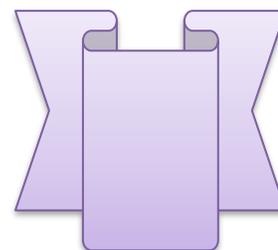
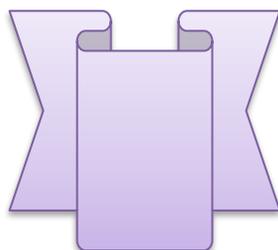
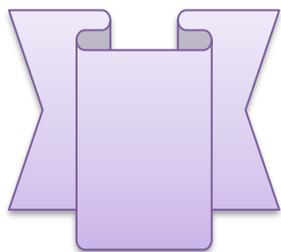
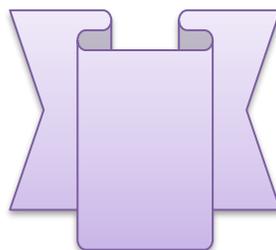
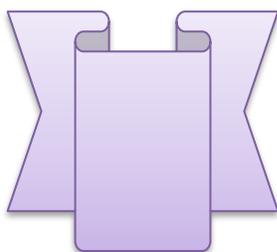
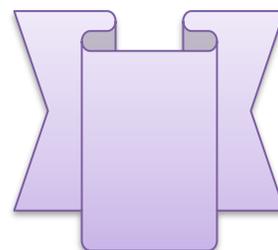
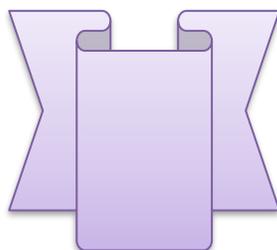
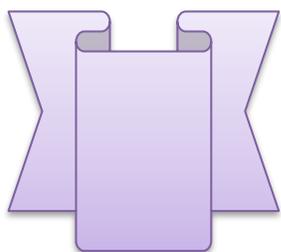


INTERNATIONAL JOURNAL OF MEDICAL ARTS



Volume 5, Issue 8, August 2023

<https://ijma.journals.ekb.eg/>



Print ISSN: 2636-4174

Online ISSN: 2682-3780



Available online at Journal Website
<https://ijma.journals.ekb.eg/>
 Main Subject [Gynecology and Obstetrics]



Original Article

Evaluating PPAP Scoring System for Predicting Adherent Placenta in Women with Placenta Previa

Muhamed Ahmed Abdelmoaty ^{*1}, Mohamed Talat Mohamed ²

¹ Department of Obstetrics and Gynecology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

² Department of Radiology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

ABSTRACT

Article information

Received: 09-05-2023

Accepted: 02-08-2023

DOI: 10.21608/IJMA.2023.210043.1683.

*Corresponding author

Email: muhamedahmed.216@azhar.edu.eg

Citation: Abdelmoaty MA, Mohamed MT. Evaluating PPAP Scoring System for Predicting Adherent Placenta in Women with Placenta Previa. IJMA 2023 August; 5 [8]: 3583-3589. doi: 10.21608/IJMA.2023.210043.1683.

Background: Accreta, increta and percreta are all examples of morbidly adherent placenta. This new score, the placenta previa with attached placenta [PPAP] score, was developed from ultrasound and magnetic resonance imaging [MRI] data for pregnant women who had both placenta previa and an adhering placenta.

Aim of the work: The purpose of this future research was to assess the effectiveness of a novel scoring system for identifying placenta previa with an attached placenta.

Patients and Methods: This prospective cohort study included 100 cases. It was conducted at Faculty of Medicine, of Al-Azhar University. The duration of the study was from December 2020 to December 2022. There were also MRI and ultrasound tests performed at this time. Two things go into determining your PPAP score: [1] any prior uterine surgery [including a cesarean section, a surgical abortion, or uterine reconstruction], and [2] the findings of an ultrasound [US] or [MRI].

Results: PPAP score in detection of having adherent placenta reported a sensitivity of 88.24% and specificity of 91.57%.

