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RESEARCH ARTICLE

EVALUATION OF DIAGNOSTIC AND SCREENING CRITERIA OF PLACENTA PREVIA ACCRETA BY TRANSABDOMINAL ULTRASONOGRAPHY

***Dr. Atheer A. Fadhil (D.M.R.D. ,F.I.B.M.S.), Dr. Wassan M. Abd Alzahra (D.M.R.D.,F.I.B.M.S), Dr. Nameer H. Abduljabbar (M.B.Ch.B.), Dr. Warda S. Laso (M.B.Ch.B ,D.O.G) and Dr. Haider B. Al Shama·a (F.I.B.O.G)**

Department of Radiology, Baghdad Teaching Hospital, Baghdad, Iraq

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ABSTRACT

Background: Placenta previa accreta is a morbidly attached placenta villi to the uterine wall with absence of the decidua basalis. ***Objective:*** to evaluate the diagnostic value of sonographic criteria in placenta accreta and to develop screening tools for antenatal evaluation. ***Patient and Methods:*** sixty pregnant women beyond 28 weeks of gestation having placenta previa in their current pregnancies underwent obstetrical ultrasound & gray-scale and Doppler sonographic criteria for the diagnosis of placenta accreta were recorded, all cases were followed up until end of pregnancy & the final diagnosis was confirmed by surgical and histopathological reports. ***Results:*** Disruption of the placental–uterine wall interface and the presence of vessels crossing these sites were the only two high significant individual criteria that could distinguish placenta accreta from non-accreta ***Conclusion:*** Color doppler ultrasonography had a higher overall accuracy (95%), in diagnosis of placenta accreta compared to lower but still valuable gray scale ultrasonography (90%).

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INTRODUCTION

Morbidly-adherent placentas manifest as placenta accreta, increta or percreta, depending on the depth of placental invasion (Nizami, 2009). These conditions present high risks of severe obstetrical haemorrhage at delivery (Warshak, 2010). The underlying pathology is due to defects in the decidua basalis caused by a variety of insults, such as previous surgery, excessive curettage or infection (Biswas *et al.,* 1999). The incidence of morbidly adherent placentas is rising as the frequency of caesarean sections increase (Cunningham *et al.,* 2009). There are other risk factors including the placenta previa itself, previous uterine surgery, as prior myomectomy, Asherman's syndrome, submucous fibroids & maternal age older than 35 years (Gielchinsky *et al.,* 2002). The term placenta accreta will be used collectively for percreta, increta, and accreta vera in this study.

Ultrasonographical features: The diagnosis of placenta accreta can be difficult but is possible using grey scale ultrasonography (US) and colour Doppler ultrasonography (Dwyer, 2008). Various criteria for identification of placenta accreta on antenatal grey scale sonographic examination have been reported or suggested including features as (seen in Figure 1): Obliteration of the retroplacental hypoechoic zone (including focal obliteration), presence of placental lacunae, smallest measured myometrial thickness less than 1 or 2 mm in the lower uterine segment adjacent to placenta, placental–uterine wall interface disruption, presence of focal exophytic mass with same echogenicity as the placenta beyond the uterine serosa (predictive sign for placenta percreta) (Chou *et al.,* 1992, Chou *et al.,* 2000 and Fleischer C. Arther, 2004). As so Doppler criteria including features as (seen in Figure 2): increased subplacental vascularity (by comparing the vascularity in the subplacental area to that in the adjacent non – sub placental area, irregular flow in the placental lacunae. Vessels bridging the placenta and uterine margin or serosa and vessels crossing the sites of interface disruption. Hyper vascularity of the bladder–uterine serosa interface (for percreta) (Levine *et al.,* 1997, Hobbins c. john, 2008 and Rosemond and Kepple, 1992).

PATIENTS AND METHODS

This is a prospective study was performed from the 1st of September 2010 to 30 of April 2011 in the radiology department of Baghdad teaching hospital in medical city, Baghdad. The study sample consisted from 60 pregnant women

Corresponding author:* **Dr. Atheer A. Fadhil,
Department of Radiology, Baghdad Teaching Hospital, Baghdad, Iraq.

