

## ABSENT END DIASTOLIC FLOW IN UMBILICAL ARTERIES - IT'S SIGNIFICANCE IN PREDICTION OF FETAL OUTCOME

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### SUMMARY

Doppler umbilical artery velocimetry has been used to study high-risk pregnancies. The most extreme waveform abnormality is the absence of end-diastolic velocity (AEDV). To examine the significance of this finding we studied 41 patients with AEDV in the initial ultrasound examination.

We found a high incidence of hypertension associated with pregnancy (88%) which was severe in 73%, Intrauterine growth retardation was present in 58% (23/41). Intrauterine death occurred in 7 pregnancies and the pregnancy was terminated in 17 patients.

There were 19 live births of which 53% had low Apgar scores. There were 18 perinatal deaths (PNMR - 56%).

There were 19 fetuses which had reached 34 weeks of gestation, of them 10 could be saved because of timely intervention.

Antepartum improvement in umbilical artery waveform occurred in 7% of the fetuses studied and was associated with an improvement in the perinatal outcome.

Thus, the finding of AEDV identifies the fetus at highest risk. Intense surveillance and timely intervention can result in a better fetal outcome.

### INTRODUCTION

A normal pregnancy outcome is depen-

dent on the development of an adequate uterine and umbilical circulation. Doppler ultrasound provides a means of studying these circulatory beds in a non-invasive and apparently safe way.

Doppler investigations of the umbilical artery have been reported to identify fetuses at increased risk for poor fetal outcome. Increased ratios of umbilical artery systolic to diastolic flow detected by Doppler ultrasound have been associated with increased perinatal morbidity and mortality and intrauterine growth retardation.

The most extreme waveform abnormality is that in which there is absence of end-diastolic velocity (AEDV). Ominous pregnancy outcomes have been reported in this group. These fetuses with AEDV seem to represent a special group requiring rapid diagnosis, vigilant assessment, and frequently, early intervention.

The purpose of this study is to assess the perinatal outcome in patients showing this extreme abnormality of waveform and establish the significance of this finding.

#### **PATIENTS AND METHODS**

We studied 41 pregnancies with Absent End Diastolic Velocity (AEDV) in their initial doppler ultrasonogram.

Ultrasound examination was performed with the patient in the supine position with a slight lateral tilt. The equipment used was ALOKA SSD630 with UGR 38 Doppler unit. Initially a routine ultrasonogram was performed using a 2-D mode real time ultrasound with a 3.5 MHz probe and the gestational age determined. Doppler waveforms were obtained after localising the vessels by a B-mode dual sector real time scanner.

The absence of end diastolic velocity was confirmed when five studies from each patient showed no diastolic velocity. The patients were put on bed rest and antihypertensives. Sequential umbilical velocimetry was performed at 1-3, day intervals until delivery. The presence of end-diastolic velocity during any subsequent velocimetry examination was considered as an improvement in the waveform.

Data with regard to the outcome of the studied pregnancies was collected and included the number of still births, mode of delivery, Apgar scores, gestational age at entry and delivery, birth weight, number of days in the neonatal intensive care unit, and number of neonatal deaths.

#### **RESULTS**

We had 41 patients with Absent End Diastolic Velocity (AEDV) in the initial ultrasonogram. Thirty seven patients had hypertension associated with pregnancy, in 33 it was pregnancy induced hypertension (PIH). Essential hypertension was present in 3 patients and one patient had hypertension secondary to chronic nephritis. The hypertension was mild in 7 and severe in 30.

At the time of detection of the abnormality, 23 pregnancies were < 31 wks (Table I) and 18 were between 31-36 wks (Table II). The AEDV persisted in 36 pregnancies, in 3 it became normal and remained normal till delivery and in the rest it became borderline abnormal and remained the same until delivery (Table III).