Conclusion: PPAP scoring system is effective and reliable system for diagnosis of adherent placenta in females with placenta previa.

Keywords: PPAP; Adherent placenta; Placenta previa; Evaluation.



This is an open-access article registered under the Creative Commons, ShareAlike 4.0 International license [CC BY-SA 4.0] [<https://creativecommons.org/licenses/by-sa/4.0/legalcode>].

INTRODUCTION

The obstetric condition adherent placenta produces placenta accreta, increta and percreta. A morbidly adherent placenta may cause considerable bleeding, organ damage, cesarean hysterectomy, and the mother's death ^[1]. Placenta previa is a significant risk factor for morbidly adherent placenta. Predicting adherent placenta in placenta previa pregnancies may help to avoid complications ^[2].

Obstetricians may utilize this information to arrange for obstetric anesthesia, right surgical skills, blood supply and interventional radiology for uterine artery embolization during cesarean delivery. Placental attachment may be predicted using prenatal ultrasonography and magnetic resonance imaging. Several studies have shown that diagnostic scoring systems comprising of many ultrasound results indicatives of attached placenta may be further beneficial than a single ultrasound finding utilized in prenatal diagnosis ^[3, 4]. Nevertheless, subsequent studies have investigated the reliability of adherent placenta scoring systems in predicting placental adhesions in females who have had prior cesarean births, who have placenta previa, or who have a low-lying placenta ^[4].

Studies have indicated that the ratings derived in these studies had good sensitivity, specificity, positive predictive value and negative predictive value at the appropriate cut-off levels for predicting an adherent placenta. Unlike comparable ratings, the PPAP considers the patient's ultrasound and MRI data in addition to the patient's history of uterine surgery and cesarean delivery ^[4].

The purpose of this research was to assess the accuracy of a novel scoring system for diagnosing morbidly adherent placenta, the placenta previa with an attached placenta [PPAP] score.

PATIENTS AND METHODS

One hundred instances made up this prospective cohort research. It was conducted at Al-Hussein Hospital, Faculty of Medicine, of Al-Azhar University. The duration of the study was from December 2020 to December 2022.

Women who had prenatal care and gave birth at the university hospital and were

diagnosed with placenta previa were involved in the research. The permission of each patient was obtained with full knowledge of the risks involved. Study participants were questioned about their experiences with CS, surgical abortion, and other uterine surgeries at the outset of their participation. The placenta previa with attached placenta [PPAP] score was evaluated using ultrasound [US] and MRI on all patients who presented to the university hospital prior to 32 weeks gestation.

US and MRI were performed on the babies at 28 and 32 weeks. If a patient was sent to our facility after 32 weeks of gestation, we performed US scans at their first appointment and then MRI examinations a week later. In the US tests, many types of ultrasonic equipment were employed. The absence of the retro-placental hypoechoic clear zone [LCZ], the existence of placental lacunae [PL], and turbulent blood flow [TBF] in the arteries connecting the placenta to the uterine serosa were all investigated using transabdominal ultrasonography and color Doppler [figure 1, 2]. Using transvaginal ultrasound, we looked for an "irregular sign," which is an abnormality in the placenta-myometrium border at the internal uterine os. Each variable was given a score based on the results from the United States, and the associated pictures from the United States were saved. Images saved from the US were analyzed afterwards.

A 1.5 Tesla MRI scanner was used in the study. After performing localizer scans, several imaging techniques were used, including axial double-echo gradient-echo chemical shift imaging, balanced-fast field echo, and half-fourier acquisition with single-shot turbo spin echo. Magnetic resonance imaging was used to examine how well the placenta attached to the uterine wall. There are a number of MRI findings that indicate an adherent placenta, including a nodular interface between the uterus and placenta, an external uterine bulge caused by the placental mass effect, heterogeneous signal intensity within the placenta, dark intra-placental bands observed on T2-weighted images and abnormal dilated venous lakes within the placenta [figure 3].