beyond 28 weeks gestation referred for exclusion of placenta accreta because of the presence of risk factors for whom trans-abdominal sonographic examinations utilizing (Philips HDx11, Netherlands), using a 2-5MHz curved array transducer and/or a 12–5-MHz linear-array transducer. Gray-scale sonography, color and/ or power Doppler sonography were performed in all women and the sonograms were reviewed regarding the presence or absence of the following criteria on gray-scale imaging: Obliteration of the retroplacental clear space (including focal obliteration); interruption of interface between the posterior bladder wall and the uterus; presence of focal exophytic mass with same echogenicity as the placenta beyond the uterine serosa; placental lacunae; smallest myometrial thickness adjacent to the placenta <1 mm; and disruption of the placental–uterine wall interface. The criteria on color or power Doppler imaging included: increased subplacental vascularity (by comparing the vascularity in the subplacental area to that in the adjacent non-subplacental area); flow in the placental lacunae; hypervascularity of the bladder–uterine serosa interface; vessels extending from the placenta to the bladder; vessels bridging the placenta and uterine margin (or serosa); and vessels crossing the sites of interface disruption. Women with positive signs of placenta accreta by transabdominal sonography were followed up as those who suspected to have pl. pr. without accreta until delivery to know how the pregnancy ended. The diagnosis of placenta previa accreta was confirmed by surgical findings and the histopathological diagnosis when it is appropriate. The statistical software package SPSS version 14.0 was used for data analysis. The accuracy of the various criteria in discriminating placenta accreta from non-accreta was examined in terms of sensitivity, specificity, positive predictive value, and negative predictive value and compared.A 2-tailed Fisher's exact test was used to determine the association of various sonographic criteria with the presence of placenta accreta. A p value of less than 0.05 was considered statistically significant, and if less than 0.001, considered as highly significant. Then further evaluation done on test performing characteristic way see figure 3 in order to detect which is more accurate in discriminating placenta previa accreta from non-accreta ,gray scale or Doppler ultrasonographic exam.

RESULTS

In 22 (36.6%) of the sixty women in the study sample , the diagnosis of placenta accreta was confirmed, 12 histologically (placenta accreta or increta, diagnosed on hysterectomy specimen in 10 cases and on placental specimen in 2 case), and the rest 10 cases diagnosed clinically on surgical notes. The demographic data of the 22 women with and 38 women without placenta accreta are shown in Table 1. There was no statistically significant difference between the 2 groups in terms of age, parity number of previous curettage and gestational age at the time of the sonographic examination while the number of previous caesarean section and multigravity both show significant correlation with incidence of placenta accreta regarding the results of ultrasound criteria analysis. By looking to tables 2A&B out of the positive 22 women with placenta accrete there were five criteria showing a statistically significant association with placenta accreta namely: 22 cases (100%) had obliteration of retro placental clear space, (P value < 0.05) and 5 cases (22.7%) showed myometrial thickness <1 mm, (P value <0.05), 7 cases (31.8%) had vessels bridging placenta and uterine margin or serosa. (P value<0.05), 19 cases (86.4%) had disruption of the placental–uterine wall interface, (P value <0.001) and 17 cases (77.3%) showed vessels crossing the site of interface disruption. (P value <0.001), The last two criteria of disruption of the placental–uterine wall interface and vessels crossing the sites of interface disruption showed a highly significant association with cases of placenta accreta (p <0.001 for both) with high accuracy of 91.5 % for the former and 96.5% for the latter. Both are applicable to all cases regardless of the extent of myometrial invasion in the case of Placenta accreta (i.e. accreta vera, increta, or percreta).

In addition to that only 2 criteria had a sensitivity of 100%:

- obliteration of retroplacental clears pace (22/22)
- placental lacuna flow (17/17, when color or power Doppler was performed in the presence of placental lacuna).

It appears that a few of the reported criteria could be found in both women with placenta accreta and women without placenta accreta, like Placental lacunae were found in 23 cases (60%) of the 38 non accreta cases as obliteration of the retroplacental clear space in 25 cases (65.7%) of the 38 non accreta case s also some of the criteria were not present in all the placenta accreta cases. So the fail to get good spasticity and achieve significant co incidence with placenta accreta The most frequent placental orientation of the accreta cases was the pure anterior position (45.4%). The central placenta location was the least frequent (9 %). The remaining cases were nearly equally distributed among the pure posterior, postero lateral and antero-lateral.

