Original Article

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Diagnostic Performance of Ultrasonography for Detection of Abruption and Its Clinical Correlation and Maternal and Foetal Outcome

Obstetrics and Gynaecology Section

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ABSTRACT

Introduction: Placental abruption complicates about 1% of singleton pregnancies and is an important cause of perinatal mortality and morbidity. Though sensitivity and reliability of ultrasound are poor for detecting or excluding placental abruption, because of the advances in ultrasound resolution, imaging and interpretation, sensitivity of ultrasound is better than what was reported previously.

Aim: To determine the diagnostic performance of Ultrasonography (USG) for the detection of placental abruption and whether sonographic results correlate with maternal and foetal management and outcome.

Materials and Methods: Thirty patients with clinical diagnosis of placental abruption were studied in the Obstetrics and Gynaecology Department of Krishna Institute of Medical Sciences, over a period of 6 months. These patients underwent ultrasonography for confirmation. Obstetric and neonatal outcome and sonographic results were compared and reviewed. Sonographic sensitivity and specificity and positive and negative predictive values were calculated.

Results: Incidence of abruption in present study was 1.56% (28 patients out of 1786 total deliveries). Sensitivity of ultrasonography in the diagnosis of abruption was 57% (CI 37.15%-75.57%) while its specificity was 100% (CI 15.81%-100%) with a positive predictive value of 100% (CI 79.42%-100%) and a 14% (CI 1.78% - 42.83%) negative predictive value. An 87.5% of patients(14 out of 16) with a positive USG finding of abruption had Intrauterine foetal Death (IUD)/still birth while 91.6% of patients (11 out of 12) with negative USG findings of abruption gave birth to babies who required NICU admission.

Conclusion: Sonography is not sensitive for the detection of placental abruption but it is highly specific. Positive sonographic findings are associated with increased maternal morbidity, require more aggressive obstetric management and it is associated with worse perinatal outcome. In case of a negative USG finding, but a strong clinical suspicion of abruption if obstetric intervention is made in due time, foetal as well as maternal outcome are better. Foetal outcome also depends on gestational age. Preterm patients with positive USG and intrapartum findings of abruption have worse foetal outcome compared to full-term patients with abruption.

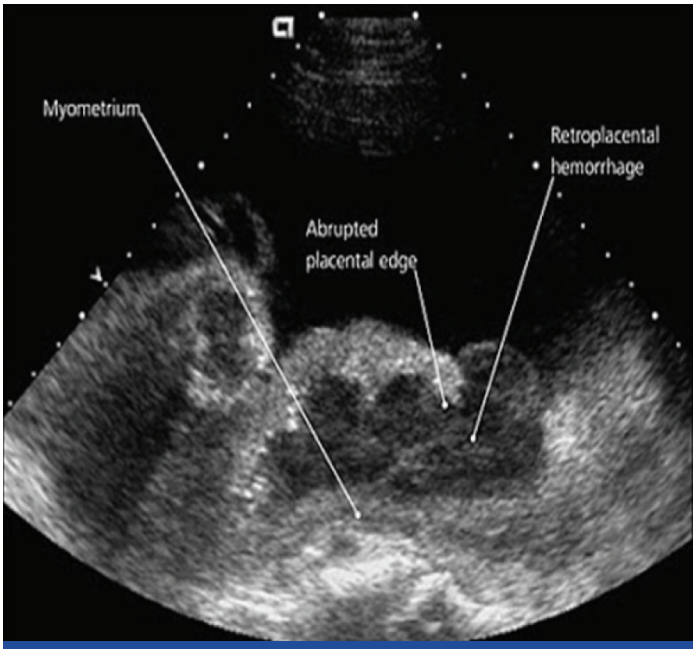
Keywords: Antepartum haemorrhage, USG in antepartum haemorrhage