If a woman had at least 1 of the above-stated MRI findings, she was considered to have an attached placenta. Ladies who had an emergency C-section before receiving their PPAP score were not included in this research.

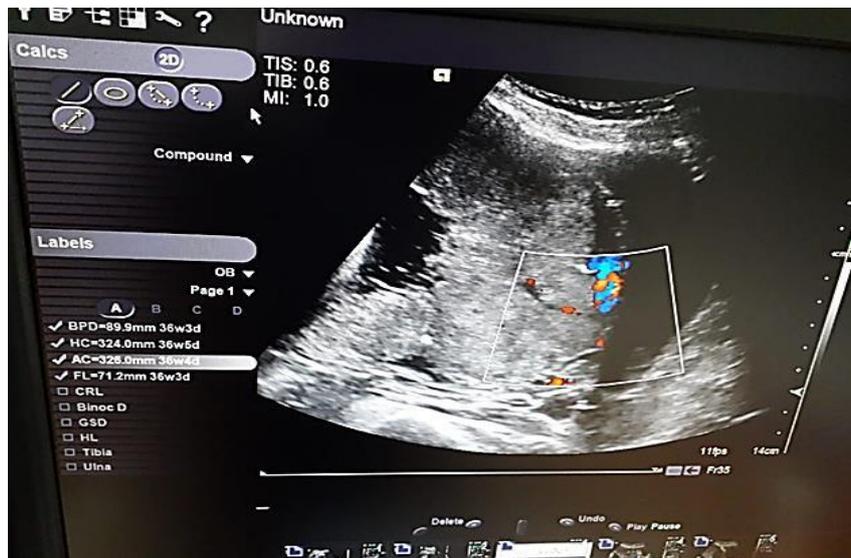


Figure (1): Ultrasound imaging showing Presence of placental lacunae and loss of the clear zone and bladder wall interruption plus uterovesical hypervascularity

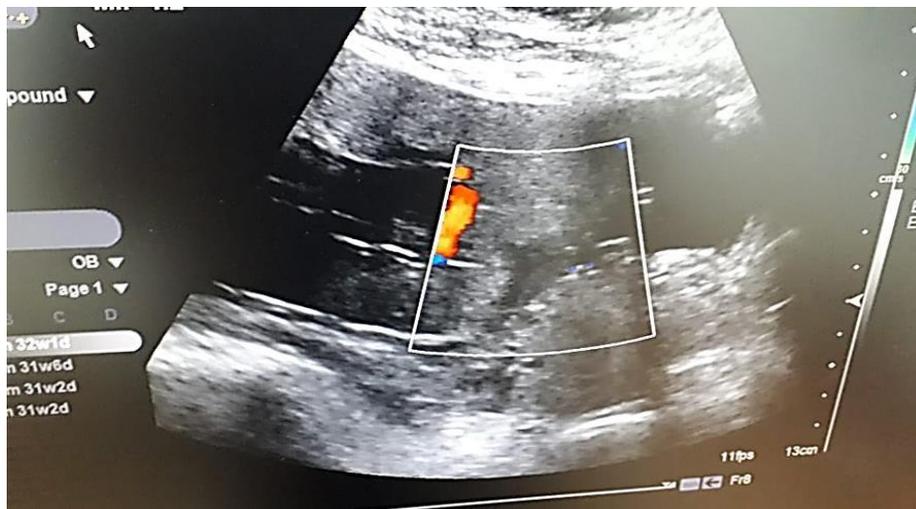


Figure (2): Ultrasound imaging showing Presence of placental lacunae and loss of the clear zone and bladder wall interruption

