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Study of Different Gray Scale and Colour Doppler Ultrasonographic Findings for Diagnosis of Placenta Accreta

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A B S T R A C T

To optimize ultrasound and doppler signs for diagnosis of placenta accrete. prospective observational study. The method is to observe 30 pregnant females who had anterior low lying placenta or placenta previa with previous cesarean section were examined by ultrasound and Doppler at 20-24 wks and followed up every four weeks till termination of pregnancy by cesarean section for gray scale and colour Doppler signs of placenta accrete. The study resulted in " loss of retroplacental clear space" sign was found in 28 patients (93.33%) at 28 weeks of gestation and in all patients (100%) at 32 and 36 wks of gestation. Also in Doppler signs,"placental lacunae" sign was found in 28 cases (93.33%) at 32 wks and 30 cases (100.00%) at 36 wks of gestation. However "dilated vessels around the cervix" sign, only 2 cases (6.67%) was found at 36 wks of gestation. It is concluded that the signs of diagnosis of placenta accreta by normal ultrasound and Doppler are sensitive and specific at different gestational ages, so early use of gray scale ultrasound and doppler is important in early diagnosis of placenta accreta.

Introduction

Placental adhesive disorder is a catastrophic and life-threatening obstetric condition which is an important cause of intrapartum and postpartum hemorrhage and peripartum hysterectomy.[1] Placenta accrete (a collective term for accreta, increta and percreta) occurs as a result of a defect in the decidua basalis, allowing the anchoring villi to penetrate into the myometrium.[2]

The risk factors for placental adhesive disorder are: placenta previa, prior uterine surgery such as cesarean section, myomectomy, Asherman syndrome, endometrial defects due to vigorous curettage, corneal resection, anterior placenta, smoking, hypertension, pregnancy induced via in vitro fertilization (IVF), subserosal and submucosal myoma, and may vary while fetus is male or female.[3] Most important complication of placenta accrete is due to catastrophic blood loss, other complications are adult respiratory

distress syndrome, Sheehan's syndrome, renal failure, and even death. Thus there is a need for early reliable antenatal diagnosis of placenta accrete, if these pregnancies can be identified before delivery, the site and time of delivery, as well as the surgical approach, can be planned ahead and blood loss minimized[4]

Diagnosis of placenta accreta could be done by gray-scale sonographic diagnostic criteria which include thinning of the myometrium underneath the placenta**,** Loss of the retroplacental "clear space and interruption of baldder line.[5]while by using color Doppler includes diffuse and focal irregularly shaped placental lacunae, turbulent flow, tornado sign, increased peri-uterine vascularity between uterus and urinary bladder, interphase hypervascularity with abnormal blood vessels linking the placenta to the bladder and markedly dilated peripheral subplacental vascular channels with pulsatile venous-type flow over the uterine cervix.[6]

Operative management of placenta accrete was a matter of debate, and it ranges from hysterectomy with placenta insitu, to cutting the cord short without attemping removal of the placenta with post operative methotraxate intake and now there is wide varities of operative conservative treatment of placenta accrete either hemostatic suturing of placental bed, stepwise uterus preserving technique, trimming of lower uterine segment and bilateral uterine artery ligation [7.] With the sensitivity of individual criteria ranging from 7% to 93%.[8]with the use of color and/or power Doppler, the reported sensitivity and specificity of antenatal diagnosis increase to 82.4–100% and 92–96.8%, respectively.[9]

Cases selection

This study had been conducted on 30 pregnant women attending the outpatient clinic and inpatient Department of Obstetrics and Gynecology, Tanta university hospital

They were selected according to the following criteria :

Gestational age of pregnancy 20-24 weeks

All patients had:

anterior low lying placenta in primigravida *or* anterior placenta previa with history of previous Cesarean section

They were excluded if :

Patients had moderate or severe antepartum hemorrhage.
Chronic diseases as any cardiac disease, renal and hepatic disease.

