Original Article

Concordance of Grey Scale Findings of Morbidly Adherent Placenta with Intraoperative Findings

Rabia Qasim,[1] Abeera Choudry,[2] Shumaila Khawaja Khail[3], Amna Fareed[4], Ghazala Huma,[5] Muhammad Nouman[6]

[1]Consultant Gynecologist, [2,4]Professor [3]Assistant Professor, [5]Fellow Maternal Fetal Medicine
Department of Obstetrics & Gynecology, PEMH Rawalpindi

Correspondence: *Dr Rabia Qasim*
Consultant Gynecologist, PEMH Rawalpindi
rabia.khichi@outlook.com

Abstract

Objective: To evaluate the concordance between grey scale ultrasound findings and intraoperative observations in cases of morbidly adherent placenta (MAP) to assess the diagnostic accuracy of grey scale imaging in identifying varying degrees of placental adherence.

Methodology: A prospective observational study was conducted at the Department of Obstetrics & Gynecology, PEMH Rawalpindi, from June 2023 to December 2023. Pregnant women aged >18 years, diagnosed with morbidly adherent placenta based on grey scale ultrasound findings, and scheduled for cesarean delivery were included. Intraoperative findings, particularly the extent of placental invasion into the myometrium and surrounding structures, stage of placental attachment, and involvement of the bladder or other organs, were recorded by the attending obstetrician/gynecologist during surgery. The findings were then compared with grey scale imaging results to evaluate diagnostic accuracy. Data was analyzed using SPSS version 26.

Results: The mean age of the participants was 34.78 years, with 91.3% being housewives. Ultrasound findings indicated that Grade 2 placenta lacunae were commonly associated with cases without bladder invasion, whereas Grade 3 lacunae were strongly linked to bladder invasion. The uterine serosa-bladder interface showed no association with morbidly adherent placenta overall but was correlated with bladder invasion specifically. Placental thickness >4 cm was significantly associated with both bladder and broad ligament invasion. Grey scale parameters, including Grade 3 placenta lacunae (PPV: 91.67%), uterine serosa-bladder interface (PPV: 89.29%), and placental thickness >4 cm (PPV: 87.50%), demonstrated high positive predictive values for identifying true cases of morbidly adherent placenta. However, the sensitivity, specificity, and overall diagnostic accuracy of these parameters ranged from moderate to low.

Conclusion: Grey scale ultrasound demonstrates a reliable positive predictive value for diagnosing morbidly adherent placenta, particularly through parameters such as Grade 3 placenta lacunae, uterine serosa-bladder interface, and placental thickness >4 cm. However, its moderate sensitivity, low specificity, and limited overall accuracy underscore the need for complementary diagnostic tools to enhance the accurate identification and management of MAP.

Keywords: Morbidly adherent placenta, placenta lacunae, bladder invasion, ligament invasion

Cite this article as: Qasim R Choudry A, Khail SHK, Fareed A, Huma G, Nouman M. Concordance of Grey Scale Findings of Morbidly Adherent Placenta with Intraoperative Findings. J Soc Obstet Gynaecol Pak. 2024; 15(1):1-5. DOI. 10.71104/jsogp.v15i1.873

Introduction

Morbidly adherent placenta becomes a form of placental attachment condition in which the placenta is inseparable from the uterus because of the different degrees of penetration of trophoblastic tissues across the wall of the uterus.[1] It is an uncommon but potentially life threatening complication of pregnancy that poses significant risks to maternal and fetal health. The consistently rising rates of caesarean section (CS) deliveries in recent years have been linked to a parallel increase in the occurrence of both placenta previa and placenta accreta.[2,3] Notably, the likelihood of placenta accreta in cases where placenta previa is present escalates substantially, increasing from 24% after a single caesarean section to 67% following four or more caesarean deliveries.[2] Due to its high likelihood of causing severe obstetric hemorrhage, placenta accreta is among the leading causes of caesarean hysterectomy.[4,5]Therefore, early detection and prior knowledge of placental adherence are very important in reducing the maternal morbidity. Early identification enables better preparation and facilitates a multidisciplinary approach to managing cases of suspected placental invasion effectively.[4]

An accurate antenatal diagnosis is essential for effective delivery planning to minimize maternal and fetal morbidity. Ultrasound and Doppler are the first-line imaging modalities, offering high sensitivity.[6] While transabdominal ultrasound is noninvasive, visualizing

