



Il Doppler ombelicale nelle Gravidanze complicate da Preeclampsia

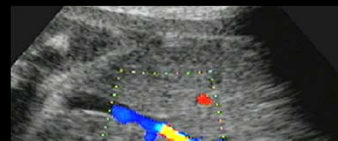
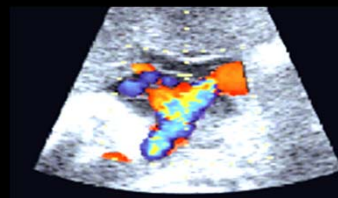
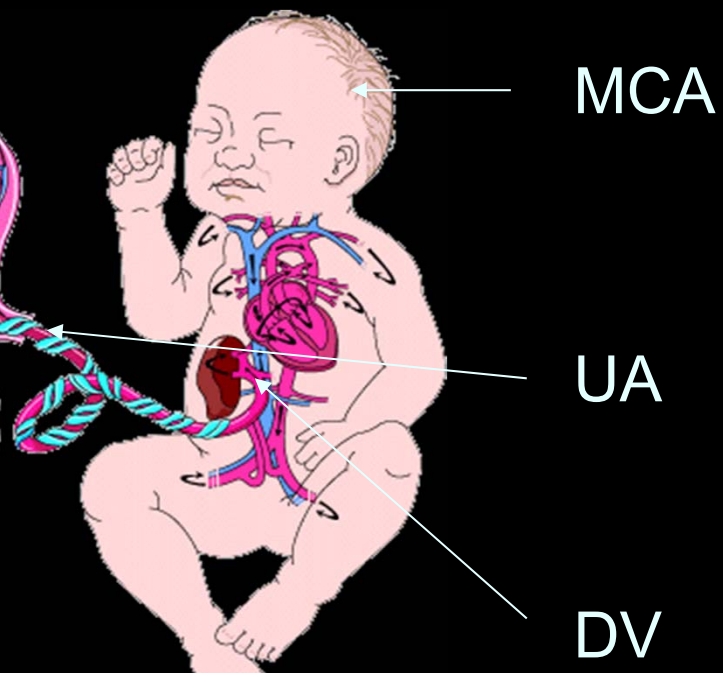
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Doppler studies in the fetus



ACOG

Committee on
Obstetric Practice

Committee Opinion



Number 188, October 1997

(Replaces #116, November 1992)

Utility of Antepartum Umbilical Artery Doppler Velocimetry in Intrauterine Growth Restriction

Doppler ultrasonography is a noninvasive technique to assess the aspects of blood flow that provide information about downstream impedance. Umbilical artery Doppler flow velocimetry may be used for fetal surveillance, based on characteristics of the peak systolic frequency shift (S), the end-diastolic frequency shift (D), and the mean peak frequency shift over the cardiac cycle (A). Following are commonly used indices:

- systolic and diastolic ratio ($\frac{S}{D}$)
- resistance index ($\frac{S-D}{S}$)
- pulsatility index ($\frac{S-D}{A}$)

The umbilical artery $\frac{S}{D}$ ratio, the most commonly used index, is considered abnormal if it is elevated above the 95th percentile for gestational age or if diastolic flow is either absent or reversed after 18–20 weeks of gestation.

Doppler ultrasonography presents no risk of ionizing radiation to the fetus. It may be applied using either continuous- or pulsed-wave techniques. Continuous-wave techniques apply very little energy levels (low acoustic output). Pulsed waves apply significantly higher energy levels to the fetus because of the small areas that are being intensively insonated. To reduce any potential fetal risk, the ultrasound intensity and examination time should be as minimal as possible, and attention should be paid to the acoustic output of the instrument.

The pregnancies most likely to benefit from the use of umbilical artery velocimetry are those with a presumptive diagnosis of intrauterine growth restriction, whether that occurs as an idiopathic process or in the presence of hypertension or preeclampsia. Recent reviews, meta-analyses, and randomized studies of the use of Doppler ultrasonography in growth-restricted fetuses

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ISSN 1074-861X

The American College of

Doppler

Doppler meta-analysis has shown the use of the umbilical artery in high risk pregnancies reduces the number of neonatal admissions (44%), inductions of labor (29%), cesarean sections for fetal distress (52%), and perinatal mortality (38%)

