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Placenta Accreta Prediction

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Abstract

To compare between the two-dimensional ultrasound and three dimensional power Doppler for diagnosis of Placenta accreta spectrum disorders and prediction of its complications. A prospective cross sectional single-institute study carried out on 86 patients known to have placenta previa during ANC. Total number of patients included in the study was 94 but there was 8 patients did not complete the follow up and we continued the study to reach the sample size (86 patients) and as shown in this table that 33.7% of the patients had accreta, 22.1% had increta, 8.1% had percreta and 36.1% had non-MAP. 3D power Doppler can be used as a complementary technique to 2D ultrasound for confirmation of the diagnosis of placental invasion owing to its high sensitivity.

Keywords: ANC, Placenta, 3D

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1. Introduction

Placenta accreta occurs when placental trophoblasts invade the endometrium beyond the Nitabuch's layer of decidua basalis. Also, placenta increta occurs when placental trophoblasts invade the myometrium and placenta percreta occurs when placental trophoblasts invade the serosa [1]. Placenta accreta range (PAS) issue have become a noteworthy dangerous obstetrical issue because of its expanded rate from 0.12 to 0.31% in the last 30 years and the detailed death pace of roughly 7.0% [2]. In patients with risk factors, it is advisable to assess placental implantation after 12 weeks by using 2D ultrasound and Doppler or nuclear magnetic resonance in order to look for signs that may suggest placenta accrete [3]. Complications of PAS disorders range from uterine rupture in early pregnancy to life-threatening postpartum haemorrhage, frequently requiring aggressive transfusion and surgical treatment. Haemorrhage from the placental bed after attempted placental extraction is the most frequent complication, which can lead to major maternal morbidity and ultimately to maternal death [4]. Infertility and psychological disturbances may have a strong and long-lasting impact on women's health, Long-term complications can also occur, and these need to be considered when counselling women with PAS disorders [5]. Intrauterine synechia have also been reported with successful conservative management. Postpartum pituitary necrosis secondary to hypoperfusion (Sheehan's syndrome) is a rare complication of massive blood loss, leading to hypopituitarism and subfertility [6].

An accurate and an early prenatal diagnosis of PAS allows time for a multidisciplinary team to plan delivery in a center with expertise in surgical management of these disorders. As such, surgical complications, blood loss, requirement for transfusion, hysterectomy, and intensive care unit stay can be reduced in women after antenatal diagnosis, compared with those in whom the diagnosis of PAS is made during the intrapartum period [7],[8].Two-dimensional ultrasound evaluation, by transabdominal and transvaginal approaches, with grayscale and CDI, is the recommended first-line modality for antenatal diagnosis of PAS [9]. Classical ultrasound signs of PAS have been well-documented, including the loss of the normal uteropla-cental interface (clear zone), extreme thinning of the underlying myometrium, and vascular changes within the placenta (lacunae) and placental bed (hypervascularity) [10].

1.1. Aim of the work

To compare between the two-dimensional ultrasound and three dimensional power Doppler for diagnosis of Placenta accreta spectrum disorders and prediction of its complications.

2. Patient and Method

A prospective cross sectional single-institute study will be carried out on 86 patients known to have placenta previa during ANC. This study will be conducted at the Department of Obstetrics and Gynecology, Minia maternity University Hospital, and Feto-Maternal Unit, Department of Obstetrics and Gynecology,, Egypt, from July 2021 to July 2022 in women with singleton pregnancies, between 28 wks. and 38 weeks of gestation will be included.

- Women were referred for US for the evaluation of placenta previa and signs of abnormal placental invasion.
- The patients were given written consent before the study.

2.1. Inclusion criteria

- Patient diagnosed with PAS-disorders during ANC by using ultrasound.
- History of previous one or more cesarean sections.

2.2. Exclusion criteria

- Patients with medical disorders such as bleeding disorders, hypertension and diabetes mellitus, lethal fetal anomalies, and emergency surgery were excluded.
- All the patients included were examined using 2D gray scale US and 3D power Doppler.
- The enrolled patients were routinely followed up afterward and admitted for surgery according to local protocols.
- The patients who decided to withdraw, excluded.

