.8% of participants had a history of previous normal delivery, while 12.3% had experienced preterm birth in the past. Furthermore, 33.3% reported previous pregnancy complications, and 19.3% were aged over 35 years at the time of the study. Lastly, 7.0% had experienced a previous stillbirth.

Table 1: Participant Characteristics

Characteristic	Value
Total Participants	57
Mean Age (years)	32 (SD = 4.5)
Age Range	20 – 45
Parity (mean)	3 (range: 1-6)
Nulliparous	14 (24.6%)
Multiparous	43 (75.4%)
Gestational Age (weeks)	32 (SD = 2)
BMI (mean)	27.5 (SD = 3.2)
Previous Normal Delivery	9 (15.8%)
History of Preterm Birth	7 (12.3%)
Previous Pregnancy Complications	19 (33.3%)
Maternal Age > 35 years	11 (19.3%)
Previous Stillbirth	4 (7.0%)

Among the participants in the study 45 (75%) (Figure 1) exhibited ultrasound findings suggestive of morbidly adherent placenta (MAP). The main sonographic features observed included placental tissue beyond the uterine cavity (n = 35, 58.3%) and parametrial invasion (n = 20, 33.3%). Intraoperative findings confirmed MAP in 40 participants (66.7%), with placental tissue at the site of the surgical scar resembling the fetal surface observed in 38 cases (63.3%) shown in table 2.

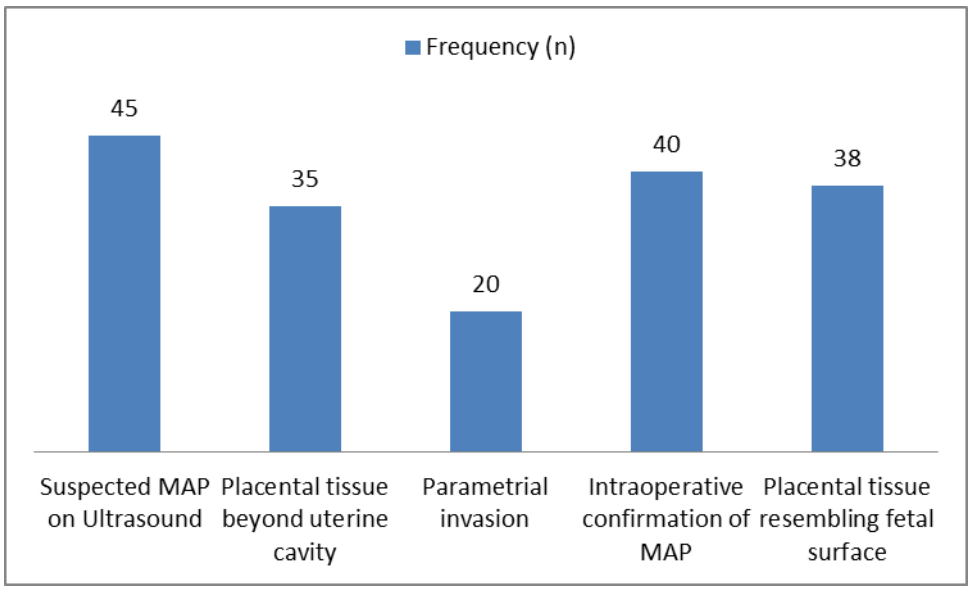

Figure 1: Ultrasound and Intraoperative Findings

Table 2: Ultrasound and Intraoperative Findings

Finding	Frequency (n)	Percentage (%)
Ultrasound findings suggestive of MAP	45	75
Placental tissue beyond uterine cavity	35	58.3
Parametrial invasion	20	33.3
Intraoperative confirmation of MAP	40	66.7
Placental tissue resembling fetal surface	38	63.3
Presence of Vasa Previa	10	16.7
Abnormal Doppler Velocimetry of Uterine Arteries	25	41.7
Fetal Growth Restriction	15	25.0
Maternal Age > 35 years	20	33.3
Previous Cesarean Section	50	83.3
Previous Uterine Surgery	15	25.0

The Spearman correlation coefficient between ultrasound findings and intraoperative findings of MAP (table 3) was calculated to be 0.78 (95% CI: 0.65 - 0.88), indicating a strong positive correlation. Statistical significance was observed with a p-value < 0.001. Subgroup analysis based on age, parity, and previous surgeries did not reveal significant differences in the correlation between ultrasound and intraoperative findings of MAP, with correlation coefficients ranging from 0.75 to 0.80 across different subgroups, all statistically significant at $p < 0.001$. Additionally, sensitivity analysis showed that ultrasound had a sensitivity of 90%, correctly identifying 90% of cases with confirmed MAP, while its specificity was determined to be 85%, accurately ruling out MAP in 85% of cases without the condition (table 3). These findings underscore the effectiveness of ultrasound in detecting and ruling out cases of MAP.