Doppler

transducer

ultrasound beam

θ
blood flow

$$f_d = 2 f_0 \frac{v \cos \theta}{c}$$

f_0 = transducer frequency

f_d = doppler shift

θ = insonation angle

c = ultrasound velocity

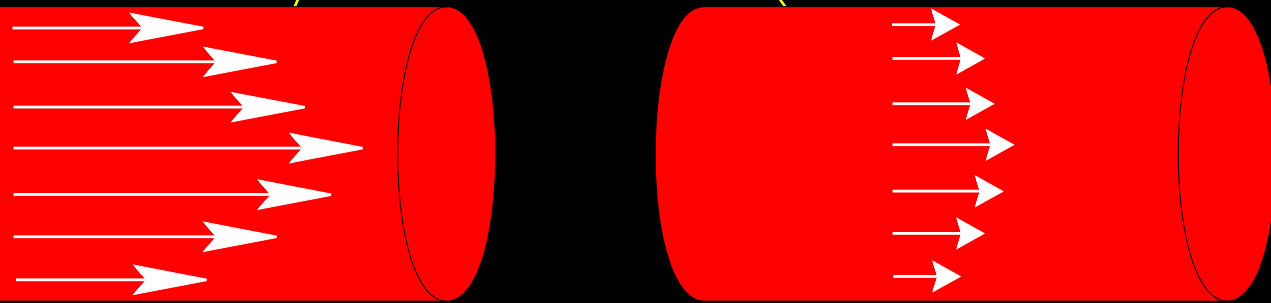
v = flow velocity



$$\frac{S}{D}$$

$$\text{Pourcelot (RI)} = \frac{S - D}{S}$$

$$\text{Gosling (PI)} = \frac{S - D}{\text{mean vel}}$$



B 1 •/+1/1/5
Depth= 29mm
Gate= 3.0mm
Gain=-13dB

11:44:25 am

6C2
6.0MHz **34mm**
OB
General

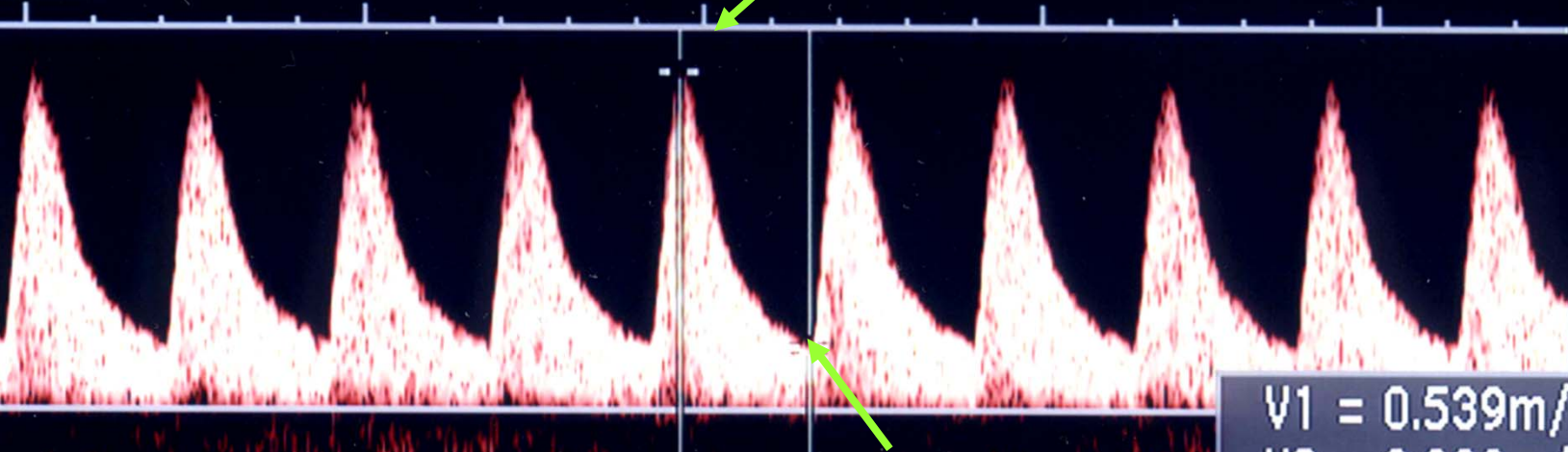


Store in progress
Sweep=50mm/s

UMBILICAL ARTERY
DOPPLER

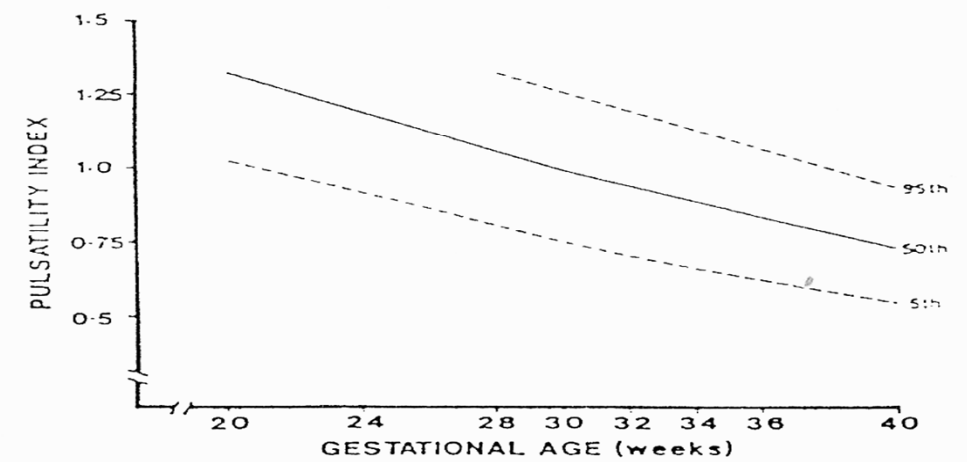
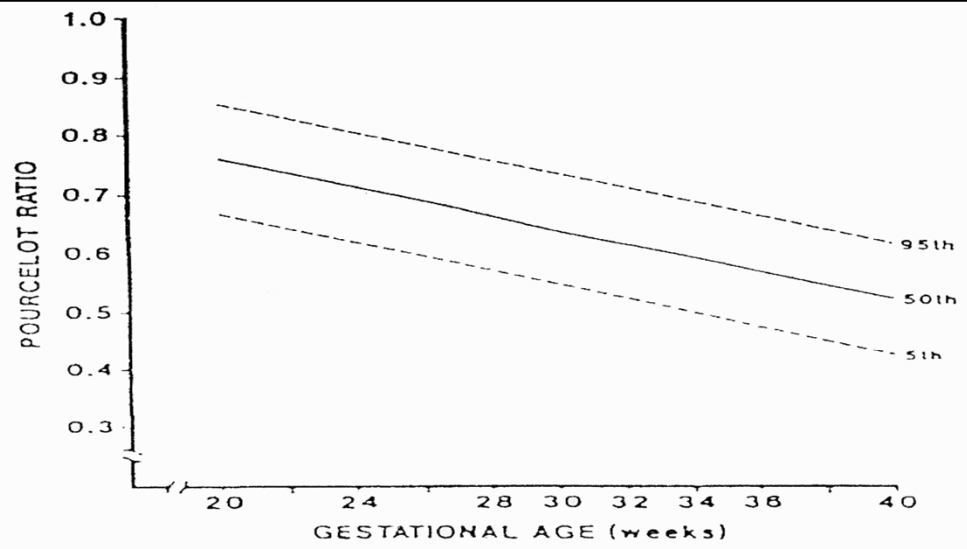
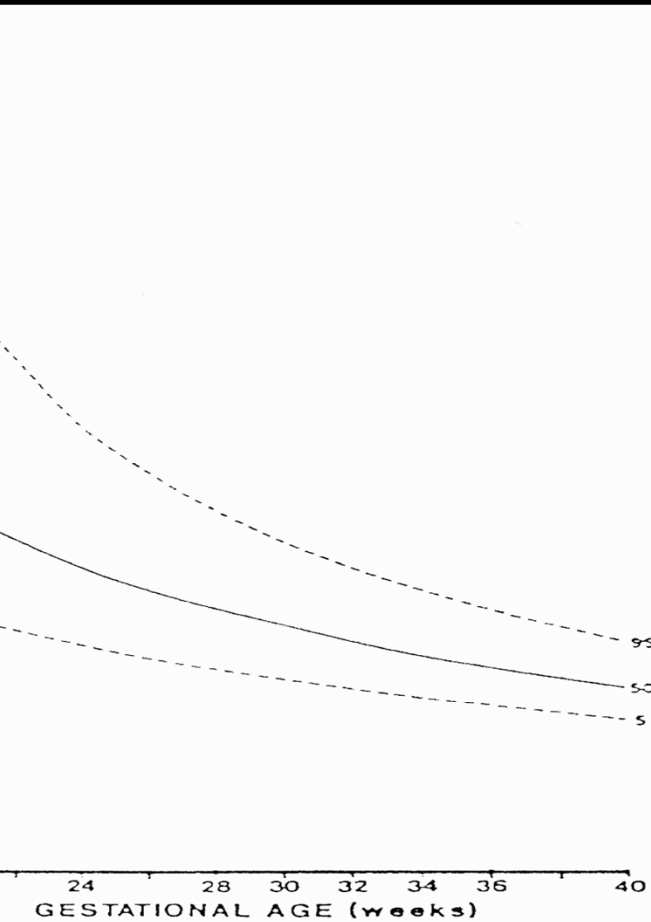
7:2.5MHz