Intrauterine growth retardation was

**Table I**  
**PATIENTS WITH AEDV SCANNED BEFORE 31 WEEKS (n=23)**

Sl. Indication No.	GA at delivery (in wks)	Birth Weight	APGAR Score	IUGR	PIH	Abnormal Fetal Heart Rate	Fetal Outcome
1. Secondary HTN, Nephritis	22	600 g	-	No	+	-	EAE instilled-Still born
2. PIH	28	1.2 kg	-	+	+	-	EAE-Still born
3. PIH	28	1.25 kg	-	No	+	-	IUD
4. Bad obstetric history (BOH) & PIH	36	2 kg	8/10	+	+	No	Alive and well
5. PIH	26	1 kg	4/6	No	+	-	EAE-Neonatal death
6. PIH	25	600 g	-	+	+	-	IUD
7. BOH with PIH	30	1 kg	-	+	+	-	IUD
8. PIH	30-32	1.1 kg	4/6	+	+	Yes	Generalized convulsions Neonatal death
9. PIH	26	900 g	-	+	+	-	EAE-Still born
10. PIH	26	1.2 kg	-	+	+	-	EAE-Still born
11. Recurrent PIH	27	900 g	-	+	+	-	EAE-Still born
12. Recurrent PIH	30	1.4 kg	-	No	+	-	EAE-Still born
13. Prectous Preg.	37	1.8 kg	7/10	+	+Elective LSCS		Alive and Well
14. Recurrent PIH	24	900 g	-	+	+	-	IUD
15. PIH	26	600 g	2.8	+	+	-	Neonatal death
16. BOH with PIH	26	1 kg	-	No	+	-	EAE-Still born
17. PIH	30	1.3 kg	-	+	+	-	EAE-Still born
18. Recurrent PIH	34	1 kg	-	+	+	-	EAE-Still born
19. BOH with PIH	28	1.2 kg	-	No	+	-	EAE-Still born
20. BOH prectous preg.	36	2.4 kg	7/10	No	+Elective LSCS		Alive and Well
21. Essential HTN	32-33	1.5 kg	7/9	No	+	EAE	Well at discharge
22. BOH Bicornuate uterus with PIH	32	1.2 kg	6/8	+	+	No	Neonatal death'
23. BOH with PIH	32	1 kg	3/5	+	+	EAE	Neonatal death

present in 23 of the 41 fetuses studied (58%). Intrauterine death resulted in 7 pregnancies, 17 pregnancies had to be terminated (by extramniotic emcredyl instillation (EAE) in view of the uncontrolled hypertension and the severe degree of IUGR. This resulted in 14 still born babies and 3 were

**Table II**  
**PATIENTS WITH AEDV SCANNED FROM 31-36 WEEKS (N = 18)**

Sl. No.	Indication	GA at delivery (in wks)	Birth Weight	APGAR Score	IUGR	PIH	Abnormal	Fetal Outcome Fetal Heart Rate
1.	Elderly Primi, Fibroids assoc with preg.	34-36	1.9 kg	6/8	-	-	Elective LSCS	Alive and Well
2.	IUGR	32-34	1.5 kg	-	+	+	-	EAE-Still born
3.	PIH with IUGR	35	1.5 kg	8/10	+	+	Elective LSCS	Alive & well
4.	Recurrent PIH with bad obstetric history	36	1.5 kg	-	+	+	-	IUD, Still Born
5.	Post-dated with PIH	41	3 kg	8/10	No	+	Elective LSCS	Alive & Well
6.	Recurrent PIH	37	2.5 kg	9/10	No	+	Yes	Emergency LSCS alive & Well
7.	PIH	36-37	2.2 kg	8/10	No	+	No	EAE-Alive & well
8.	PIH	32	1.2 kg	4/6	+	+	-	EAE-Alive & Well
9.	Recurrent PIH	34-36	1.8 kg	-	+	+	-	IUD-Still born
10.	BOH with recurrent PIH	34	1.1 kg	4/7	+	+	EAE	Intraventricular h'ge, bil hydrocephalus alive and well at discharge
11.	Recurrent PIH	36-37	2 kg	8/10	-	+	No	Alive & Well
12.	PIH	34-36	1 kg	-	+	+	-	EAE-Still born
13.	PIH	34-36	2.2 kg	1/5	-	+	Yes	Deeply asphyxiated still born
14.	PIH	37	1.4 kg	-	+	+	-	EAE-Still born
15.	Essential HTN	37	2.2 kg	7/10	No	+	Elective LSCS	Alive and well
16.	Essential HTN	34-36	1.8 kg	7/10	No	+	Elective LSCS	Alive & well
17.	GDM with PIH	35	2.4 kg	-	No	+	IUD	Still born
18.	Recurrent PIH	34	1.5 kg	8/10	+	+	-	IUD

born alive (Table IV). There were 22 stillbirths, 16 of whom were < 34 wks and weighed < 1.5 kg, while 6 had reached > 34 wks of gestation and weighed > 1.5 kg.