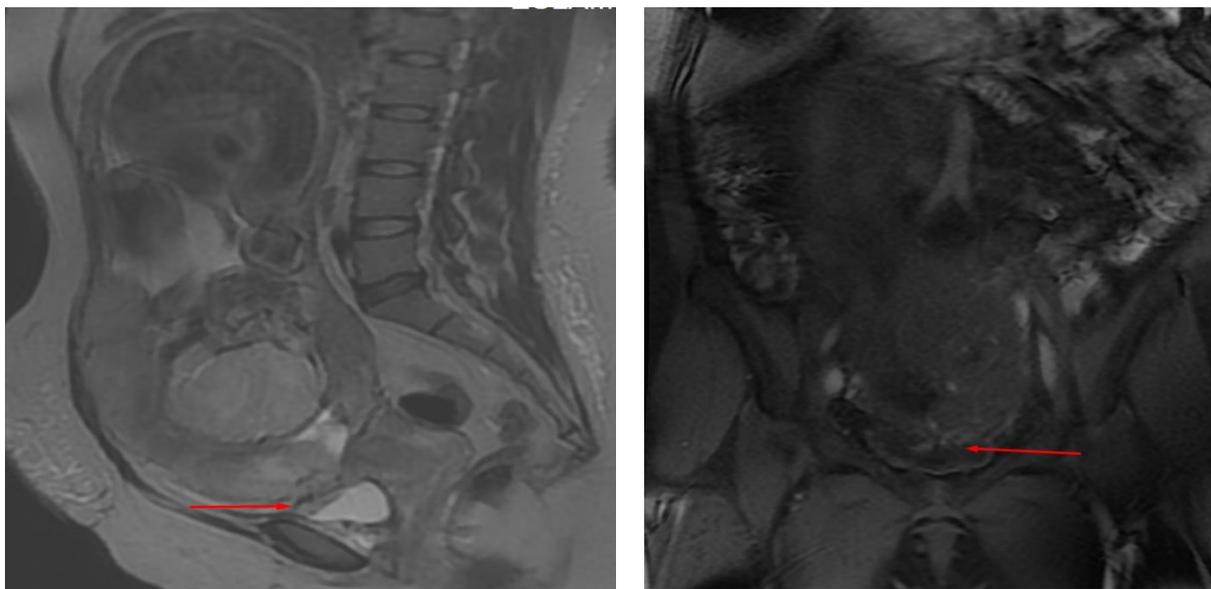


Figure (3): MRI scanning, T2 sagittal & coronal WIs & coronal T1 fat sat WIs revealed placenta previa & percreta with urinary bladder infiltration

Procedure

In the PPAP scoring system, there are two components: [1] past history of cesarean section, surgical abortion, and/or uterine surgery; and [2] ultrasound [US] and magnetic resonance imaging [MRI] test findings.

Each category was assigned a score of 0, 1, 2, or 4 points, and the aggregate of the scores for all variables determined the PPAP score, which ranged from 0 to 24.

The PPAP scoring method incorporates characteristics and scores commonly recognized as crucial risk factors or US findings related to adherent placentas.

Patients with placenta previa with a PPAP score of 8 were expected to have placenta

accrete spectrum. Following fetal birth through cesarean section via transverse uterine incision, the typical approach comprises bilateral ligation of the internal iliac arteries, followed by a trial of manual placenta removal. This method is used to reduce excessive bleeding and other difficulties during birth. A different method is employed when the placenta is discovered to be a localized adherent. The damaged section of the uterine wall is specifically removed to guarantee complete removal of the placenta and avoid any potential problems. A cesarean hysterectomy was performed if placental separation did not occur. The presence of placenta accrete spectrum was established clinically or histopathologically.

The PPAP score's predictive accuracy for placenta accrete spectrum has been studied.