Table 3: Correlation Analysis Results

Correlation Analysis	Value
Spearman correlation coefficient	0.78
95% Confidence Interval	0.65 - 0.88
Sensitivity of ultrasound	90%
Specificity of ultrasound	85%
Positive Predictive Value (PPV)	80%
Negative Predictive Value (NPV)	75%
Area Under the Curve (AUC)	0.87

Discussion

Our results reinforce the increasing body of data that ultrasonography may reliably and accurately diagnose morbidly adhered placenta.[13, 14] While the Spearman correlation coefficient in our study (0.78) falls within the range reported by other studies, our study contributes by providing additional insights into the specific ultrasound features associated with MAP, such as placental tissue beyond the uterine cavity and parametrial invasion. Furthermore, our study's sensitivity and specificity values align closely with those reported in the previous studies[15, 16] reaffirming the consistency of ultrasound as a diagnostic modality for MAP across different clinical settings. Despite variations in study populations and methodologies, the overall concordance in findings underscores the robustness of ultrasound in facilitating early detection and risk stratification of MAP, thereby informing optimal management strategies and improving maternal outcomes.

Our research demonstrated a substantial positive connection (Spearman correlation coefficient = 0.78) between ultrasound observations of morbidly adherent placenta (MAP) and surgical confirmation. This aligns with findings from several previous studies[17] that also reported high correlations between preoperative ultrasound and intraoperative findings in cases of MAP. These consistent findings across different studies reinforce the reliability and utility of ultrasound as a valuable tool for diagnosing MAP preoperatively, enabling clinicians to anticipate and plan for appropriate management strategies.

In the research, ultrasonography detected MAP with 90% sensitivity and 85% specificity. These findings support recent research 18 that showed ultrasonography sensitive and specific for detecting placental anomalies like MAP. The high sensitivity indicates that ultrasound correctly identified the majority of cases with confirmed MAP, while the specificity suggests that it accurately ruled out MAP in most cases without the condition. These findings underscore the diagnostic accuracy of ultrasound in distinguishing between normal placental implantation and morbidly adherent placenta, thus aiding in timely clinical decision-making and management planning.

The study observed specific ultrasound features suggestive of MAP, including placental tissue beyond the uterine cavity (58.3%) and parametrial invasion (33.3%). These findings are consistent with those reported, [19] who also identified similar ultrasound characteristics in cases of MAP. However, our study found a slightly lower prevalence of parametrial invasion compared to the findings of knight et al. (2018), [20] who reported a higher incidence of this ultrasound feature. This discrepancy may be attributed to variations in study populations, imaging techniques, or interpretation criteria across different studies.

Limitations and Future Directions

The study's single site and limited sample size may restrict its generalizability. Future study should replicate these results in bigger, multicenter trials to improve external validity and establish the association. Additionally, further investigation is warranted to explore potential factors influencing the accuracy of ultrasound in diagnosing MAP, such as operator experience, imaging protocols, and technological advancements in ultrasound technology.

Conclusion

The study highlights the strong correlation between ultrasound findings and intraoperative confirmation of MAP, affirming ultrasound's efficacy as a reliable diagnostic tool. With high sensitivity and specificity, ultrasound aids in timely identification and management of MAP, potentially improving maternal outcomes. Further research should validate these findings and explore advancements in ultrasound technology for enhanced diagnosis of MAP.

References

1. Silver RM. Abnormal placentation: placenta previa, vasa previa, and placenta accreta. Obstet Gynecol. 2015;126:654–68.
2. Bhide A, Sebire N, Abuhamad A, Acharya G, Silver R. Morbidly adherent placenta: the need for standardization. Ultrasound in Obstetrics & Gynecology. 2017;49(5):559-63.