PSV

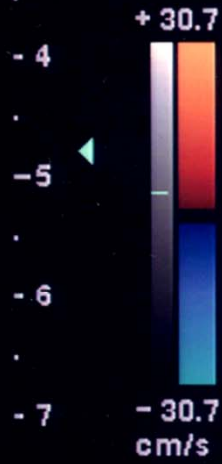
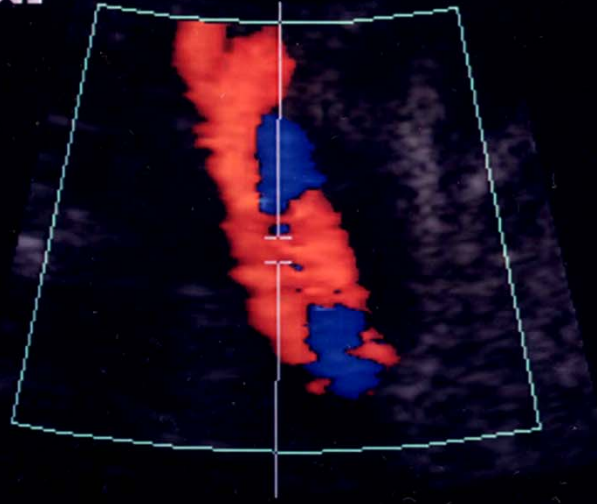


V1 = 0.539m/s

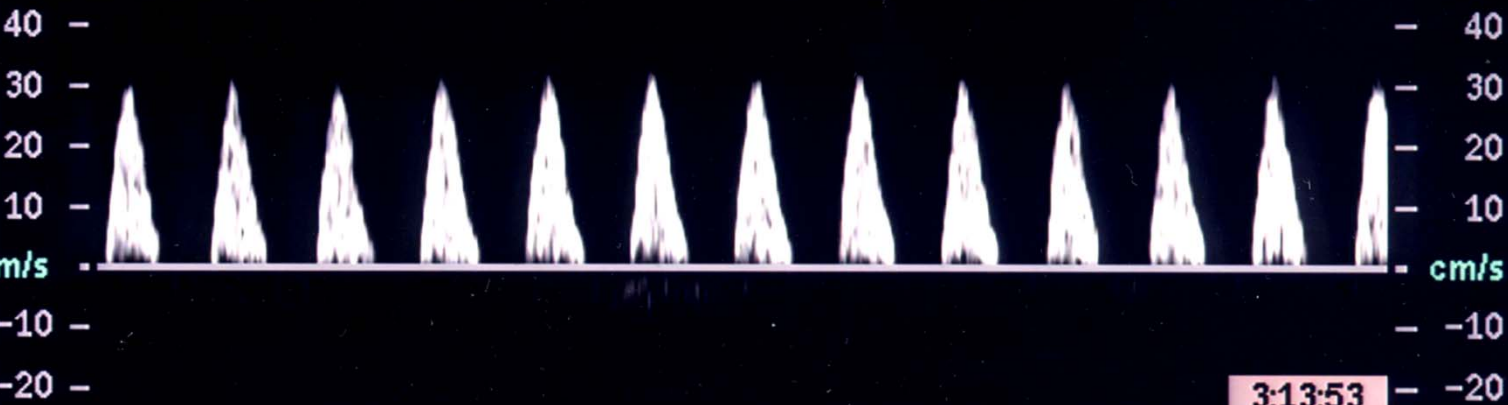
Normal Values for the Umbilical Artery



ATL



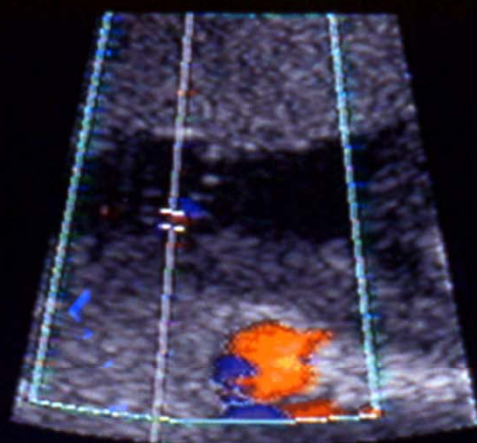
SV Angle 0°
Dep 5.5 cm
Size 2.0 mm
Freq 2.5 MHz
WF Low



