Antenatal diagnosis of myometrial invasion in anterior placenta previa by transabdominal color Doppler ultra sound

Dr. Jwan N. Sulaiman*

Abstract

Background: The incidence of maternal mortality in placenta previa accrete is 7%,and its preoperative diagnosis is of a great value.

Objective: to evaluate the efficacy of transabdominal color Doppler ultrasound in diagnosing placenta previa accreta and inccreta. Color Doppler imaging criteria used in: includes diffuse parenchymal placental lacunar flow, focal intra parenchymal placental lacunar flow and bladder uterine serosa interphase hyper-vascularity.

Design: Prospective study on patients from January2007 to January 2008.

Patients and method: 48patients with one caesarean section or more and with persistent anterior placenta previa diagnosed by transabdominal ultrasound were examined by color Doppler at 32 or more weeks of gestation to determine the possibility of myometrial invasion depending on the above color Doppler criteria.

Results: Out of 48 patients eleven exhibited characteristic Doppler imaging pattern highly specific for placenta accreta and inccreta according to preceding criteria , one patient had false positive color Doppler imaging result, 5 patients underwent caesarian hysterectomy , the remaining five were treated conservatively by uterine artery ligation and other conservative measures because of bleeding from the lower uterine segment.

Conclusion Color Doppler sonography is highly sensitive and
specific in the antenatal diagnosis of placenta previa accreta .If a strong suspicion is found before delivery ,appropriate location and timing for delivery should be considered ,to allow access to adequate surgical personel and equipment ,preoperative blood preparation to reduce morbidity and mortality.

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Introduction

The incidence of placenta accreta has increased 10 fold in the past 50 years and now occurs with a frequency of 1 per 2,500 deliveries. Women who have had 2 or more cesarean deliveries with anterior or central placenta previa have nearly a 40% risk of developing placenta accrete and increta.the incidence of placenta accrete ,increta and percreta have been increased because of the increased caesarean delivery rate [(1)]An abnormally adherent placenta, although an uncommon condition, assumes considerable significance clinically because of morbidity and at times mortality from severe hemorrhage, uterine rupture, and infection .

The term Placenta Accreta is used to describe any placental implantation in which there is abnormally firm adherence to the uterine wall. As the consequence of partial or total absence of the decidua basalis and imperfect development of the fibrinoid layer, placental villi are attached to the myometrium. In Placenta Increta, it invades the myometrium and in Placenta Percreta, it penetrates through myometrium reach the peritonium. The abnormal adherence may involve all of the cotyledons (total placenta accreta), a few to several cotyledons (partial placenta accreta), or a single cotyledons (focal placenta accreta). Placenta accreta is the most common form of placental invasion (76% of cases), followed by placenta increta (18%) and placenta percreta (6%) [(2)].

Although this classification scheme is widely accepted, the majority of the published literature discusses these abnormalities collectively as placenta accrete [(3)].

Abnormal placental adherence is found when decidual formation is defective. The risk factors for placenta accreta include:
Previous uterine surgery, (Caesarean section ,myomectomy) ,Ashermans syndrome ,maternal age more than 35 years and grand multiparous

Early in pregnancy, the maternal serum alpha-fetoprotein level may be increased. The possibility exists that placenta increta might be diagnosed in antepartum (5).

The need to predict the presence of placenta accrete is now of great importance, so this study was stated to

see the role of color Doppler ultrasound. Placenta accreta can be diagnosed using gray-scale sonography, color Doppler sonography, and power Doppler.

Transvaginal sonography. This simple, widely available technique is now the preferred route for evaluating a patient suspected of having placenta previa. TVS is highly accurate with a sensitivity of 87.5%, a specificity of 98.8%, and positive and negative predictive values of 93.3% and 97.6% respectively[15][16].