Table [1]: Variables and scores in the PPAP scoring system ^[4]

| Variable | | Level of Variable | Score | |
|----------------------------------|------------------------------------|----------------------------|-----------------------------|----|
| Past History | No. of previous CS | 0 | 0 | |
| | | 1 | 2 | |
| | | ≥2 | 4 | |
| | No. of previous surgical abortions | <3 | 0 | |
| | | ≥3 | 2 | |
| | Other uterine surgeries | No | 0 | |
| | | Present | 2 | |
| Placenta located on uterine scar | | 4 | | |
| Imaging examination | USG | Grade of placental lacunae | 0 | 0 |
| | | | 1 | 2 |
| | | | ≥2 | 4 |
| | | Loss of clear zone | Absent | 0 |
| | | | Equivocal | 2 |
| | | | Present | 4 |
| | | Turbulent blood flow | Absent | 0 |
| | | | Equivocal | 1 |
| | | | Present | 2 |
| | Irregular signs | Absent | 0 | |
| | | Present | 2 | |
| | | MRI | Adherent placenta suspected | No |
| Yes | 2 | | | |

They were suspected of having placenta accrete spectrum with a PPAP score ≥ 8.

Ethical Approval: Informed written consent was obtained from all participants. the research was sanctioned by the university's ethics board. Both the Helsinki Declaration and the Code of Ethics for Medical Research Involving Human People were adhered to throughout the study.

Statistical Analysis: The data was analyzed using IBM-SPSS version 24 [May 2016]. The Wilcoxon tests, Spearman's correlation, and logistic regression analysis were employed to

establish statistical significance. Each variable was examined according to the sort of data it contained, whether parametric or not. If the P-values were less than 0.05, or 5%, the results were judged statistically significant.

RESULTS

There was no significant difference among the 2 study groups regarding age, residence and gestational age at diagnostic work up [table 2].

There was significant increase in previous surgical abortion and uterine surgeries in adherent placenta group [table 3].

There was significant increase in PPAP US and MRI parameters suggesting adherent placenta in cases reported actual placental adherence [table 4].

PPAP score in detection of having adherent placenta reported a sensitivity of 88.24% and specificity of 91.57% [table 5].

The difference in gestational age amongst the two groups was not statistically significant. The linked placenta group, on the other hand, saw much higher blood loss [table 6].

Table [2]: Demographic data about the involved study groups

| | Adherent placenta [n = 17] | No adherent placenta [n = 83] | P. Value |
|--|-------------------------------|----------------------------------|----------|
| Age [Years] | 29.24 ± 4.07 | 27.27 ± 4.61 | 0.11 |
| Residence [Urban] | 8 [47.06%] | 48 [57.83%] | 0.42 |
| Gestational weeks at diagnostic workup | 31.59 ± 1.97 | 31.77 ± 2.45 | 0.77 |

Table [3]: Past history of included subjects

| | Adherent placenta [N = 17] | No adherent placenta [N = 83] | P. Value |
|----------------------------------|-------------------------------|----------------------------------|----------|
| No. of previous CS | 1.35 ± 1.22 | 1.25 ± 1.16 | 0.75 |
| Previous surgical abortions | 3.53 ± 1.62 | 1.24 ± 1.17 | <0.001* |
| Other uterine surgeries | | | |
| No | 7 [41.18%] | 79 [95.18%] | <0.001* |
| Present | 6 [35.29%] | 2 [2.41%] | |
| Placenta located on uterine scar | 4 [23.53%] | 2 [2.41%] | |

Table [4]: Imaging examination of included subjects

| Imaging examination | Adherent placenta [n = 17] | No adherent placenta [n = 83] | P. Value |
|-----------------------------|-------------------------------|----------------------------------|----------|
| Ultrasonography | | | |
| Grade of placental lacunae | 1.47 ± 1.07 | 0.51 ± 0.59 | <0.001* |
| Loss of clear zone | | | |
| Absent | 5 [29.41%] | 81 [97.59%] | <0.001* |
| Equivocal | 9 [52.94%] | 1 [1.2%] 0 [0%] | |
| Present | 3 [17.65%] | 1 [1.2%] | |
| Turbulent blood flow | | | |
| Absent | 8 [47.06%] | 81 [97.59%] | <0.001* |
| Equivocal | 8 [47.06%] | 1 [1.2%] | |
| Present | 1 [5.88%] | 1 [1.2%] | |
| MRI | | | |
| MRI Irregular signs | 8 [47.06%] | 1 [1.2%] | <0.001* |