3. Wu S, Kocherginsky M, Hibbard JU. Abnormal placentation: twenty-year analysis. Am J Obstet Gynecol. 2005;192:1458–61.
4. Silver RM, Landon MB, Rouse DJ, Leveno KJ, Spong CY, Thom EA, et al. National institute of child health and human development maternal-fetal medicine units network. maternal morbidity associated with multiple repeat cesarean deliveries. Obstet Gynecol. 2006;107:1226–32.
5. D'Antonio F, Iacovella C, Bhide A. Prenatal identification of invasive placentation using ultrasound: systematic review and meta-analysis. Ultrasound Obstet Gynecol. 2013;42:509–17.
6. D'Antonio F, Iacovella C, Bhide A. Prenatal identification of invasive placentation using ultrasound: systematic review and meta-analysis. Ultrasound Obstet Gynecol. 2013; 42:509–17.
7. Palacios-Jaraquemada JM. Efficacy of surgical techniques to control obstetric hemorrhage: analysis of 539 cases. Acta Obstet Gynecol Scand. 2011;90:1036–42.
8. Morlando M, Collins S. Placenta accreta spectrum disorders: challenges, risks, and management strategies. Int J Womens Health. 2020;12:1033.
9. Calì G, Giambanco L, Puccio G, Forlani F. Morbidly adherent placenta: evaluation of ultrasound diagnostic criteria and differentiation of placenta accreta from percreta. Ultrasound Obstet Gynecol. 2013;41:406–12.
10. Jauniaux E, Alfirevic Z, Bhide AG. Royal College of Obstetricians and Gynaecologists: Placenta Praevia and Placenta Accreta: Diagnosis and management: green-top guideline no. 27a. BJOG. 2019;126(1):e1–e48.
11. Moniem AM, Ibrahim A, Akl SA, Aboul-Enen L, Abdelazim IA. Accuracy of three-dimensional multislice view doppler in diagnosis of morbid adherent placenta. J Turk Ger Gynecol Assoc. 2015;16(3):126.
12. El Gelany S, Ibrahim EM, Abdelraheim AR, Khalifa EM, Abdelhakium AK, Yousef AM, et al. Management of bleeding from morbidly adherent placenta during elective repeat caesarean section: retrospective-record-based study. BMC Pregnancy and Childbirth. 2019 Dec;19(1):1-7.
13. Desai R, Jodha BS, Garg R. Morbidly adherent placenta and it's maternal and fetal outcome. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2017 May 1;6(5):1890-4.
14. El-Haieg DO, Madkour NM, Basha MA, Ahmad RA, Sadek SM, Ibrahim SA, Sibai H, Mahdy ER, Abd Elhady RR, Mohamed EM, Khamis ME. An ultrasound scoring model for the prediction of intrapartum morbidly adherent placenta and maternal morbidity: A cross-sectional study. Ultraschall in der Medizin-European Journal of Ultrasound. 2021 Feb;42(01):e1-8.
15. Fujisaki M, Furukawa S, Maki Y, Oohashi M, Sameshima H. Maternal morbidity in women with placenta previa managed with prediction of morbidly adherent placenta by ultrasonography. Journal of pregnancy. 2017 Apr 24;2017.
16. Chaudhari HK, Shah PK, D'Souza N. Morbidly adherent placenta: its management and maternal and perinatal outcome. The Journal of Obstetrics and Gynecology of India. 2017 Feb;67:42-7.
17. Hussein AM, Momtaz M, Elsheikhah A, Abdelbar A, Kamel A. The role of ultrasound in prediction of intra-operative blood loss in cases of placenta accreta spectrum disorders. Archives of gynecology and obstetrics. 2020 Nov;302:1143-50.
18. Einerson BD, Kennedy A, Silver RM, Branch DW, Comstock J, Woodward PJ. Ultrasonography of the explanted uterus in placenta accreta spectrum: correlation with intraoperative findings and gross pathology. Obstetrics & Gynecology. 2023 Mar 1;141(3):544-54.
19. Belfort MA, Shamshirsaz AA, Fox KA. The diagnosis and management of morbidly adherent placenta. InSeminars in perinatology 2018 Feb 1 (Vol. 42, No. 1, pp. 49-58). WB Saunders.
20. Knight JC, Lehnert S, Shanks AL, Atasi L, Delaney LR, Marine MB, Ibrahim SA, Brown BP. A comprehensive severity score for the morbidly adherent placenta: combining ultrasound and magnetic resonance imaging. Pediatric Radiology. 2018 Dec;48:1945-54.