INTRODUCTION

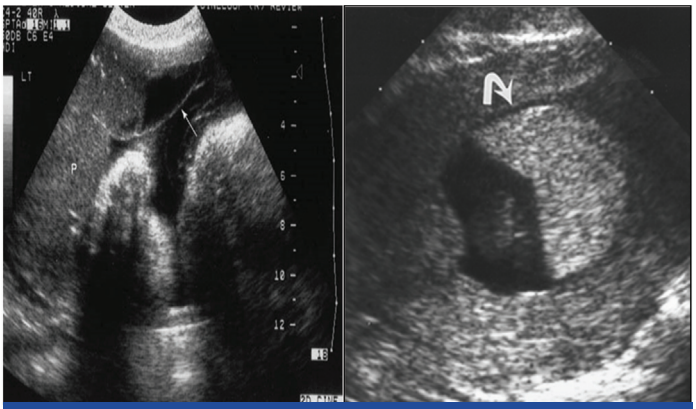
Placental abruption has been defined as the complete or partial separation of the normally located placenta from its uterine site before the delivery of the foetus [1]. The term 'abruptio placentae' literally means 'rending as under of the placenta' which denotes a sudden accident that is a clinical characteristic of most of the cases [2]. It occurs in approximately 1 in 80 deliveries [3]. Incidence of placental abruption is 1% in singleton pregnancies, while its incidence is almost doubled in twin gestations and it is more common in third trimester of pregnancy, although the process may occur earlier in gestation [3]. The diagnosis of placental abruption is clinical, based on characteristic signs and symptoms. Abruption is confirmed after placental delivery by evaluation of the retroplacenal clots or a depression in the maternal surface of placenta. The classic, clinical hallmark is vaginal bleeding, which may be present in upto 80% to 90% of cases [1]. Patients with placental abruption most commonly present with the triad of abdominal pain, abnormal uterine tenderness and vaginal bleeding [1]. However, these signs are not always present and absence of these does not exclude the diagnosis. Sensitivity and reliability of ultrasound is poor for detecting or excluding placental abruption as clinically significant abruption most of the time shows negative sonographic findings [3]. Ultrasonographically, abruption may show a variety of appearances depending upon the size, location of the bleed and also the time between the abruption and when ultrasonography was performed. Ultrasonographic findings may be negative in mild or early stage or in revealed type of abruption. Ultrasonographic criteria for diagnosis of placental abruption include- pre placental collection under chorionic plate, jello-like movement of chorionic plate with foetal activity, retroplacental collection, marginal haematoma, sub chorionic haematoma, increased placental thickness >5cm and intra-amniotic haematoma [4] [Table/Fig-1-6]. Because of the advances in ultrasound resolution, imaging and interpretation the sensitivity of ultrasound is better than what was reported previously.

MATERIALS AND METHODS

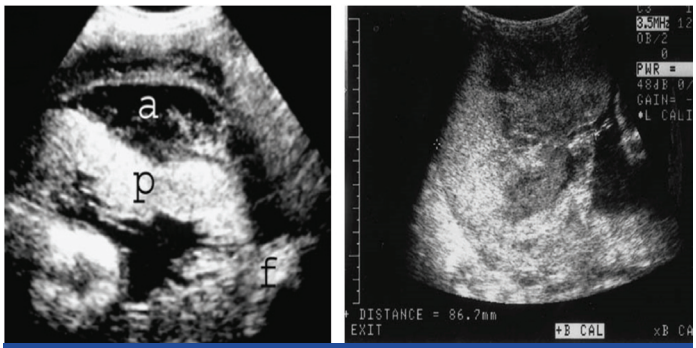
A prospective study was done in the Obstetrics and Gynaecology department of Krishna Institute of Medical Sciences, Karad in 30 patients over a period of 6 months (1st March to 31stAug 2015). A total of 1786 deliveries were done, out of which 30 patients were clinically suspected of having placental abruption. Ultrasonography was done for all these patients to confirm the clinical diagnosis of abruption. The USG reports, intrapartum findings and maternal and foetal outcome were then compared and sensitivity, specificity and positive and negative predictive values were calculated in order to correlate clinical and sonographic findings. Statistical tests used in study was Fischer-exact test.