- There were three cases with false positive findings of site disruption of the placental–uterine wall interface on gray-scale imaging. All with a history of previous cesarean section but Absence of vessels crossing the suspected site of interface disruption could exclude placenta accreta in two of them.
- There were two cases with false negative findings ,both were seen in posteriorly located placenta previa on gray scale imaging , one of cases with history of previous uterine surgery for fibroid, the other had previous repeated curettage history, gray scale and doppler imaging modalities failed to establishes them to be with the true positive placenta accreta cases.
- Both modalities had similar sensitivity (91%) and false negative rate (9%), i.e. if U/S was to be used as screening procedures in cases with placenta previa to predict a possible diagnosis of placenta accreta it can detect up to 91% of possible cases with accrete and on the other hand it can miss only 9% of cases.
- The comparability of the two modes in other validity parameters results shows almost equal (NPV) negative predictive value (94.5%) for both, i.e. U/S can exclude a possible diagnosis of placenta accreta with 94.5 % confidence in cases with placenta previa. Color Doppler study had a higher specificity (97.4%) and therefore higher (PPV) positive predictive value (95.2%), i.e. Doppler U/S study can establish the diagnosis of placenta accreta with 95% confidence among cases with placenta previa. The rate of false positive diagnosis of placenta accreta is obviously higher in B-mode study (7.9% compared to 2.6% color doppler study).