3:13:53

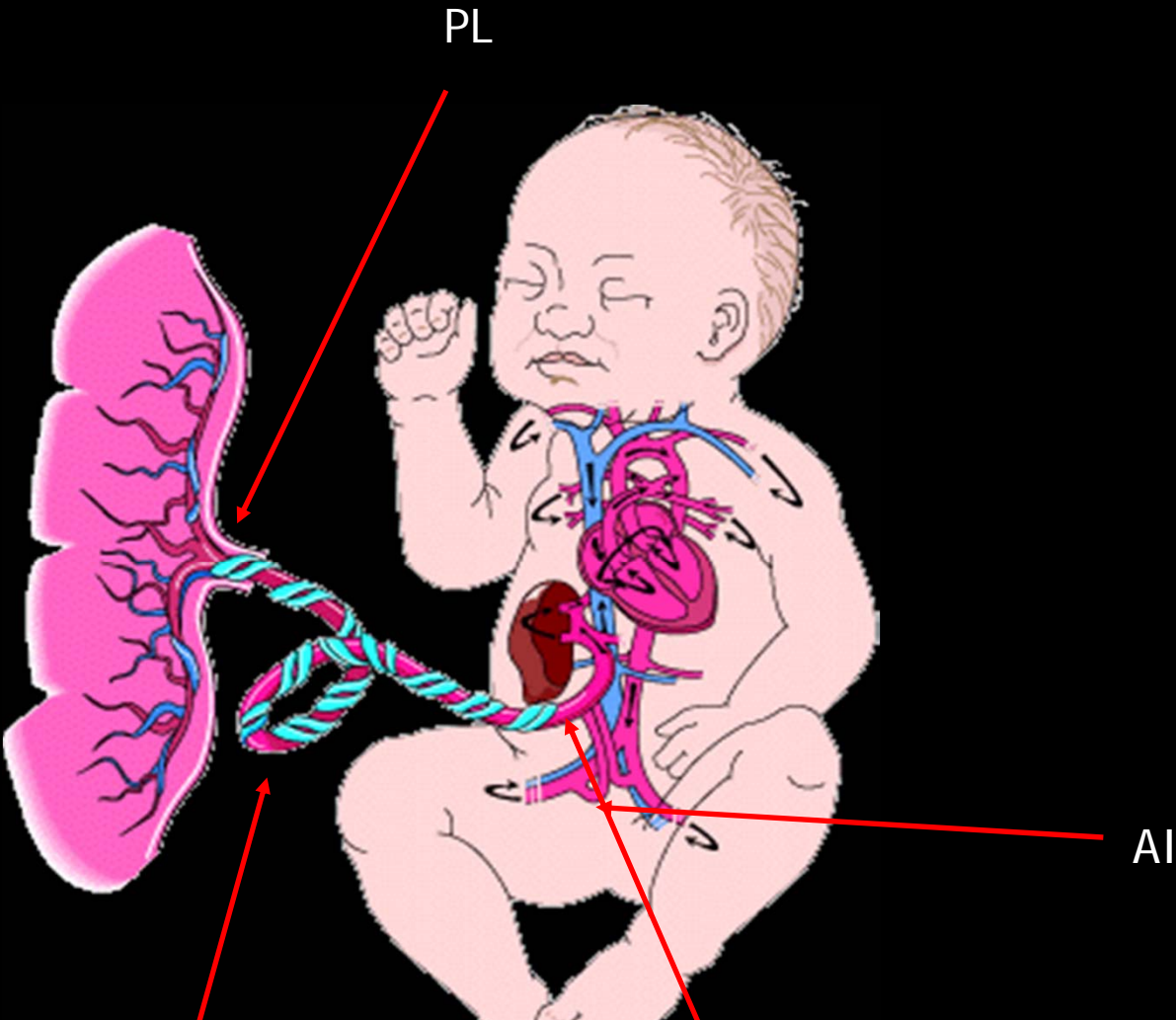
University of Virginia Prenatal Diagnosis and Treatment Center