Table [5]: Sensitivity and specificity of PPAP score in detection of having adherent placenta

| Suspected of having adherent placenta according to PPAP | Adherent placenta [N = 17] | No adherent placenta [N = 83] | Sensitivity | Specificity |
|---|-------------------------------|----------------------------------|-------------|-------------|
| Yes | 15 [88.24%] | 7 [8.43%] | 88.24% | 91.57% |
| No | 2 [11.76%] | 76 [91.57%] | | |

Table [6]: Delivery data of included subjects

| | Adherent placenta [n = 17] | No adherent placenta [n = 83] | P. Value |
|-------------------------------------|-------------------------------|----------------------------------|----------|
| Gestational age at delivery [Weeks] | 33.06 ± 2.84 | 33.3 ± 2.99 | 0.76 |
| Blood loss at CS | 5006.94 ± 2289.92 | 2685.3 ± 1356.39 | < 0.001* |

DISCUSSION

When the placenta adheres to the lower uterus, partially or totally blocking the cervix,

severe bleeding, early labor, maternal and fetal morbidity and death may occur [5, 6]. Adherent placenta occurs when the placenta invades the uterine wall and does not detach after birth. It

may cause severe bleeding, hysterectomy, and maternal death. Adherent placentas must be recognized and managed early to avoid morbidity and mortality [7].

The diagnostic sensitivity for placenta accreta is enhanced when ultrasonography and clinical criteria are combined. Clinical suspicion may identify placenta accreta in up to 50% of cases [for example, bleeding, previa, past cesarean delivery] [8].

In our sample, previous studies that incorporated maternal age, parity, past curettage and prenatal bleeding to predict placenta accreta did not improve the model [1]. Based on uterine surgery and cesarean section history, ultrasound, and MRI data, the PPAP score predicts adherent placenta [4].

Women with placenta previa, regardless of whether or not they have had a previous cesarean section, were predicted to have an adherent placenta using the PPAP scoring system with a sensitivity of 91.3%, specificity of 98.0%, PPV of 87.5%, NPV of 98.7%, and accuracy of 97.1%, as determined by **Tanimura et al.** [4].

The PPAP score method may be used to identify pregnant women with placenta previa who are at great hazard of placenta attachment. Unfortunately, the PPAP grading method used in this study was not able to correctly predict the presence of an attached placenta in two of the women. A history of myomectomy and myometrium resection may increase the risk of adherent placenta in women with placenta previa [9]. Attached placentas have been connected to many different surgical procedures, including abortion, transcervical resection, myomectomy and myometrium resection for adenomyosis [10].

Prenatal diagnosis of placenta accreta varies in sensitivity and specificity, even utilizing the same sonographic criteria. In the United States, placenta accreta is diagnosed between 15 and 40 weeks of pregnancy based on a placental lacuna [sensitivity 79%], obliteration of the echolucent area among the uterus and the placenta [low diagnostic and predictive sensitivity, false-positive rate nearly 50%], and a myometrium thickness of 1 mm [11-15].

Obese women and those who have already had a cesarean delivery may make trans-

abdominal ultrasonography less effective for detecting posterior or fundal implantation. Neovascular component analysis with 3D ultrasound yields hemostasis-critical data [16].

In order to detect adherent placenta in females with placenta previa, the placental protrusion sign or MRI evidence of placental protrusion into the internal uterine os may be useful [17]. When aberrant ultrasound signals were found throughout this research, it may have explained why a placental protrusion sign was shown on MRI.

There have only been four studies to our knowledge that have looked into the diagnostic accuracy of scoring systems other than PPAP for predicting adherent placenta [18-21]. These studies enrolled pregnant women who had at least one previous CS and/or placenta previa, or US findings suggestive of adherent placenta. Additionally, two of the four previous studies aimed to determine more effective parameters for predicting adherent placenta and appropriate weighing of each parameter using logistic regression models, and also aimed to determine an optimal cut-off value of the scoring system via ROC analysis [18, 19].