Although it may appear dangerous to introduce an U/S probe into the vagina of patients with placenta previa, this technique has been shown to be safe.17 The probe is placed under direct visualization and does not need to touch the cervix to obtain an adequate image. In fact, since the focal length of the probe is 2 to 3 cm, placing the probe too close to the cervix will blur the image. In addition, since the longitudinal axis of the vagina and the cervix are different, it would be highly improbable to reach the internal cervical os using this route.[7]. Once the clinician obtains an image of the internal cervical os, he or she can easily ascertain its relationship to the lowermost placental edge.

Color Doppler sonography. Doppler ultrasound has been suggested as a sensitive aid in diagnosing placenta accreta because it highlights areas of increased turbulent flow that may extend from the placenta into the surrounding uterine wall and cervix. The sensitivity and specificity of color Doppler imaging for diagnosing placenta previa accreta, especially anterior placenta accreta, have been high, because it can detect with a high level of confidence abnormal uteroplacental hypervascularity caused by the angiogenesis of placental invasion.

Lerner and colleagues reported a sensitivity of 100% and a specificity of 94% for the prenatal detection of placenta accreta using color Doppler.[21] Also, this technique may allow turbulent flow to be visualized in cases of placenta percreta where placental vessels extend beyond the uterine serosa and reach other pelvic organs, such as the bladder. Chou and colleagues have characterized the following color Doppler criteria as suggestive of placenta previa myometrial invasion [22]:

(1) A diffuse lacunar flow pattern from dilated vascular channels scattered throughout the whole placenta and the surrounding myometrial or cervical tissues. High velocity pulsatile venous-type flow can be found in the sonolucent vascular spaces. A finding of this nature has been associated with a higher level of maternal morbidity and mortality.

(2) A focal lacunar flow pattern showing irregular sonolucent vascular lakes with turbulent lacunar flow distributed regionally or focally within the intraparenchymal placental area.

(3) Interface hypervascularity with abnormal blood vessels linking the placenta to the bladder

(4) Markedly dilated peripheral subplacental vascular channels with pulsatile venous-type flow over the uterine cervix.

(5) Absence of subplacental vascular signals in the areas lacking a peripheral hypoechoic zone.

Using these criteria, these investigators reported a sensitivity of 82.4% and a specificity of 96.8% for the antenatal diagnosis of myometrial invasion in anterior placenta previa .[22] The positive and negative predictive values were 87.5% and 95.3%, respectively. Therefore, color Doppler may offer an advantage over gray-scale U/S in that the specificity may be higher and the depth of invasion may be better assessed. In any case, color Doppler is generally used as an adjunct technique to evaluate suspicious findings seen with gray-scale sonography.

Methods:

During the period from January 2007- to January 2008, 853 patients were examined in the outpatient clinic of AL-Ewiyah maternity teaching hospital and in the private clinic .Patients with gestational age of 32 or above weeks of gestation and those with history of previos 1 or more caesarean section were included in the prospective study,they were sent to transabdominal ultrasound to determine the site of the placenta.

Forty eight patients showed anterior placenta previa of different grades

and they were examined by color Doppler sonography to diagnose the presence or absence of myometrial invasion.

The surgical operations were done by different obstetricians working in AL-Elwiyah maternity hospital and Dar Alnajat private hospital. The

Fourty eight patients were with anterior placenta previa, their ages were ranged from 21 years to 45 years with mean 33.46 .The results of colour Doppler ultrasound were compared to the intra operative findings at the time of caesarean section.

Statistical analysis was done according to the SPSS program using the chi- square test used to assess the predictive value.

Results:-

Table no. (1) shows the age groups with their percentages of the 48 patients included in the study. Most of the patients were from the age group of (30-39) 33 (68.8%) patients.

Table no. (1): Age groups

Age group	Frequency	%
20-29	8	16.7
30-39	33	68.8
40 and >	7	14.5
Total	48	100.0

Table no. (2) Shows the parity of the 48 patients included in the study. 30 of them (62.5%) had more than 5 children.

Table no. (2): Parity

Parity	Frequency	%
1	6	12.5
2-4	12	25
5 or more	30	62.5
Total	48	100.0

Table no. (3) shows the frequency of the C/S of the patients included in the study. Most of the patients 20 (41.6%) were with previous 4 C/S .