Dop 62% Map 1
WF Low
PRF 700 Hz
Flow Opt: Med V



SV Angle 0°
Dep 7.6 cm
Size 2.0 mm
Freq 2.5 MHz
WF Low
Dop 69% Map 2
PRF 2500 Hz





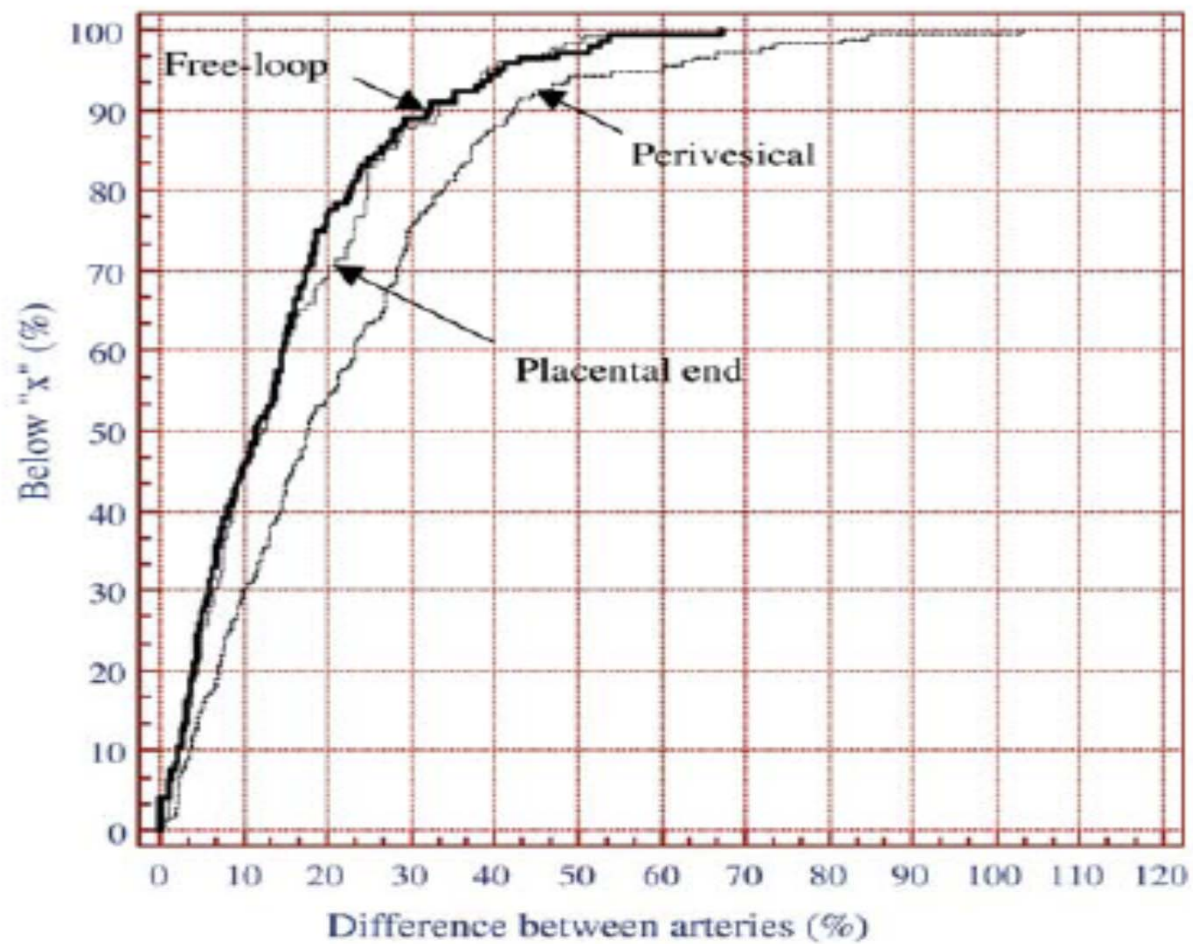


Figure 1 Proportion of cases ("y") with a percentage of pulsatility index difference between arteries below "x".
 Percentage of pulsatility index difference (absolute values) = $(PI_1 - PI_2 / PI_2) \times 100$.

Means of indices across gestation from the four sites of sampling.

	Gestation weeks (<i>n</i>)	Placental insertion	Free loop	Abdominal insertion	Perivesical site
index	24 (7)	0.63 ± 0.07	0.68 ± 0.3	0.75 ± 0.06	0.74 ± 0.04
	28 (19)	0.59 ± 0.06	0.66 ± 0.08	0.68 ± 0.05	0.74 ± 0.098
	32 (12)	0.05 ± 0.12	0.62 ± 0.09	0.61 ± 0.08	0.70 ± 0.089
	34 (8)	0.55 ± 0.10	0.61 ± 0.04	0.64 ± 0.06	0.66 ± 0.059
	36 (15)	0.49 ± 0.11	0.57 ± 0.08	0.59 ± 0.13	0.66 ± 0.09
	38 (10)	0.51 ± 0.08	0.57 ± 0.03	0.6 ± 0.04	0.68 ± 0.08
index	24	1.04 ± 0.22	1.08 ± 0.13	1.15 ± 0.33	1.20 ± 0.18
	28	0.92 ± 0.15	1.06 ± 0.22	1.07 ± 0.19	1.19 ± 0.20
	32	0.80 ± 0.28	0.97 ± 0.24	0.97 ± 0.24	1.19 ± 0.30
	34	0.81 ± 0.20	0.90 ± 0.13	0.96 ± 0.17	1.05 ± 0.17
	36	0.72 ± 0.24	0.85 ± 0.19	0.90 ± 0.31	1.08 ± 0.26
	38	0.76 ± 0.21	0.86 ± 0.10	0.96 ± 0.16	1.14 ± 0.25
astolic ratio	24	2.83 ± 0.53	3.26 ± 0.43	4.35 ± 1.74	4.00 ± 0.49
	28	2.52 ± 0.48	3.18 ± 0.77	3.22 ± 0.56	4.02 ± 1.20
	32	2.36 ± 0.85	2.88 ± 0.73	2.83 ± 0.77	3.59 ± 1.02
	34	2.37 ± 0.50	2.57 ± 0.29	3.08 ± 0.97	3.21 ± 0.71
	36	2.12 ± 0.43	2.46 ± 0.53	2.82 ± 0.91	3.18 ± 0.89
	38	2.11 ± 0.36	2.37 ± 0.23	2.45 ± 0.25	3.31 ± 1.01

Index	Mean of difference	95% CI (mean \pm 1.96 SD)	<i>P</i> -value
RI			
PVC24-PL24	0.11	–	0.02
PVC28-PL28	0.15	–0.04 to 0.34	<0.01
PVC32-PL32	0.16	–0.16 to 0.49	0.02
PVC34-PL34	0.11	–	0.05
PVC36-PL36	0.17	–0.03 to 0.36	<0.01
PVC38-PL38	0.16	–	0.02
PI			
PVC24-PL24	0.17	–	0.03
PVC28-PL28	0.27	–0.09 to 0.87	<0.01
PVC32-PL32	0.39	–0.44 to 1.24	0.01
PVC34-PL34	0.27	–	0.06
PVC36-PL36	0.35	–0.11 to 0.82	<0.01
PVC38-PL38	0.37	–	0.02
S/D ratio			
PVC24-PL24	1.18	–	0.02
PVC28-PL28	1.50	–0.06 to 3.60	<0.01
PVC32-PL32	1.22	–0.28 to 2.89	0.02
PVC34-PL34	0.84	–	0.05
PVC36-PL36	0.99	–0.33 to 2.31	<0.01
PVC38-PL38	1.20	–	<0.01

Map 1

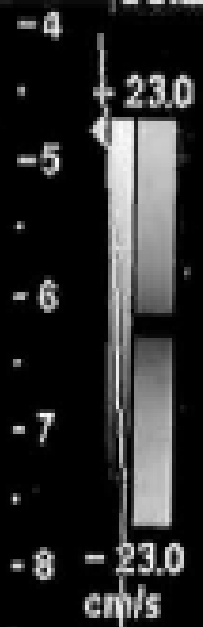
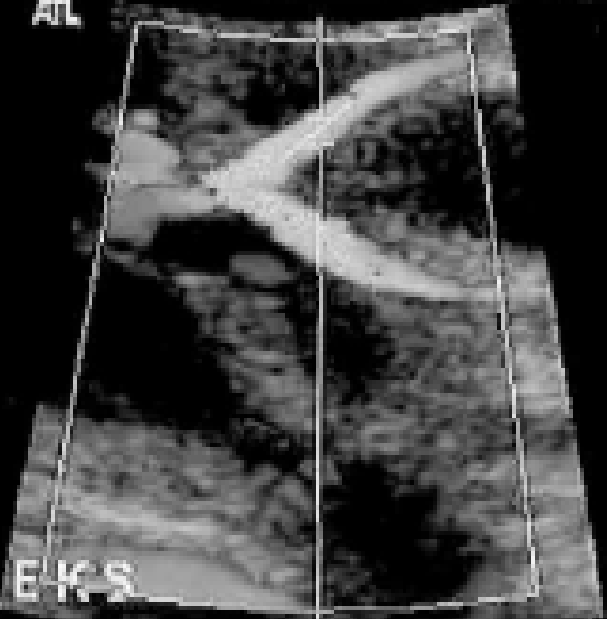
00 Hz