Predicting an adherent placenta using these measures has been shown in two trials to have a sensitivity of 72.0-94.2%, specificity of 52.5-85.0%, positive predictive value [PPV] of 63.4%-70%, and negative predictive value [NPV] of 86.0%-100%. [NPV]. The next two studies [20, 21] estimated the parameters, weighting of each parameter and cut-off values, yielding results ranging from 69.6% to 97.0% sensitivity, 98.7% specificity, 84.2% PPV and 97.1% NPV. In contrast, all of the women in this research were pregnant and had been told they had placenta previa but chose not to have surgery.

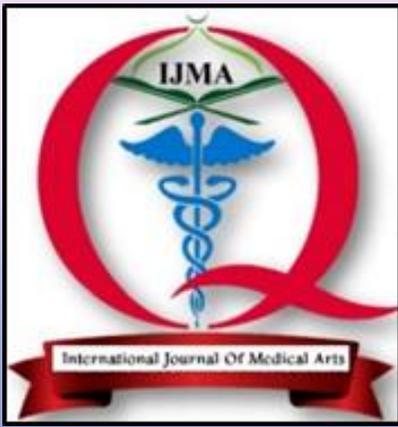
Limitations of the study: The study was conducted at a single center and included a relatively small sample size of patients. This may limit the generalizability of our findings to other settings and populations.

Conclusion: The PPAP scoring system is a reliable and effective tool for recognizing adherent placentas in women with placenta previa.