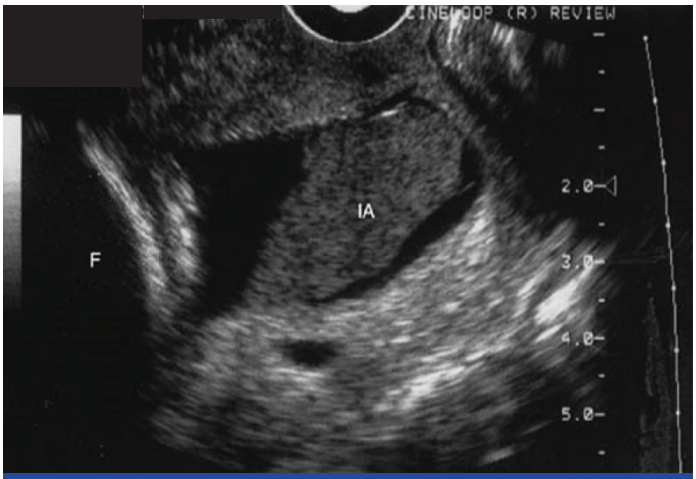
[Table/Fig-1]: Sonographic image of placental abruption.



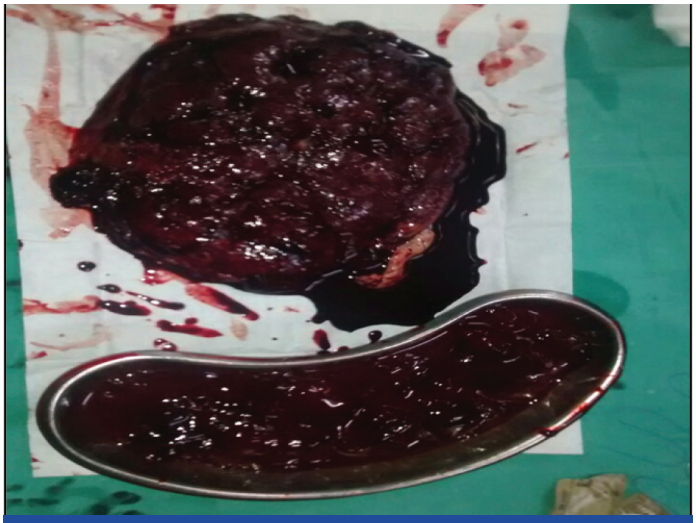
[Table/Fig-2 and 3]: Apparent thickening of placenta consistent with Retro placental clot.



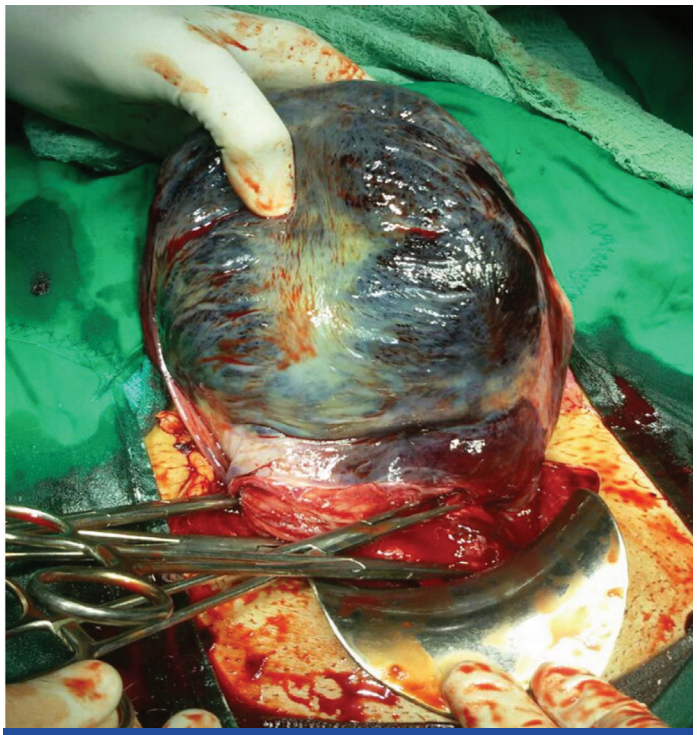
[Table/Fig-4 and 5]: Increased placental thickness >5cm.



[Table/Fig-6]: Intra-amniotic haematoma.



[Table/Fig-7]: Retro placental clots.



[Table/Fig-8]: Couvelaire uterus.