Table no. (3) : C/S

C/S	Frequency	%
1	8	16.7
2	6	12.5
3	12	25.0
4	20	41.6
5	2	4.2
Total	48	100.0

This table shows the grading of the anterior placenta noticed by U/S for 48 patients. Most of the 27 (516.25%) were from grade I, 15 (31.25%) were from grade II , and only 6 (12.5%) of them were from grade III.

Table no. (4) : U/S Results

Placenta grading	Frequency	%
Grade I	27*	56.25
Grade II	15	31..25
Grade III	6	12.5
Total	48	100.0

P< 0.001*

The Pre operative Doppler study shows that out of 48 patients with anterior placenta only 11of them (22.9%) had myometrial invasion, while 37 (77.1 %) had no myometrial invasion, as shown in Table (5).

Also intra operative finding show that 10 of the 48 patients had Myometrial invasion while 38 had not as shown in table no. (6)

Table no. (5) : Pre operative Doppler Results

Result of Pre operative Doppler Study	Frequency	%
Myometrial invasion	11	22.9%
No Myometrial invasion	37*	77.1%
Total	48	100.0

P<0.001 *

Table no. (6): Operative out come

Operative Invasion	Frequency	%
Myometrial invasion	10	20.1%
No Myometrial invasion	38*	79.1%
Total	48	100.0

P<0.001 *

Table no. (7) show the U/S grading of the anterior placenta compared to pre operative Doppler study. Out of 27 patients with grade I , only 1 (3.8%) had myometrial invasion, and out of 15 patients with grade II only 5 (33.3%) had myometrial invasion, and 5 (83.3%) from 6 with grade III had myometrial invasion.

Table no. (7): Grading of placenta by U/S compared to pre operative Doppler results

Placenta grading	Myomet, invasion	No Myomet invasion	Total
Grade I	1 (3.8%)	26	27
Grade II	5 (33.3%)	10	15
Grade III	5 (83.3%)	1	6
Total	11	37	48

P<0.001

The sensitivity of color Doppler in diagnosing placenta previa accrete in the current study was 91% and its specificity was 97% in the current study.

Table(8)

	Estimated Value	95% Confidence Interval	
		Lower Limit	Upper Limit
Prevalence	0.229167	0.125145	0.37666
Sensitivity	0.909091	0.57117	0.995236
Specificity	0.972973	0.841906	0.998588

Discussion

With the rising incidence of caesanan section, operations, the number of cases of placenta previa and its' complication will continue to increase (7 , 8 , 10 , 14).Placenta accrete occurs in approximately 1 in 2500 deliveries and has increased 10 folds in the last 50 years (22).

Gravid hysterectomy has been associated with maternal mortality rate of 7.4% with 90% incidence of blood transfusion .28% of postpartum infection and 5% incidence of ureteral injuries or fistula formation<2i). Placenta accrete is a growing cause of post partum hemorrhage and an increasing cause of hysterectomy (21)

In the prospective study. 48 patients had placenta previa by abdominal ultrasound. 11 of them were diagnosed as a cases of placenta previa accreta or increta by pre -operative color Doppler sonography. Intra operatively. in 10 patients the placenta were difficult to be separated from the lower uterine segment, there was myomaterial invasion.

Intra-operative hemorrhage was controlled using conservative measures (oxytocic drugs, ergometrrne. uterine packing, placenta bed suturing) . In 5 patients bilateral uterine artery ligation was beneficial and the bleeding stopped, in the remaining 5 patients it was useless and abdominal hysterectomy was preformed to stop the intra-operative bleeding and save the life of the patients. The patients received blood units ranged from 5-8 unit of blood.