Materials and Methods

Written consent was taken from all patients submitted to the study withclarification of the methods, value and hazards of the study.
Detailed history taking from all patients.
Full general, systemic and pelvic examination.
Abdominal and transvaginal U/S examination with Doppler study:

It was done to the female at 20-24 weeks gestation Using Siemens Acuson X300 premium edition ultrasound. Ultrasound was done by ultrasound machines using the curvi-linear transducer (at frequency 3–5 MHz) or endovaginal transducer (at frequency 3–9 MHz). The lower uterine segment is evaluated using the highest-frequency transducer that can produce an adequate image, which is often a 5-MHz transducer. Transabdominal imaging is performed with the patient's bladder full. Transvaginal US is always performed when the placenta is low lying or placenta previa is present.

The placenta was assessed for the following:

The gray-scale sonographic diagnostic criteria are:
Thinning of the myometrium underneath the placenta
Loss of the retroplacental "clear space,"
Protrusion of the placenta and may reach to the serosa of the bladder, (interruption of baldder line).[6]

Signs of placenta accrete by color Doppler study:

Diffuse irregularly shaped placental lacunae (vascular spaces) within the placenta,
Focal irregularly shaped placental lacunae (vascular spaces) within the placenta
Turbulent flow, tornado sign
Increased peri-uterine vascularity between uterus and urinary bladder,interphase hypervascularity with abnor mal blood vessels linking the placenta to the bladder
Markedly dilated peripheral subplacental vascular channels with pulsatile venous-type flow over the uterine cervix.[7]
The patients have been followed up at 4 weeks interval till 36 weeks -38 weeks gestation (time of termination of pregnancy)
All patients at time of follow up visit have been checked for the maternal and fetal status, and checked for new complaint.
Follow up gray scale and Doppler ultrasound examination have been done and compare the findings with the previous findings for the appearance of new finding, disappearance of previous finding, progression of previous finding or the observation of no changes
All this data have been recorded in special file for the patients included in that study.

Cesarean section

Cesarean section has been done at 36-38 weeks gestations according to maternal and fetal condition
Intraoperative observation of the degree of placental adhesion
Operative complications as bladder injury, atony or blood transfusion and postpartum complications as shock, sepsis or second operation if presented was recorded
All this data have been recorded in special file for the patients included in that study
Operative data have been correlated with the sonographic findings.

Ethical approval

This study was approved by local ethical committee of Tanta University before the start of this study.

Results and Discussion

In this study, it was found that " loss of retroplacental clear space" sign was found in all patients (100%) at 32 and 36 wks of gestation. And "placental lacunae" sign was found in all 30 cases (100.00%) at 36 wks of gestation. However "dilated vessels around the cervix" sign, only 2 cases (6.67%) was found at 36 wks of gestation.

Degree of placenta accreta at time of operation was, 22 (73.33%) cases had placenta accrete [3 patients (10%) were accrete, 14 patients (46.67%) were increta and 5 patients (16.67%) were percreta] and 8 women were not accrete and placenta separated easly.fig (1)

Operative end results were 4 (13.33%) cases underwent hysterectomy and 26 (86.67%) women including the 8 women who were not accrete were completed conservative. (table 1). Complications were divided into; need for blood transfusion in 16 cases (53.33%), bladder injury in 6 cases with (20.00%) percentage and need ICU admission in 7 cases

(23.33%). Myometrial thining as a sign for placenta accreta was most accurate at 36 weeks of gestation with percentage of 83.33% and its sensitivity reaches to be 100% at 36 weeks of gestation and was most specific at 24 wks of gestation by percentage (100%) (table 2).