ot: Res

Pg 0

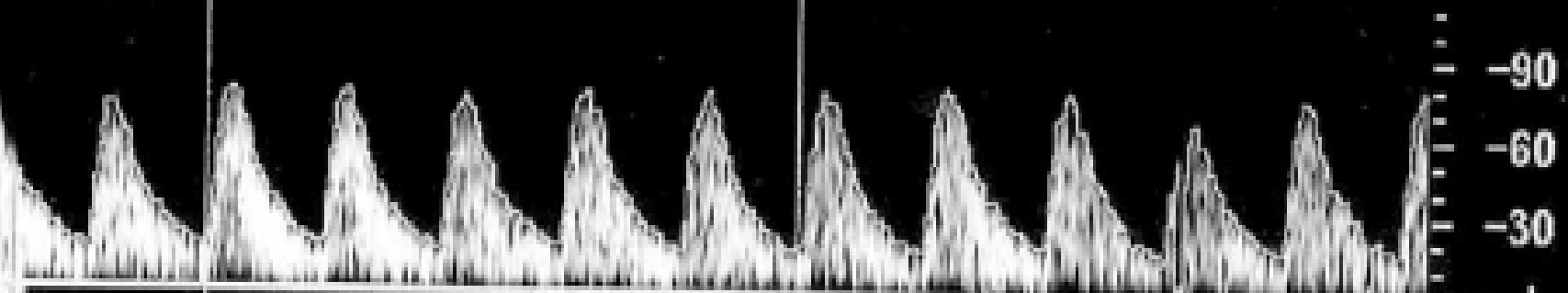
Pg 0

ATL



SV Angle 52°
Dep 4.9 cm
Size 2.0 mm
Freq 2.5 MHz
WF Low
Dop 71% Map 2
PRF 5000 Hz

28 WEEKS
PVC 2



74.3 cm/s

-90
-60
-30
cm/s
30
60

Preeclampsia

Rischio di Morbosita' e Mortalita' perinatale



Condizioni Materne



Condizioni Fetali

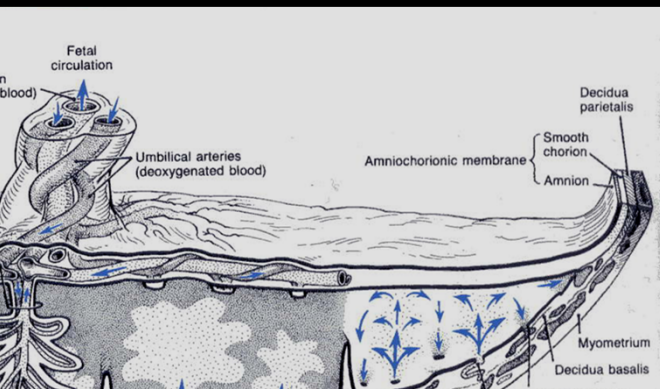
Causes

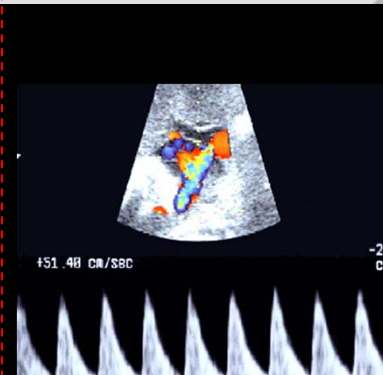
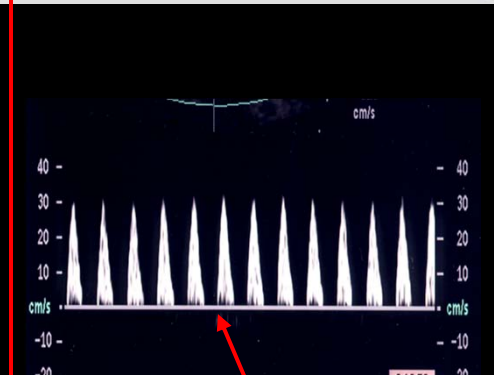
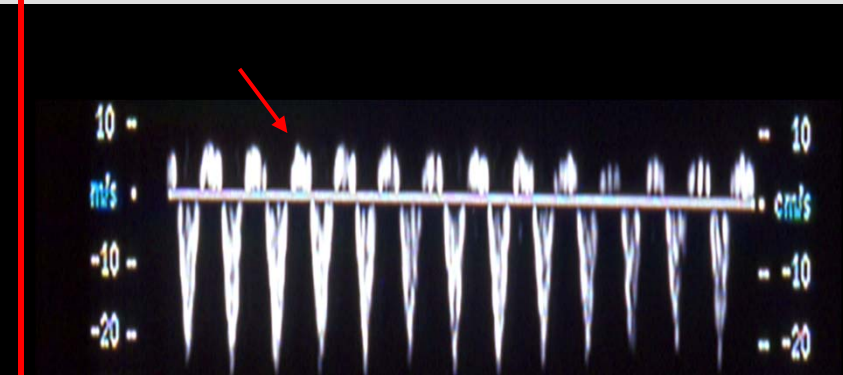
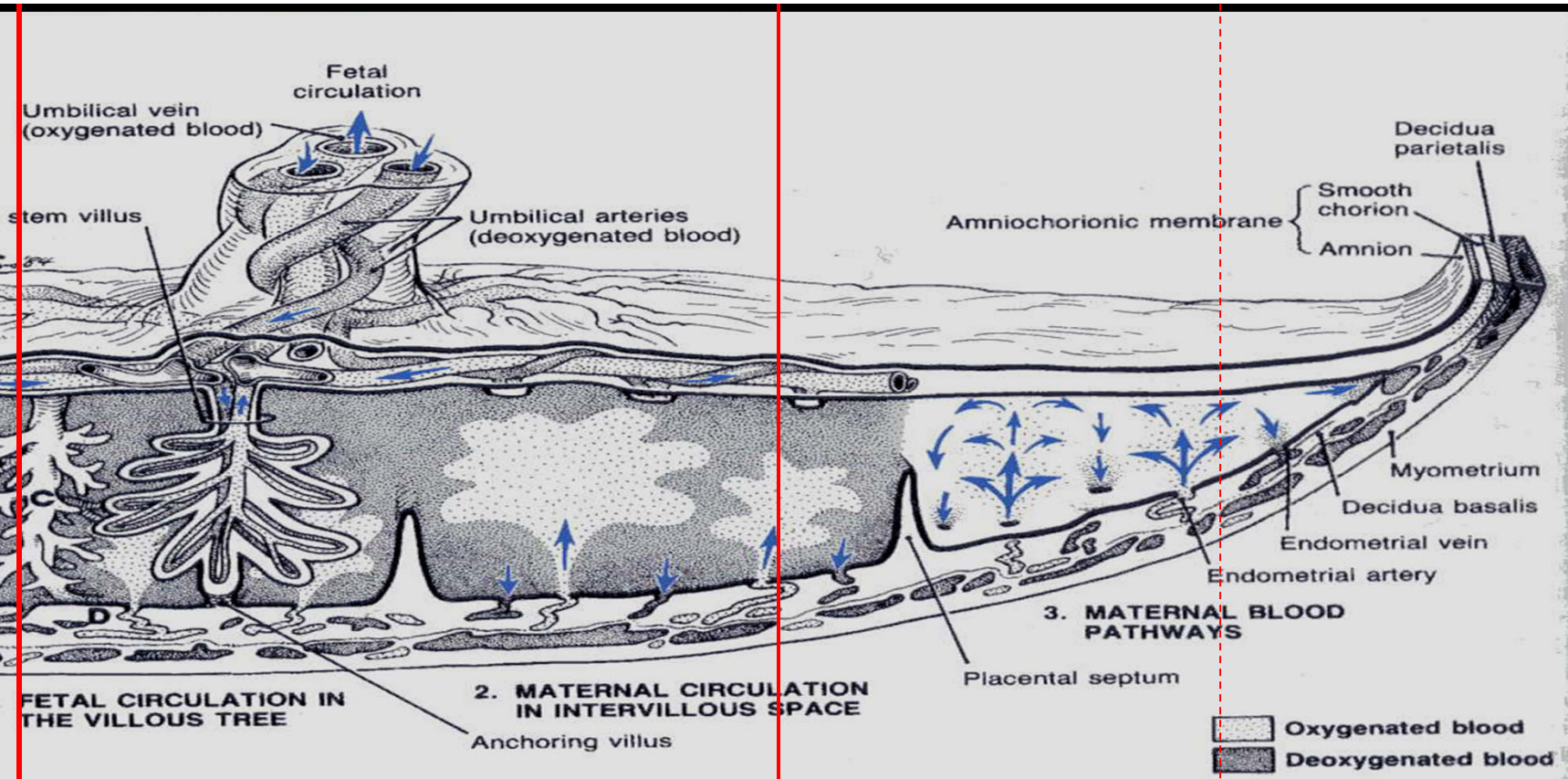
Idiopathic