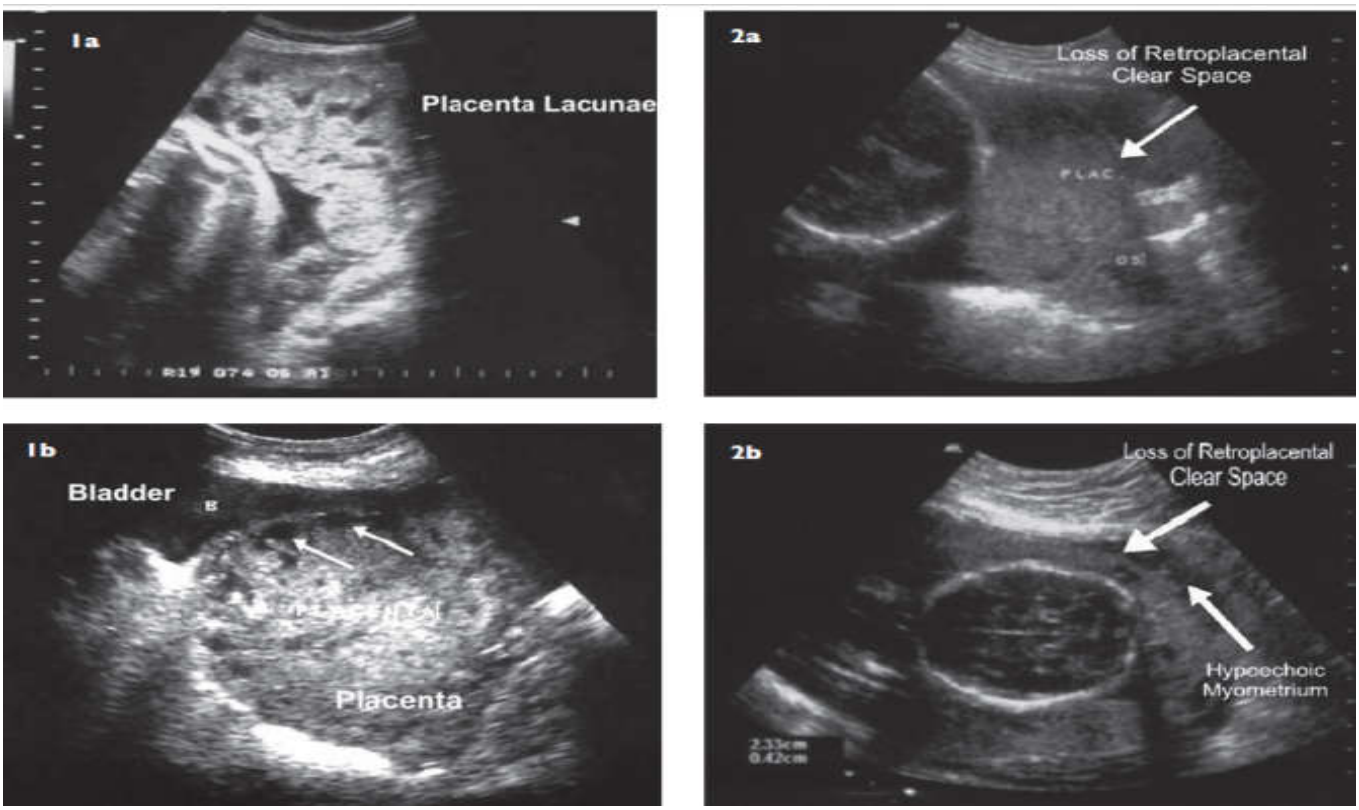

Figure 1. Shows most of grey scale ultrasound scan findings in placenta accrete

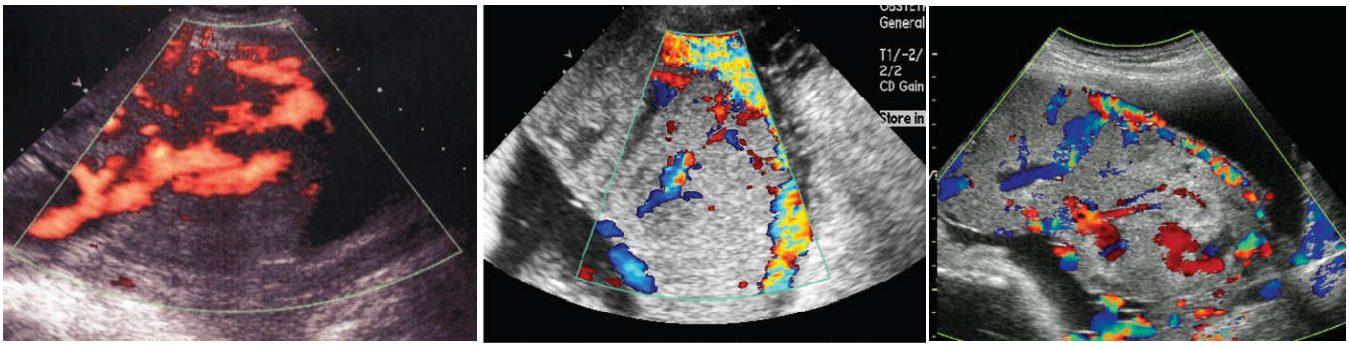

Figure 2. Shows most of color doppler finding in placenta accreta

DISCUSSION

Regarding the effect of some demographic data of the cases in this study sample as a risk factores increasing the incidence of placenta accreta:

- Pervious cesarean sections is the major risk factor which had a significant incidence relationship that increasing with increased frequency of cesarean sections starting from 0% in unscarred uterus to 50% to those with one or two C/S up to 80 % in those women having three or more C/S.

This confirmed by Rosen T 2008 and agree with Hung et al 1999 who found that the incidence of pl. acc. when previa presentin 5% in unscarred uterus and increased proportionately with the number of previous one C/S deliveries reaching 24% in previous one C/S to 67% in those with four or more C/S , this agree also with Miller et al 2003 and Zaki et al 1998[16] who showed that the incidence of accreta increase from 4.1 % in women with no history of C/S to 60 % in those with history of three or more previous C/S. In agreement with Hung *et al.,* 2000, gravidity was higher in patients with placenta accreta as it reaches statistical significance. This association may reflect the increasing uterine insult with repeated pregnancies. Other risk factores considered in this study still effective but fail to reach a significant levels. In addition to risk factors fetal male gender was noticed frequently in established cases of placenta accreta, although it fails to reach statistically significant co incident level and it is un explainable risk factor. there is also high incidence of placenta accreta among pure anteriorly located placenta previa, this agree with Nizami DJ 2009.

Diagnosis of placenta accrete*:* Various gray scale and Doppler ultrasonographic criteria have been reported for the sonographic diagnosis of placenta accreta alone or in combination.

- There are 5 criteria having a statistically significant association with placenta accreta in this study :
- Vessels bridging the placenta and uterine margin.
- Obliteration of the retroplacental clear space.
- Myometrial thickness < 2 mm.

Table 1. Demographic Data of 22 women with and 38 Women without placenta Previa Accreta

Variable		Placenta previa Accrete 22 cases		Placenta previa 38 cases		Total 60 cases		*P value
		No.	%	No.	%	No.	%	
Age(year)	< 35	14	40	21	60	35	100	0.81
	≥ 35	8	32	17	68	25	100	
Gravidity	< 3	1	12.5	7	87.5	8	100	<0.05 significant
	≥ 3	21	40.4	31	59.6	52	100	
Parity	< 3	4	26.7	11	73.3	15	100	0.99
	≥ 3	18	40	27	60	45	100	
No. Of Previous CS	None	0	0	22	100	22	100	<0.05 Significant
	1-2	14	50	14	50	28	100	
	≥ 3	8	80	2	20	10	100	
No. Of Previous D&C	None	8	25	24	75	32	100	0.09
	1-2	10	47.6	11	52.4	21	100	
	≥ 3	4	57.1	3	42.9	7	100	

* Two-tailed Mann-Whitney U test.