Loss of retroplacental clear space was most specific at 20 wks gestational age (100%) , was most accurate at 24 weeks of gestation by percentage of 83.33% and its sensitivity reaches 100% at 28,32 and 36 wks of gestation.(table 2)

Interruption of bladder line, it was specific at 32wks and 36 wks of gestation by 100 % despite that high specificity, its sensitivity was very low 22.73% at 36 weeks gestation, and so the accuracy was low at 36 wks by 43.33 %. This sign did not appear except after 32 weeks gestation.(table 2)

About placental lacunae, it shows 100% specificity at 20 and 24 wks of gestation and 100% sensitivity at 36 wks of gestation then at 32 wks by 95 % and more accurate at 28 wks by 80 %.(table 2)

The tornado sign was 100% specific at 24,28 and 32 wks of gestation, it was 91 % sensitive at 36 wks of gestation and most accurate with 86.67 % at 36 wks of gestation (table 2).

increased periuterine vascularity between uterus and urinary bladder was 100 % specific at 28,32,36 wks of gestation but shows low sensitivity with accuracy 60% at 36wks.(table 2). Dilated vessels over the cervix didn't appear except at 36 wks of gestation and with specificity 100 %, sensitivity was very low, and accuracy was 33 %.(table 2)

It is desirable to identify placenta accreta before birth so plans can be made for a controlled delivery, available blood products, and back up surgical help to prevent forceful detachment of placenta from uterine wall and thus severe uncontobable hemorrhage that lead to hysterecyomy.[10]

Hemorrhagic and surgical complications associated with placental adhesive disorder depend on the depth of placental invasion and involvement of adjacent structures.[11]

Placenta adhesive disorder with bladder invasion is a serious condition, which necessitates proper antenatal diagnosis and appropriate management strategy [10]

The risk of performing an unnecessary hysterectomy (false positive) or the risk of secondary bleeding following attempted placental removal (false negative) should always be considered.

This study was conducted on 30 pregnant women attended the outpatient clinic and inpatient Department of Obstetrics and Gynecology, Tanta university hospital. The study was taken from December 2017 to December 2018.

For all selected patients, they were followed till 36-38 weeks of gestation by First Abdominal U/S examination and colour Doppler to optimize ultrasound and doppler signs for diagnosis of placenta accrete. After proper statistical analysis it was found that All of the 22 cases having placenta accreta, (100%) had placental lacunae with Doppler abnormality. Placental lacunae were found in all women with placenta accreta with specificity at 20 wks and 24 wks of gestation by 100 % and sensitivity at 36 wks of gestation by 100 % but at 32 wks by 95.45 %.

According to thinning of the myometrium underneath the placenta, in our study we found that it was most accurate at 36 weeks

of gestation with percentage of 83.33% and its sensitivity reaches to be 100% at 36 weeks of gestation and was most specific at 24 wks of gestation by percentage (100%).These results were in agreement with Shawky *et al.,* study [12](in their study on 50 pregnant women, 18 of the 50 pregnant woman were diagnosed as placenta accreta by surgical criteria on doing Cesarean section)and Wong *et al.,* study in specifity of 100% but in disagreement with sensitivity.[13]

According to loss of retroplacental clear space, in our study we found that it was most specific at 20 wks gestational age (100%) , was most accurate at 24 weeks of gestation by percentage of 83.33% and its sensitivity reaches 100% at 28,32 and 36 wks of gestation. These results were in agreement with Comestock *et al.,* and Wong *et al.,* study in sensitivity of 89% but in disagreement with these 2 studies in specifity of 50%.

Regarding interruption of bladder line, in our study we found that it was specific at 32wks and 36 wks of gestation by 100 % but more accurate at 36 wks by 43.33 % and its sensitivity was about 22.73% at 36 wks of gestation.

These results were in agreement with Shawky *et al.,* and Cali *et al.,* in specify of 94% and sensitivity of 33%. [14] Regarding the specificity (100%) and PPV =100%, denoting the importance of this sign in diagnosis of placental accretion. According to placental lacunae sign, in our study we found that it was specific at 20 wks and 24 wks of gestation by 100 %, most sensitive at 36 wks of gestation by 100 % then at 32 wks by 95.45 % and more accurate at 28 wks by 80 %.In agreement of our study, Shawky *et al.,* they found that Placental lacunae have a sensitivity of 89%, specificity of 81%, positive predictive value of 73% and negative predictive value of 93%.