Maternal

Fetal

Placental



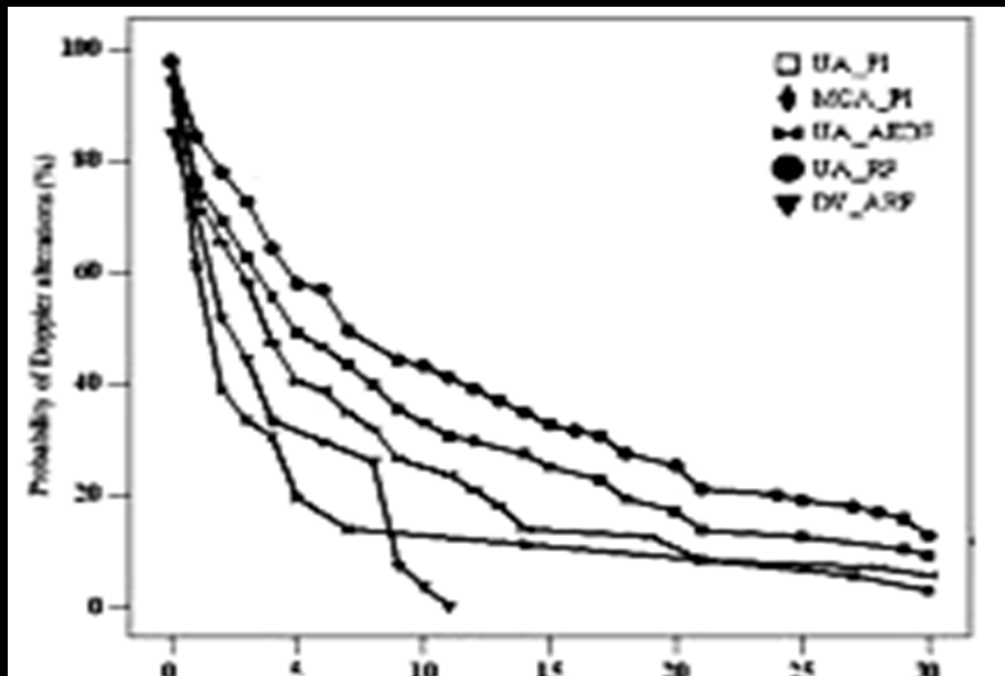


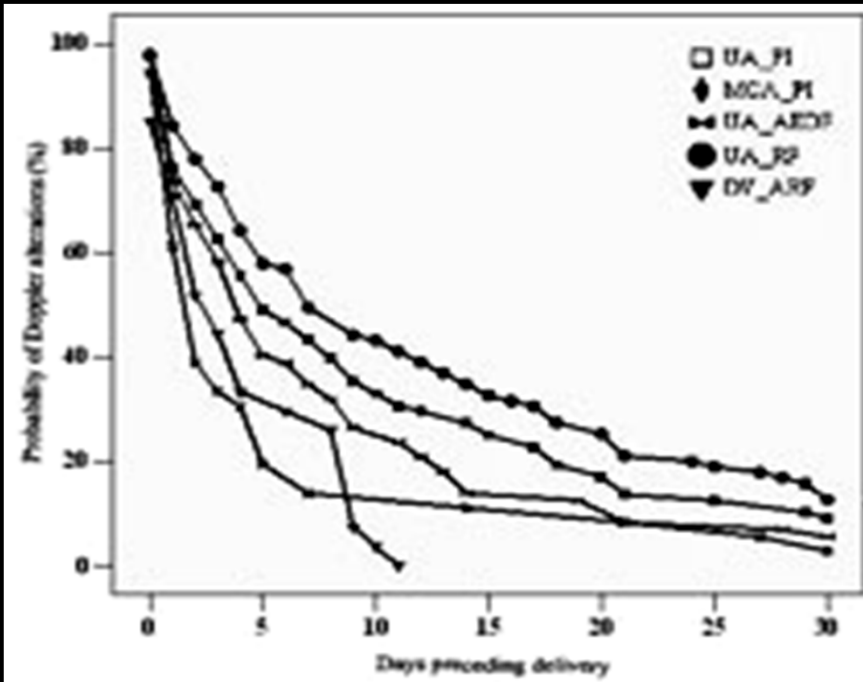
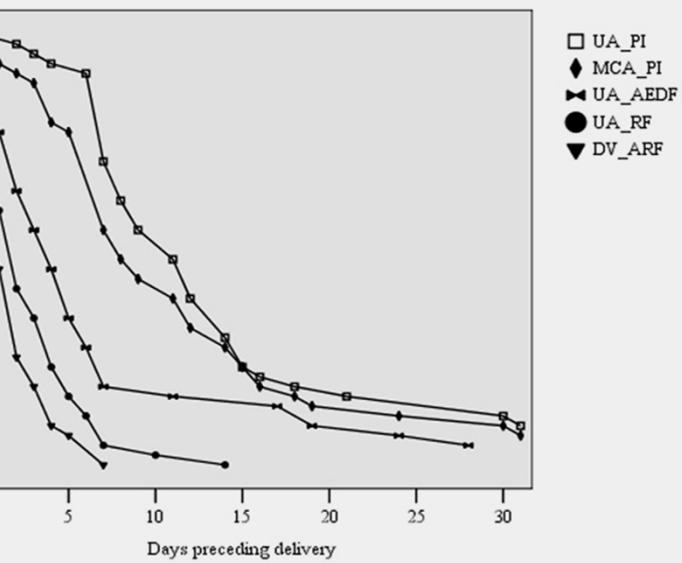
Antenatal testing performed in all fetuses from preeclamptic women

- Doppler velocimetry twice weekly
- fetal growth every 2 weeks