All patients underwent the following:

- Antenatal diagnosis
- This starts by complete history taking with special emphasis on the nature of previous cesarean sections or uterine surgeries, history of hematuria or vaginal bleeding, followed by general and obstetric examination.
- Using GE voluson E8 device (Hatfield, UK) device, first abdominal US will be done with the patient having a full bladder to evaluate the signs of placental invasion.
- Gray scale, color Doppler, power Doppler, and 3D power Doppler will be applied.
- 3D volumes were obtained in automatic sweeps using a motorized curved-array transducer while the women held their breath.
- The scanning of the placental vascular tree was performed with the use of 3D static power Doppler.
- Then the 3D power Doppler volume histogram program automatically calculated the values of vascularization index (VI), flow index (FI), and vascular flow index (VFI) within the obtained volume.
- Final diagnosis of MAP was made based on the surgical and pathological examination of hysterectomy specimen by a perinatal pathologist, which included the presence of accreta, increta, or percreta.

2.3. Perioperative preparations

- Preoperative CBC.
- Preoperative preparation of cross matched at least 4 units of packed RBCS.
- Counseling the patient and her family for the possibility of incidence of C.S hysterectomy, together with taking written high-risk consent and consent for hysterectomy.

3. Results

Regarding the ages of the patients were between 24 and 42 with mean age of 31.86 ± 5.48 years, meanwhile mean BMI is 26.78 ± 3.5 kg/m^2.,the mean parity of patients was 2.56 ± 1.2, and mean gravidity was 3.76 ± 1.57. The number of previous CS ranged from 2 – 5. Table 3 shows that 60.4% of the patients had complete centralis placenta, 26.7% had incomplete centralis placenta, and 12.9% had placenta marginalis. As regard the total number of patients included in the study was 94 but there was 8 patients did not complete the follow up and we continued the study to reach the sample size (86 patients) and as shown in this table that 33.7% of the patients had accreta, 22.1% had increta, 8.1% had percreta and 36.1% had non-MAP. Table (5) shows that means of vascular indices increases as increased the grade of morbidity and adherence of placenta and there is statistically significant difference between the means of VI and VFI while there is no statistically significant difference in the means of FI among the MAP groups. Table (6) shows that US sensitivity was 87.3%, specificity was 90.3%, NPV was 80% and PPV was 94.1% with accuracy of 88.4% in diagnosis of MAP.

4. Discussion

Our results showed that Patients were between the ages of 24 and 42 with mean age of 31.86 ± 5.48 years, meanwhile mean BMI is 26.78 ± 3.5 kg/m^2. The number of previous CS ranged from 2 – 5 and Gestational age ranged from 30 – 38with mean gestational age was 34.69 ± 2.54(weeks). Mean parity of patients was 2.56 ± 1.2, and mean gravidity was 3.76 ± 1.57. Our results showed that 51 patient diagnosed as MAP according to criteria in 2D US findings, 48 patients were MAP by histopathological examination while the remaining 3 patient two of them the placenta was separated easily during caesarean delivery and the remaining patients even the placenta separated easily and there was bleeding and ended by hysterectomy but the histopathological examination did not show any evidence of MAP and the false positive was 9.7%.

Also, 35 patients diagnosed as non-MAP according to criteria in 2D US finding 7 patient were MAP by histopathological examination and 28 patient delivered by caesarean delivery and placenta separated spontaneously easily. There was highly statistically significant difference regarding Comparison of 2D US findings according to histopathology findings. Our results showed that Diagnostic value of 2D US sensitivity was 87.3%, specificity was 90.3%, NPV was 80% and PPV was 94.1% with accuracy of 88.4% in diagnosis of MAP. Among the 2D US parameters, our result agrees with previous stud [11] who reported that 2D US in diagnosis of MAP had sensitivity of 82.6%, specificity of 88.9%, PPV of 85.5%, and NPV of 85%. An earlier study [12] reported sensitivity to detect placenta accreta was 77.43% and specificity was 95.02%. A previous study [13] reported sensitivity of 73% specificity of 86%, PPV 60%, and NPV 90%. An earlier study [14] reported a sensitivity rate of 74% for presence of four or more lacunae. In our result if we compare the VI and FI as a predictor for MAP we found that the values of VI ≥ 18 in diagnosis MAP had 96.5% sensitivity, 93.3% specificity ,high AUC 0.890 with accuracy of 95.4% in diagnosis of MAP. As regard the values of FI ≥ 41.5 in prediction and diagnosis of MAP the sensitivity was 78.6%, specificity was 85.1%, AUC was 0.745 with accuracy of 86.1% in diagnosis of MAP . [15] conducted cross-sectional study in 34 patients known to have PAS and by comparing to gross pathological appearance, the FI value was found to be significant (p - 0.015) while VI and VFI values were found not to be significant , the FI value was also higher as PAS grading increased from actreta to increta