These results were also in agreement with a study by Wong *et al.,* in sensitivity but in disagreement with specificity and positive predictive value of 39% and 17%, respectively. And it was in agreement with study by Cali *et al.,* in sensitivity of 73%, specificity of 86%, positive predictive value of 60% and negative predictive value of 90%.

About tornado sign (turbulent flow), in our study we found that it was of specificity 100 % at 24,28 and 32 wks of gestation with PPV (100%), it was most sensitive with 90.91% and most accurate with 86.67 % at 36 wks. These results were in agreement with Comstock et al., and Shawky *et al.,* studies who found that turbulent flow (Tornado-shaped flow of venous, arterial or mixed blood) are more likely with placenta accrete (PPV = 100%).

About increased periuterine vascularity between uterus and urinary bladder, in our study we found that, it was most specific in 28,32,36 wks of gestation by 100 % and most accurate at 36 wks by 60% but its sensitivity was about 45.45% at 36 wks of gestation.

These results were in agreement with Cali *et al.,* study in specificity of 100%, but the sensitivity was 90% and this disagrees with our study.These results were in disagreement with Shawky *et al.,* study as this sign sensitivity was 78% and specificity was 56%.

It is concluded that the signs of diagnosis of placenta accreta by normal ultrasound and Doppler are sensitive and specific at different gestational ages, so early use of gray scale ultrasound and doppler is important in early diagnosis of placenta accreta.

Table.1 Shows the operative end result of the cases whether conservative or hysterectomy

Operative result		
	N	%
Conservative	26	86.67
Hysterectomy	4	13.33
Total	30	100.00

Table.2 Shows sensitivity and specificity of signs of placenta accrete that found in patients at different gestational age

|	20 Weeks		24 Weeks		28 Weeks		32 Weeks		36 Weeks	
	Sens.	Spec.	Sens.	Spec.	Sens.	Spec.	Sens.	Spec.	Sens.	Spec.
Thin endometrium	0	0	13.6	100.0	40.9	87.5	86.36	62.50	100.00	37.50
Clear retroplacental space	54.55	100.00	95.45	50.00	100.00	25.00	100.00	0.00	100.00	0.00
Interruption bladder line	0.00	0.00	0.00	0.00	0.00	0.00	9.09	100.00	22.73	100.00
Lacunae	18.18	100.00	63.64	100.00	86.36	62.50	95.45	12.50	100.00	0.00
Tornado sign	30	100.00	4.55	100.00	18.18	100.00	68.18	100.00	90.91	75.00
Increased periuterine Vascularity	0.00	0.00	0.00	0.00	4.55	100.00	13.64	100.00	45.45	100.00
Dilated vessels around Cervix	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.09	100.00
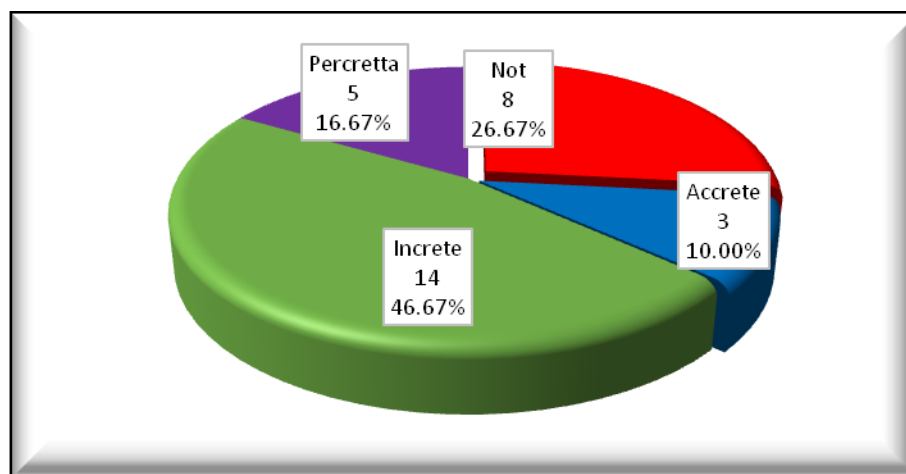
Fig.1 Shows degree of placenta accrete at time of operation

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