Authorship Contribution: [1,3,5]Substantial contributions to the conception or design of the work or the acquisition, [3]Drafting the work or revising it critically for important intellectual content, Literature review [2,4]Final approval of the version to be published

Funding Source: none
Conflict of Interest: none

Received: Sept 02, 2024
Accepted: Jan 10, 2025

the lower uterine segment may be challenging. In such cases, transvaginal ultrasound and color Doppler can enhance diagnostic accuracy, particularly in patients with placenta previa, as they provide more detailed visualization. Although recent studies have explored the use of MRI, they have not shown it to be superior to transvaginal ultrasound.[6,7] Nevertheless, diagnosing morbidly adherent placenta (MAP) remains complex.[6]

Availability to modern medical technologies such as transvaginal ultrasonography and color Doppler imaging remains to be limited in developing nations, including Pakistan, particularly in rural regions. These modern procedures are not only limited, but also costly, making early detection of disorders such as morbidly adherent placenta (MAP) difficult for a large proportion of the population. Given this scenario, grey-scale two-dimensional ultrasonography emerges as the most extensively utilized and practical antenatal diagnostic method for MAP identification. Grey-scale ultrasonography is non-invasive, inexpensive, and more widely available in resource-constrained areas, making it an excellent choice for early detection.[8]

Numerous research studies have supported the use of grey-scale ultrasonography to identify MAP, with Cali et al showing 80-90% sensitivity and 70-80% specificity when performed by competent practitioners[9] Silver et al also emphasized its usefulness as a screening tool in high-risk pregnancies, particularly in areas with limited resources.[10] Inconsistently, a study reported limitations in detecting modest cases, particularly in early pregnancy, implying that it is less reliable than color Doppler or MRI. On the other hand, it has been observed that its diagnostic accuracy varies with the operator's experience and clinical conditions.[11] These inconsistencies and limited local data highlighted the need for additional study to evaluate grey-scale ultrasonography accuracy versus operative findings, particularly in low-resource settings, in order to enhance maternal health as well as decrease dependency on advanced invasive modalities.

Methodology

This prospective observational study was done at Department of Obstetrics & Gynecology, PEMH Rawalpindi, during a period of six months from June 2023 to December 2023. Pregnant women age ≥18 years, diagnosed with morbidly adherent placenta based on grey scale ultrasound findings and who were scheduled for cesarean delivery were included. All the women with gestational age of less than 20 weeks, women with twin pregnancies, women with poor placental visualization on grey-scale ultrasound due to maternal obesity or unfavorable fetal positioning, patients with incomplete medical regarding operative findings and placental diagnosis other than MAP were excluded. Study was done after taking ethical approval. Informed consent was obtained from each case after being fully informed about the goals and methods. All patients were counseled that their information would be kept confidential. All the relevant demographic clinical and ultrasonography data were collected preoperatively. Intraoperative findings were noted by the attending obstetrician/gynecologist during the cesarean delivery, particularly as extent of placental invasion into the myometrium and surrounding structures and bladder or other organ involvement. All the information was collected via self-made study proforma. Findings were compared by grey scale findings for its diagnostic accuracy. Data was entered and analyzed using SPSS version 26.

Results

The mean age of the patients was 34.78 years, with a standard deviation of 4.02 years. The majority of the patients were housewives (91.3%). Regarding educational status, 34.8% of the patients were illiterate, 21.7% had matriculation-level education, 4.3% had completed intermediate education, and 4.3% held graduate qualifications. In terms of ethnicity, the most represented groups were Punjabi (26.1%) and Hindko (21.7%), followed by Pathan (17.4%), Saraiki (13.0%), and Kashmiri (13.0%), while Urdu-speaking individuals constituted the smallest ethnic group (8.7%) (Table I).