Inclusion Criteria

All patients admitted in labour room under OBGY department of Krishna Institute of Medical Sciences, Karad with chief complaints of Per-Vaginal (PV) bleeding, pain in abdomen with gestational age 28 weeks or more and who were clinically suspected of having abruption placenta.

Exclusion Criteria

All those antenatal patients with bleeding PV before 28 weeks and patients those who were diagnosed as placenta previa were excluded. Those patients with previous history of abruption were excluded from this study.

RESULTS

Incidence of abruption in present study was 1.56% (28 patients out of 1786 total deliveries). Out of the 30 patients who were suspected of having placental abruption, 28 patients had positive evidence of abruption intra-partum findings [retro placental clots [Table/Fig-7], blood stained liquor, couvelaire uterus in LSCS [Table/Fig-8]. Of these 28 patients, only 16 patients showed positive sonographic findings of abruption while 12 patients showed negative sonographic findings but positive intra-partum findings

of abruption. Remaining 2 patients who were clinically suspected of having abruption but had negative sonographic findings had no evidence of abruption intra-partum. These 2 patients were full-term and underwent LSCS with good foetal outcome. Out of 28 patients which were considered in study further, 14 were preterm and 14 were term gestation.

USG finding	Intrapartum Findings suggestive of Abruption	No Intrapartum Findings suggestive of Abruption
Positive findings	16	0
Negative findings	12	2
Sensitivity of USG in detecting abruption	57%	CI 37.15% - 75.57%
Specificity of USG in detecting abruption	100%	CI 15.81%-100%
Positive predictive value (PPV)	100%	CI 79.42% - 100%
Negative predictive value (NPV)	14%	CI 1.78% - 42.83%

[Table/Fig-9]: USG findings.

Sensitivity of USG in detecting abruption was 57% (CI 37.15%-75.57%). Specificity was 100% (CI 15.81%-100%). Positive Predictive Value (PPV) was 100% (CI 79.42% - 100%). Negative predictive value (NPV) was 14% (CI 1.78% - 42.83%). This shows that USG is not sensitive for detection of abruption, however it is highly specific (100%) [Table/Fig-9].

On ultrasonography retroplacental clot looked like thickened placenta, as clot is sometimes iso-echoic to the placenta. Retroplacental clot or haematoma can be hypo echoic or with heterogeneous echogenicity. Because of the low sensitivity of sonography in detecting small retro placental or sub membranous haematomas or the occasional absence of bleeding with placental abruption, negative sonographic findings do not rule out the presence of placental abruption [5].

A 50% of patients with positive USG finding underwent an LSCS while remaining 50% had a vaginal delivery. Out of the latter 50% all were IUD/still birth.

A 100% of patients with negative USG findings underwent an LSCS for foetal distress with fair neonatal outcome. This means that in spite of negative USG findings if there is a strong clinical suspicion of abruption, immediate intervention (LSCS) should be made in order to have a better foetal outcome [Table/Fig-10].

A total of 16 patients had positive USG findings as well as intra-partum findings suggestive of abruption. Out of these 16 patients, 7 were preterm which all delivered vaginally-IUD/ stillbirth babies, and remaining 9 patients were full-term. Out of these 9 patients, 8 underwent LSCS with baby outcome as-6 babies were stillborn and 2 babies required NICU admission. Remaining one full-term patient underwent vaginal delivery for IUD [Table/Fig-10].

Of the 12 patients (negative USG findings but positive intrapartum findings), all underwent LSCS, out of which one baby was preterm and was IUD. Remaining 11 babies required NICU out of these, 6 were preterm and 5 were full term [Table/Fig-10].

p-value- <0.0001(Fischer-exact test), the association is statistically significant for neonatal outcome.

Foetal outcome also depends on gestational age. Preterm patients with positive USG and intrapartum findings of abruption will have worst foetal outcome compared to full-term patients with abruption.

Considering perinatal mortality, it was found that mortality was much higher (61%) in unbooked as compared to booked (10%) cases. Perinatal deaths were also high in 2nd and 3rd gravida. Similarly, perinatal mortality is high in cases of hypertension, Premature Rupture Of Membranes (PROM) and oligohydramniosis [Table/Fig-11].