Table 1. Demographic characteristics of the studied patients

	Patients *(n=86)*	
	Mean ± SD	*Range*
Age *(years)*	31.86 ± 5.48	24 – 42
BMI *(kg/m^2)*	26.78 ± 3.5	21 – 32
No. of previous CS	2.92 ± 0.898	2 – 5
GA *(weeks)*	34.69 ± 2.54	30 – 38
Parity *Mean ± SD*	2.56 ± 1.2	2-6
Gravidity *Mean ± SD*	3.76 ± 1.57	2-11

Table 2. Laboratory parameters of the studied patients

	Patients *(n=86)*
Hb *(g/dL)* *Mean ± SD*	10.83 ± 1.64
TLC *(x 10^3/L)* *Mean± SD*	10.15 ± 2.45
PLT *(x 10^3/L)* *Mean± SD*	285.47 ± 47.76
ALT *(U/L)* *Mean± SD*	35.22 ± 9.34
AST *(U/L)* *Mean± SD*	34.57 ± 8.76
INR *Mean ± SD*	1.04 ± 0.156

Table 3. Placental site distribution among the patients

	***Patients** (n=86)*	
	N	***%***
Complete centralis	52	60.4%
Incomplete centralis	23	26.7%
Marginalis	11	12.9%

Table 4. PAS distribution among the patients according to histopathology findings

	***Patients** (n=86)*	
	N	***%***
Non-MAP	31	36.1%
Accreta	29	33.7%
Increta	19	22.1%
Percreta	7	8.1%

Table 5. 3D Power Doppler vascular indices distribution of the studied patients according to Histopathological and surgical diagnosis

	accreta	***increta***	***percreta***	***P value***
Vascularization index (VI) *Mean ± SD*	***27.19±4.30***	***30.85±6.36***	***32.95±4.40***	***0.035***
Flow index (FI) *Mean ± SD*	***42.63±2.06***	***42.90±2.12***	***44.06±1.64***	***0.084***
Vascularization flow index (VFI) *Mean ± SD*	***11.64±2.20***	***13.29±3.02***	***14.57±2.33***	***0.026***

Table (6): Diagnostic value of 2D US in diagnosis of MAP

Statistic	*Value*	*95% CI*
AUC	.888	0.802 – 0.946
Sensitivity	87.27%	75.52% - 94.73%
Specificity	90.32%	74.25% - 97.96%
Positive Predictive Value (PPV)	94.12%	84.45% - 97.92%
Negative Predictive Value (NPV)	80%	66.48% - 88.97%
Accuracy	88.37%	79.65% - 94.28%

Our results showed that Diagnostic value of VI ≥ 18 its sensitivity was 96.5%, specificity was 93.3%, which are better than those of 2D ultrasound (87.27% and 90.32% respectively) in diagnosis of MAP. Another study [16] reported also that the 3D Doppler VI ≥ 16 predicted MAP with a 100% sensitivity 100% specificity which are better than those of 2D ultrasound (60.0% and 89.1% respectively). Sever MAP occurred in 51.2% of MAP and 3D Doppler of VI > 33.1 predicted sever MAP with a sensitivity of 73.9% and specificity of 86.4%, which was superior to 2D ultrasound.

5. Conclusions

3D Doppler ultrasound is more accurate than 2D ultrasound in diagnosis of placenta accreta and degree of adherence in relation to postpartum histopathology and intraoperative findings. 3D power Doppler can be used as a complementary technique to 2D ultrasound for confirmation of the diagnosis of placental invasion owing to its high sensitivity.

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