Table I: Fundamental characteristics of the patients. (n=46)

Variables		N	%
Occupation	House wife	42	91.3
	Teacher	04	08.7
Educational status	Illiterate	16	34.8
	Middle	16	34.8
	Matric	10	21.7
	Intermediate	02	04.3
	Post graduate	02	04.3
Ethnicity	Punjabi	12	26.1
	Pathan	08	17.4
	Saraiki	06	13.0
	Hindko	10	21.7
	Kashmir	06	13.0
	Urdu	04	08.7
Mean age (mean ± SD)		34.78±4.02 years	

For placenta lacunae, Grade 2 was more common in cases without bladder invasion, while Grade 3 was significantly associated with bladder invasion. However, no significant association was observed between placenta lacunae and morbidly adherent placenta (p=0.564) or broad ligament invasion (p=0.147). The uterine serosa-bladder interface did not show a significant association with morbidly adherent placenta (p=0.966), but it was strongly linked to bladder invasion (p=0.001). Placental thickness greater than 4 cm was significantly associated with both bladder invasion (p=0.001) and broad ligament invasion (p=0.008), but no significant association was found with morbidly adherent placenta (p=0.711) (Table II).

Table II: Gray scale findings and operative findings of MAP and association between them. (n=46)

Gray scale findings	OPERATIVE FINDINGS					
	Morbidly adherent placenta		Bladder invasion		Broad ligament invasion	
	Yes	No	Yes	No	Yes	No
Placenta lacunae						
Grade 2	19	3	2	20	10	12
	41.3%	6.5%	4.3%	43.5%	21.7%	26.1%
Grade 3	22	2	16	8	16	8
	47.8%	4.3%	34.8%	17.4%	34.8%	17.4%
Total	41	5	18	28	26	20
	89.1%	10.9%	39.1%	60.9%	56.5%	43.5%
p-value	0.564		0.001		0.147	
Uterine serosa bladder interface						
Yes	25	3	6	22	14	14
	54.3%	6.5%	13.0%	47.8%	30.4%	30.4%
No	16	2	12	6	12	6
	34.8%	4.3%	26.1%	13.0%	26.1%	13.0%
Total	41	5	18	28	26	20
	89.1%	10.9%	39.1%	60.9%	56.5%	43.5%
p-value	0.966		0.001		0.266	
Placental thickness						
<4cm	20	2	2	20	8	14
	43.5%	4.3%	4.3%	43.5%	17.4%	30.4%
>4cm	21	3	16	8	18	6
	45.7%	6.5%	34.8%	17.4%	39.1%	13.0%
Total	41	5	18	28	26	20
	89.1%	10.9%	39.1%	60.9%	56.5%	43.5%
p-values	0.711		0.001		0.008	

In this study, Grade 3 placenta lacunae demonstrated a high positive predictive value (PPV) of 91.67%, indicating reliable identification of true cases of morbidly adherent placenta (MAP). However, the sensitivity, specificity, and accuracy of this parameter were relatively low at 53.66%, 60.0%, and 54.35%, respectively. Similarly, the uterine serosa-bladder interface detected on ultrasound exhibited a high PPV of 89.29%, suggesting it is reliable when positive. However, its sensitivity (60.98%), specificity (40.0%), and overall accuracy (58.70%) were moderate to low. Furthermore, placental thickness >4 cm showed a high PPV of 87.50%, making it a reliable indicator, but its sensitivity (51.22%), specificity (40.0%), and overall accuracy (50.0%) were relatively lower.

These findings indicate that while individual grey scale ultrasound parameters such as Grade 3 placenta lacunae, uterine serosa-bladder interface, and placental thickness >4 cm demonstrate strong PPVs, they are insufficient as standalone diagnostic tools. Therefore, these parameters must be supplemented with additional diagnostic criteria or advanced imaging modalities to improve the accuracy of diagnosing morbidly adherent placenta.

Discussion

Morbidly adherent placenta, is an aberrant attachment of the placenta to the uterine wall, has significantly increased in recent decades, mostly as a result of risk factors such placenta previa and prior cesarean deliveries.[12] Sonographic markers can be identified as early as the first trimester, including irregularities in the uterine serosa-bladder interface, disruption of the normal hypoechoic retroplacental zone, numerous vascular lacunae within the placenta, and poor implantation of the gestational sac. Ultrasound is highly sensitive and specific for diagnosis, with advanced diagnostic methods reserved for rare cases where ultrasound findings are inconclusive.[12] This, study was conducted on 46 cases of morbidly adherent placenta diagnosed using gray scale ultrasound to assess the association with operative findings and evaluate the diagnostic accuracy of grayscale imaging, with an overall mean age of these women was 34.78 years of them mostly were 91.3% housewives. In aligns to this study Abbas S et al[13] reported that the mean age was 30.77 years and the average gestational age was 34.15 weeks. Tahseen H et al[14] also reported that the mean age of the women with morbidly adherent placenta was 30.14±5.36 years. On the other hand Abdullah RM et al[15] reported that the mean age of women was 28.5 years. The mean age of women with morbidly adherent placenta, near to 30 years across the studies aligns with the reproductive age group commonly at risk for this condition. This age range is often associated with repeated pregnancies, cesarean deliveries, or other uterine surgeries, which are significant risk factors for the development of morbidly adherent placenta.