Miller et al. in 2002 in hospital in Boston found among 101 cases with placenta previa. 20 cases were with myomaterial invasion discarded by color Doppler study (22.7%) and at the time of operation 25 patients were with myomaterial invasion. 17 patients needed hysterectomy (24)

There were no urinary injuries nor bowel injuries in the current study, the patients were transferred to the intensive care unit and. received antibiotics and fluid, maternal mortality rate was nil.

In a study was done by Dora et. al. 2003, ureteric injury occurred in a rate of 2-3% in patients with placenta previa accrete during hysterectomy and ureteral neocystostomy was performed later on (22)

In the prospective study, the perinatal mortality rate was 2.08% (one neonate died) because of prematurity.

In one study in New Orleans, the neonatal complication of placenta previa accrete occurred (because of prematurity, intra uterine growth restriction because of bleeding and hypoxia), the perinatal mortality rate was 2-3% in case of placenta previa accrete (23).Dr Gary and dr DidlyIII stated that placental invasion is not the most common cause of postpartum hemorrhage but its occurinjg more frequently and has the highest association with maternal complications resulting from postpartum hemorrhage(21)

The ACOG Committe opinion states that profuse hemorrhage can occur when attempting to separate the placenta. If the clinician is extremely confident in the diagnosis, it may be prudent to complete the delivery of the infant and proceed with hysterectomy while the placenta remains attached (22).

If the color Doppler finding revealed placenta accrete (the patient has an 80% likeli hood of undergoing hysterectomy following delivery (22).

Dr. James L. Ferguson said that the rate of placenta accrete in patient with placenta previa was 5% if no prior C/S, 25% with one prior C/S and 50% with two or more prior C/S(23)

According to ACOG committee ((an increasing number of women are requesting elective C/S instead of vaginal delivery in the benefit that surgery will prevent future pelvic support or sexual dysfunction problem,will increase the rate of placenta accrete))(22)

Hansch and Coworkers has experienced extensive hemorrhage in 4 patients out of 6 patients with placenta previa accrete, in 3 patients the bleeding was controlled by uterine artery ligation and in 1 patient had prophylactic uterine artery catheterization and embolization (23).

Tominage and Page revealed in one study in Taipie, the relation between smoking and high altitude living and the increment in the rate of placenta previa because of the hypoxemia which leads to the enlargement of the placental surface area to be effective method of coping with the relative hypoxemia (25).Color Doppler has been suggested the more accurate tool in diagnosing placenta previa and its complication because it highlights areas of turbulent blood flow that may extend from the placenta into the surrounding uterine wall and cervix.

Lerner and colleagues reported a sensitivity of 100% and a specificity of 94% for the prenatal detection of placenta accrete using color Doppler.(15)

Chou and colleagues have characterized the following criteria as suggestive of placenta previa accrete table 9(17).

Color Doppler criteria to diagnose placenta previa accrete

1-Dilated vascular channels with diffuse lacunar flow.

2-Irregular vascular lakes with focal lacunar flow.

3-Hypervascularity linking placenta to the bladder.

4-Dilated vascular channels with pulsatile venous flow over the cervix.

5-Poor vascularity at the site of loss of hypoechoic zone.

Conclusion:

Women with risk factors like previous caesarean section should be screened for placenta accrete by color Doppler sonography before 36 weeks of gestation.

Placenta accrete and increta is rare but potentially catastrophic obstetrical complication. Antenatal diagnosis is a valuable aid in prenatal management as it allows the clinician to anticipate and recognize complications that other wise might not be expected. Because of the potential life threatening complications of placenta accrete ,its imperative that obstetricians recognize its increasing frequency ,risk factors and the diagnostic modalities that are available.[4,5]

Color Doppler U/S remain the main diagnostic tool in the prenatal diagnostic of placenta accrete, and increta (myometrial invasion)whenever placenta previa or anterior placenta in the patients with previous uterine scar, place special attention on sonogrphic evaluation (including Color Doppler) of placental myometrial invasion.[21].

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** lectural in Al-kindy College of Medicine University of Baghdad, Obstetrician and Gynecologist in Elwiyah Teaching Maternity Hospital.*