Table 2 A. statistical analysis of gray scale ultrasound criteria

Criteria on gray scale ultrasound scanning Done for 60 women		Placenta accreta 22 cases	Placenta non-accreta 38 cases	*P value	(Accuracy)
Obliteration of the retro placental hypoechoic zone	yes	22	25	0.042	(58)
	no	0	13		
Placental lacunae	yes	17	23	NS	(53)
	no	5	15		
Myometrial thickness less than 2 mm	yes	5	0	0.018	(71.6)
	no	17	38		
Placental uterine wall interface disruption	yes	19	3	<0.001 Signif.	(91.6)
	no	3	35		
Presence of focal exophytic mass with the same echogenicity as the placenta beyond uterine serosa	Yes	2	3	NS	(61.6)
	No	20	35		

*Fisher's exact test , NS: not significant.

Table 2 B. statistical analysis of doppler ultrasound criteria

Criteria on color doppler ultrasound scanning Done for 60 women		Placenta ccreta 22 cases	Placenta non-accreta 38 cases	*P value	(Accuracy) %
Increased subplacental vascularity	yes	12	17	NS	(54)
	No	7	16		
	Not done	3	5		
Irregular color flow in the placental lacunae	Yes	16	15	NS	(38.5)
	No	0	6		
	Not done	1	2		
vessels bridging the placenta and uterine margin or serosa	Yes	7	1	0.007	(73)
	No	12	32		
	Not done	3	5		
vessels crossing the sites of interface disruption	Yes	19	1	<0.001	(96.5)
	No	1	36		
	Not done	2	1		
hypervascularity of the bladder–uterine serosa interface	Yes	4	1	NS	(70)
	No	16	36		
	Not done	2	1		

*Fisher's exact test, accuracy = number of (true positive + true negative) / total number.NS: not significant.

The placental–uterine wall interface disruption sites on gray-scale Vessels crossing the interface disruption sites on color Doppler scan. The former three criteria agreed with Twickler DM 2000. And latter two features perform better overall in terms of sensitivity, specificity, positive predictive value, and negative predictive value and accuracy , reaches a highly statistically significant level ($p < 0.001$ for both) and this agreed with Wong HS. Study in 2007.

In 22 cases of placenta accreta:

- Placental lacunae were absent in 5 cases and present in variable configuration in the other 17 cases. The presence of lacuna flow which had a role to increase the sensitivity of lacunar criteria but in spite of that both fail to reach a significant level Although it is less accurate criteria, the absence of this sign cannot exclude placenta accreta. [21] Increased subplacental vascularity fail to reach a significant value in differentiating placenta accreta from placenta previa non accreta unless supported by other more reliable criteria (Kirkinen *et al.,* 2000).
- The presence of focal exophytic mass of the same echogenicity as the placenta beyond the uterine serosa, hypervascularity of the bladder–uterine serosa interface, these two criteria appear to be more applicable for placenta percreta , because they imply a breach of uterine serosa (Haratz-Rubinstein *et al.,* 2002).
- The presence of 3 cases with false positive findings of site disruption of the placental–uterine wall interface on gray-scale imaging. All of those had a history of previous caesarean section. Absence of vessels crossing

the suspected site of interface disruption could exclude placenta accreta in two of these three cases, and this proved on follow up to the delivery time.

- Two cases false negatively diagnosed by both modalities (gray scale and Doppler) and both had pure posterior placenta accreta on follow up to the delivery time were both presented clinically and histo-pathologically as placenta accreta.
- The antenatal diagnosis of placenta accreta by U/S (B-mode and color Doppler) where both having the same sensitivity and NPV (91%%& 94-95%) respectively. But Doppler U/S had higher specificity and PPV (97.4% and 95.2%) respectively, compared to B-mode U/S (92.8 and 87%) respectively.
- The rate of false positive diagnosis of placenta accreta by B-mode was 7.8 % compare to color Doppler (2.6%).
- Finally the diagnostic criteria of gray scale and Doppler ultrasonography discussed in present study showed a higher specificity of 97.4% (better diagnostic value) and high sensitivity (91%) which makes it more useful as a screening tool.

Conclusion

Color Doppler ultrasonographic examination, had a higher overall accuracy (95%), in diagnosis of placenta accreta compared to lower but still valuable gray scale ultrasonographic exam (90%). Color Doppler U/S provides an opportunity for early and accurate diagnosis of placenta previa accreta.

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