Financial and non-financial relations and activities of interest: None

REFERENCES

1. Ogawa K, Jwa SC, Morisaki N, Sago H. Risk factors and clinical outcomes for placenta accreta spectrum with or without placenta previa. *Arch Gynecol Obstet*. 2022 Mar;305[3]:607-615. doi: 10.1007/s00404-021-06189-2.
2. Hasegawa K, Ikenoue S, Tanaka Y, Oishi M, Endo T, Sato Y, *et al*. Ultrasonographic Prediction of Placental Invasion in Placenta Previa by Placenta Accreta Index. *J Clin Med*. 2023 Jan 31;12[3]:1090. doi: 10.3390/jcm12031090.
3. Sattar A, Bashir H, Rana S, Anjum S. Diagnostic value of magnetic resonance imaging [MRI] in morbidly adherent placenta, taking surgical findings as gold standard. *Med Forum*. 2020 Aug 9;31[8]:8-11.
4. Tanimura K, Morizane M, Deguchi M, Ebina Y, Tanaka U, Ueno Y, *et al*. A novel scoring system for predicting adherent placenta in women with placenta previa. *Placenta*. 2018 Apr;64:27-33. doi: 10.1016/j.placenta.2018.02.005.
5. Jauniaux E, Grønbeck L, Bunce C, Langhoff-Roos J, Collins SL. Epidemiology of placenta previa accreta: a systematic review and meta-analysis. *BMJ Open*. 2019 Nov 12;9[11]:e031193. doi: 10.1136/bmjopen-2019-031193.
6. Brennan K. Placental pathology: A review of placenta previa, placental abruption and placenta accreta. *Updat Anaesth*. 51-55. doi: 10.1029/WFSA-D-18-00010.
7. Panaiotova J, Tokunaka M, Krajewska K, Zosmer N, Nicolaidis KH. Screening for morbidly adherent placenta in early pregnancy. *Ultrasound Obstet Gynecol*. 2019 Jan;53[1]:101-106. doi: 10.1002/uog.20104.
8. Romeo V, Verde F, Sarno L, Migliorini S, Petretta M, Mainenti PP, *et al*. Prediction of placenta accreta spectrum in patients with placenta previa using clinical risk factors, ultrasound and magnetic resonance imaging findings. *Radiol Med*. 2021 Sep;126[9]:1216-1225. doi: 10.1007/s11547-021-01348-6.
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 Apr;41[4]:406-12. doi: 10.1002/uog.12385.
10. De Mucio B, Serruya S, Alemán A, Castellano G, Sosa CG. A systematic review and meta-analysis of cesarean delivery and other uterine surgery as risk factors for placenta accreta. *Int J Gynaecol Obstet*. 2019 Dec;147[3]:281-291. doi: 10.1002/ijgo.12948.
11. Garofalo A, Pilloni E, Alemanno MG, Garofalo G, Sciarrone A, Todros T, Viora E. Ultrasound accuracy in prenatal diagnosis of abnormal placentation of posterior placenta previa. *Eur J Obstet Gynecol Reprod Biol*. 2019 Nov;242:86-91. doi: 10.1016/j.ejogrb.2019.09.021.
12. Oyelese Y, Smulian JC. Placenta previa, placenta accreta, and vasa previa. *Obstet Gynecol*. 2006; 107[4]:927-41. doi: 10.1097/01.AOG.0000207559.15715.98.
13. Palacios-Jaraquemada JM. Diagnosis and management of placenta accreta. *Best Pract Res Clin Obstet Gynaecol*. 2008 Dec;22[6]:1133-48. doi: 10.1016/j.bpobgyn.2008.08.003.
14. Wong HS, Cheung YK, Zuccollo J, Tait J, Pringle KC. Evaluation of sonographic diagnostic criteria for placenta accreta. *J Clin Ultrasound*. 2008 Nov-Dec;36[9]:551-9. doi: 10.1002/jcu.20524.
15. Comstock CH. The antenatal diagnosis of placental attachment disorders. *Curr Opin Obstet Gynecol*. 2011 Apr;23[2]:117-22. doi: 10.1097/GCO.0b013e328342b730.
16. Shih JC, Palacios Jaraquemada JM, Su YN, Shyu MK, Lin CH, Lin SY, Lee CN. Role of three-dimensional power Doppler in the antenatal diagnosis of placenta accreta: comparison with gray-scale and color Doppler techniques. *Ultrasound Obstet Gynecol*. 2009 Feb;33[2]:193-203. doi: 10.1002/uog.6284.
17. Guo P, Wu Y, Yuan X, Wan Z. Clinical diagnostic value and analysis of MRI combined with ultrasound in prenatal pernicious placenta previa with placenta accreta. *Ann Palliat Med*. 2021 Jun;10[6]:6753-6759. doi: 10.21037/apm-21-1285.
18. Rac MW, Dashe JS, Wells CE, Moschos E, McIntire DD, Twickler DM. Ultrasound predictors of placental invasion: the Placenta Accreta Index. *Am J Obstet Gynecol*. 2015 Mar;212[3]:343.e1-7. doi: 10.1016/j.ajog.2014.10.022.
19. Weiniger CF, Einav S, Deutsch L, Ginosar Y, Ezra Y, Eid L. Outcomes of prospectively-collected consecutive cases of antenatal-suspected placenta accreta. *Int J Obstet Anesth*. 2013 Nov; 22[4]:273-9. doi: 10.1016/j.ijoa.2013.04.014.
20. Tovbin J, Melcer Y, Shor S, Pekar-Zlotin M, Mendlovic S, Svirsky R, Maymon R. Prediction of morbidly adherent placenta using a scoring system. *Ultrasound Obstet Gynecol*. 2016 Oct;48[4]:504-510. doi: 10.1002/uog.15813.
21. Gilboa Y, Spira M, Mazaki-Tovi S, Schiff E, Sivan E, Achiron R. A novel sonographic scoring system for antenatal risk assessment of obstetric complications in suspected morbidly adherent placenta. *J Ultrasound Med*. 2015 Apr;34[4]:561-7. doi: 10.7863/ultra.34.4.561.



International Journal

<https://ijma.journals.ekb.eg/>

Print ISSN: 2636-4174

Online ISSN: 2682-3780

of Medical Arts