There were 19 live births, of them 13 were > 34 wks and weighed > 1.5 kg and 6 were < 34 wks and weighed < 1.5 kg.

**Table III**  
**REVERSAL OF ABNORMALITY**

Persistently ADEV	36
AEDV Normal, Normal till delivery	3
AEDV Borderline, abnormal	2

**Table IV**  
**COURSE OF PREGNANCY**

Pregnancy Course	Number of Cases
Pregnancy terminated by EAE	17
Intrauterine Death	7
Still Birth	14
Live Birth	3

Eight babies were born by Caesarean section, which was done only if the estimated fetal weight was > 1.5 kg and the gestational age > 34 wks as these were the criteria for neonatal survival in our neonatal care unit.

53% of the live borns had an initial Apgar score of < 7, the 5 min apgar continued to be < 7 in 17%.

All live born babies were admitted to the neonatal care unit. 5 babies died in the neonatal period, all of them were < 34 wks of gestation at delivery and weighed < 1.5 kg at birth.

In the 3 pregnancies in whom doppler had shown marked improvement, the pregnancy continued till 36-37 wks resulting in live and vigorous babies.

Figure-I

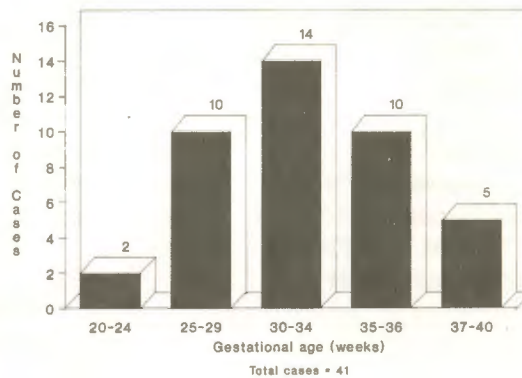


Fig. 1 : Gestational age at delivery  
5 pregnancies had reached term;  
10 were between 35-36 wks;  
14 were between 30-34 wks; and  
12 of them were < 30 wks.

Out of the 32 pregnancies with AEDV between 28 and 40 wks, there were 18 perinatal deaths, giving a Perinatal Mortality Rate of 56%.

19 pregnancies with AEDV had reached 34 wks of gestation and 10 fetuses could be saved due to timely intervention (Fig. 1)

### DISCUSSION

AEDV represents the most extreme form of altered velocity flow in the umbilical artery and represents the fetus at highest risk.

There is an extremely high incidence of catastrophic pregnancy outcomes in this group with a perinatal mortality rate of 54% (Rochelson et al, 1987).

Infants with AEDV were born significantly earlier, weighed less and were growth retarded in 58% of cases (Rochelson et al, 1987). Their mothers had a significantly higher incidence of pregnancy induced hypertension which is more likely to be severe.

Maternal bed rest and antihypertensives improve the fetal growth and result in improvement in the waveforms. The overall outcome of fetuses that show improvement

in waveforms (??) appears to be significantly better than that of fetuses with no improvement (Brar & Platt, 1989).

Incidence of delivery because of fetal indications is high after 34 wks. At a gestational age of < 34 weeks, the risk of neonatal morbidity and mortality is too high to justify delivery.

The estimated fetal weight at delivery is an important indicator of neonatal survival. An estimated birth weight of > 1.5 kg is associated with better neonatal survival than that of < 1.5 kg.

The finding of AEDV would not appear to aid in the precise timing of delivery, but it does identify the fetus at highest risk and one which requires intense surveillance. Timely intervention can result in a better fetal outcome in these hypoxic growth retarded fetuses. Prolonged conservative management may be of limited value.

### REFERENCES

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