On USG abruption present n=16	Mode of Delivery		Neonatal outcome	
	Vaginal delivery	LSCS	IUD	NICU admission
Preterm	7	0	7	0
Full-term	1	8	7	2
On USG abruption absent n=12				
Preterm	0	7	1	6
Full-term	0	5	0	5

[Table/Fig-10]: Gestational age at delivery, mode of delivery and neonatal outcome.
p-value-0.0084 (Fischer-exact test), the association was statistically significant for mode of delivery.

Clinical Characteristics		No. of cases	No. of IUDs	PNMR
Unbooked		18	11	61%
Booked		10	1	10%
Gravidity	G_1	12	6	50%
	G_{2-3}	15	8	53%
	$>G_4$	3	1	33%
Hypertension		12	8	66%
Pre term		14	8	57%
Polyhydramniosis		4	1	25%
Oligohydramniosis		6	4	66%
PROM		2	1	50%
DIC		8	6	75%

[Table/Fig-11]: Influence of various factors on perinatal outcome.

DISCUSSION

Present study tried to study the performance of ultrasonography in detection of abruption and its correlation to clinical findings and its effect on maternal and foetal outcome.

Our study is consistent with the result of Chris Glantz et al., which showed that USG has low sensitivity but high specificity for detection of abruption and also that as the scan to delivery time reduces, the specificity and PPV increases [6] [Table/Fig-12].

Value	Study		
	Present study	Chris Glantz et al., [6]	
		Overall	Scan to delivery <1week
N	30	149	55
Sensitivity	57%	28%	24%
Specificity	100%	93%	96%
PPV	100%	53%	88%
NPV	14%	83%	53%

[Table/Fig-12]: Comparison between sensitivity, specificity, PPV, NPV and study population of present and previous studies.

The present study shows that if an earlier intervention is made in cases with clinical suspicion of abruption with negative USG findings, a better foetal outcome can be expected and thus PNMR can be reduced. The Perinatal Mortality Rate (PNMR) in abruption placenta has been compared between the present study other studies in [Table/Fig-13].

Study	PNMR in abruption %	Study population
Present study	53	28
Jain S et al., [7]	41	100
Arora et al., [8]	54	112
Bhide et al., [9]	54	-
Jaju KG et al., [10]	66	45

[Table/Fig-13]: Perinatal mortality rate (PNMR) in abruption placenta in present and other studies.

Present study findings are consistent with the findings of Jaju KG et al., thus we conclude that perinatal outcome in abruption

is influenced by factors such as an unbooked pregnancy, multigravida, associated hypertension and oligohydramniosis [10] [Table/Fig-14].

Also, 8 patients out of 28 (total number of abruption positive patients) 28.5% of patients were in DIC (Disseminated Intravascular Coagulation). This explains the adverse maternal outcome of abruptio placenta with increasing number of patients requiring blood and plasma transfusions, ICU admissions and prolonged hospital stay adding to overall maternal morbidity, although no maternal mortality was reported.

Clinical Characteristics	PNMR (present study)	PNMR (Jaju KG et al., [10])
Unbooked	61%	84%
Booked	10%	15%
Gravidity		
G_1	50%	36%
G_{2-3}	53%	57%
$G_{>4}$	33%	6%

[Table/Fig-14]: Factors associated with PNMR, in comparison with Jaju KG et al.

LIMITATION

Analysing the incidence of perinatal death in cases of abruption placenta we observed that it is still a significant problem in our setup. Though maternal mortality has reduced, perinatal mortality still remains high. The single most important factor in reducing maternal and perinatal mortality has been the increasing use of caesarean delivery in case of abruptio placentae even on clinical suspicion. Vaginal delivery is appropriate in selected cases. The use of present day aids like ultrasonography to decide about the time of interventions and the more liberal use of caesarean section in well-equipped hospitals with availability of blood transfusion services will help to lower the perinatal and maternal morbidity and mortality.

CONCLUSION

Sonography has a poor sensitivity for diagnosing placental abruption, even though it has a high specificity and PPV. In a positive sonographic result, maternal morbidity and perinatal mortality are high which needs aggressive obstetric management as compared to the normal sonography. In case of a negative sonographic finding but a strong clinical suspicion of abruption if Obstetric intervention is made in due time, foetal as well as maternal outcome are better.

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