This study found that Grade 3 placenta lacunae and placental thickness >4 cm were significantly associated with bladder invasion. The uterine serosa-bladder interface also showed a significant link to bladder invasion. However, none of these parameters showed a significant association with morbidly adherent placenta or broad ligament invasion. Overall this study found that Grade III placenta lacunae (PPV: 91.67%), uterine serosa-bladder interface (PPV: 89.29%), and placental thickness >4 cm (PPV: 87.50%) are reliable for identifying true cases of morbidly adherent placenta.

However, their sensitivity, specificity, and accuracy were moderate to low, indicating that these ultrasound parameters alone are insufficient for definitive diagnosis and should be supplemented with additional diagnostic methods. These findings were correlated by the Aboshalk AE et al[16]. In another study by Moniem AM et al[17] reported that the most effective 2D grayscale ultrasound parameters for identifying emergency hysterectomies in the analyzed cases were disruption of the uterine serosa-bladder interface, which demonstrated a 81.8% sensitivity, and the presence of an exophytic mass invading the bladder, which exhibited a specificity of 94.9%, 66.7% PPV, and 84.1% NPV. In the comparison of this study Ardakani FS et al[18] also reported that the Grayscale ultrasonography revealed that over thirteen intraplacental echolucent zones might predict a morbidly adherent placenta with a 86% sensitivity of 86% and 80% specificity. Sensitivity and specificity of the echolucent zone >11 mm at the non-fetal surface for identifying a morbidly adherent placenta were 93% and 66%, respectively.[18] In aligns to this study Pagani G et al[19] reported that the sensitivity of placental lacunae for detecting placenta accreta was 74.8%, for increta was 88.6% and for percreta it was 76.3%. In the study by Yang JI et al[20] demonstrated that the Intraplacental lacunae demonstrated a sensitivity of 86.9% and a specificity of 78.6% for identifying adherent placenta. When considering Grade 2 or higher lacunae, the sensitivity increased to 100%, while the specificity was 97.2%, making it highly effective for diagnosing placenta increta or percreta. However, Shawky M et al[21] reported that the gray scale ultrasound and Doppler examinations of the placenta exhibit highly suggestive signs of placenta accreta, owing to their high sensitivity and specificity. Notably, placental lacunae with turbulent flow and a retro-placental myometrial thickness of ≤1 mm are associated with the highest specificity in diagnosing this condition. There are notable variations in the results across different studies, which can be attributed to several factors, including the use of different parameters in gray scale ultrasound and other gold standard diagnostic techniques. Furthermore, the sample sizes in these studies vary widely, which may influence the consistency and reliability of the results.

Discrepancies in sample selection criteria and study design also contribute to these differences. In our study, we encountered several limitations, particularly the small sample size and the limited diagnostic accuracy, which was assessed based on only a few specific parameters. While the findings suggest that gray scale ultrasound alone cannot be conclusively recommended as a diagnostic tool for morbidly adherent placenta (MAP), further large-scale studies are essential to establish its reliability and effectiveness in diagnosing MAP.

Conclusion

Gray-scale ultrasound demonstrates a reliable positive predictive value for diagnosing morbidly adherent placenta (MAP), particularly when evaluating parameters such as Grade 3 placenta lacunae, uterine serosa-bladder interface, and placental thickness >4 cm. However, its moderate sensitivity, low specificity, and limited overall accuracy emphasize the need for supplementary diagnostic tools to improve the accurate identification and management of MAP. A significant limitation of this study was the small sample size. Therefore, further large-scale studies are recommended to validate these findings, integrate advanced imaging modalities for comparison, and explore combined diagnostic approaches to enhance accuracy in the diagnosis of morbidly adherent placenta.

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