- daily NST
- Biophysical profile twice weekly

Preeclamptic IUGR fetuses

Temporal sequence of antenatal testing is shorter





A PI

MCA PI

UA AEDF

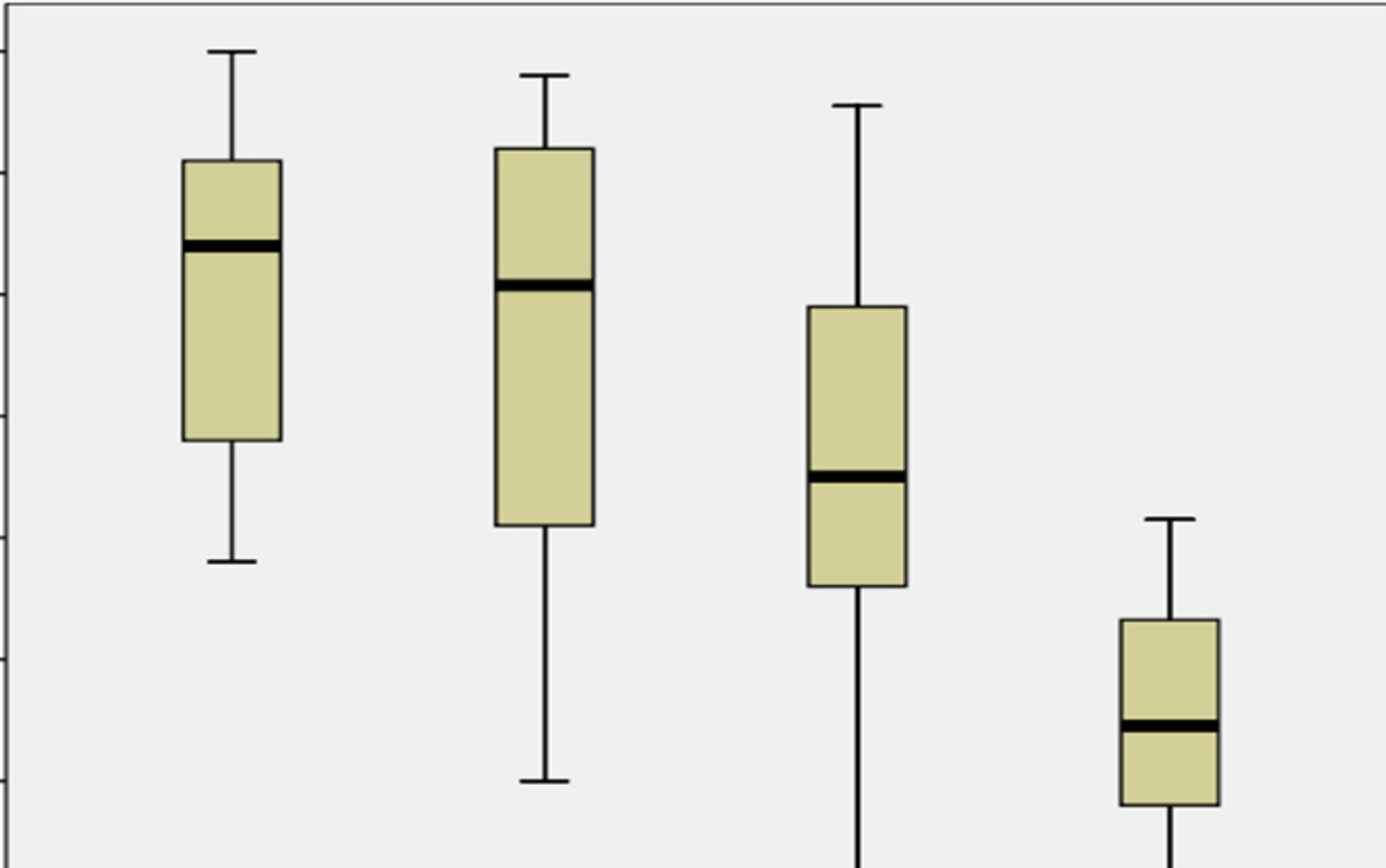
UA RDF • IVH
• NEC

DV ARF • RDS
• IVH
• NEC
• PVL
• Neonatal Death
• Fetal Death

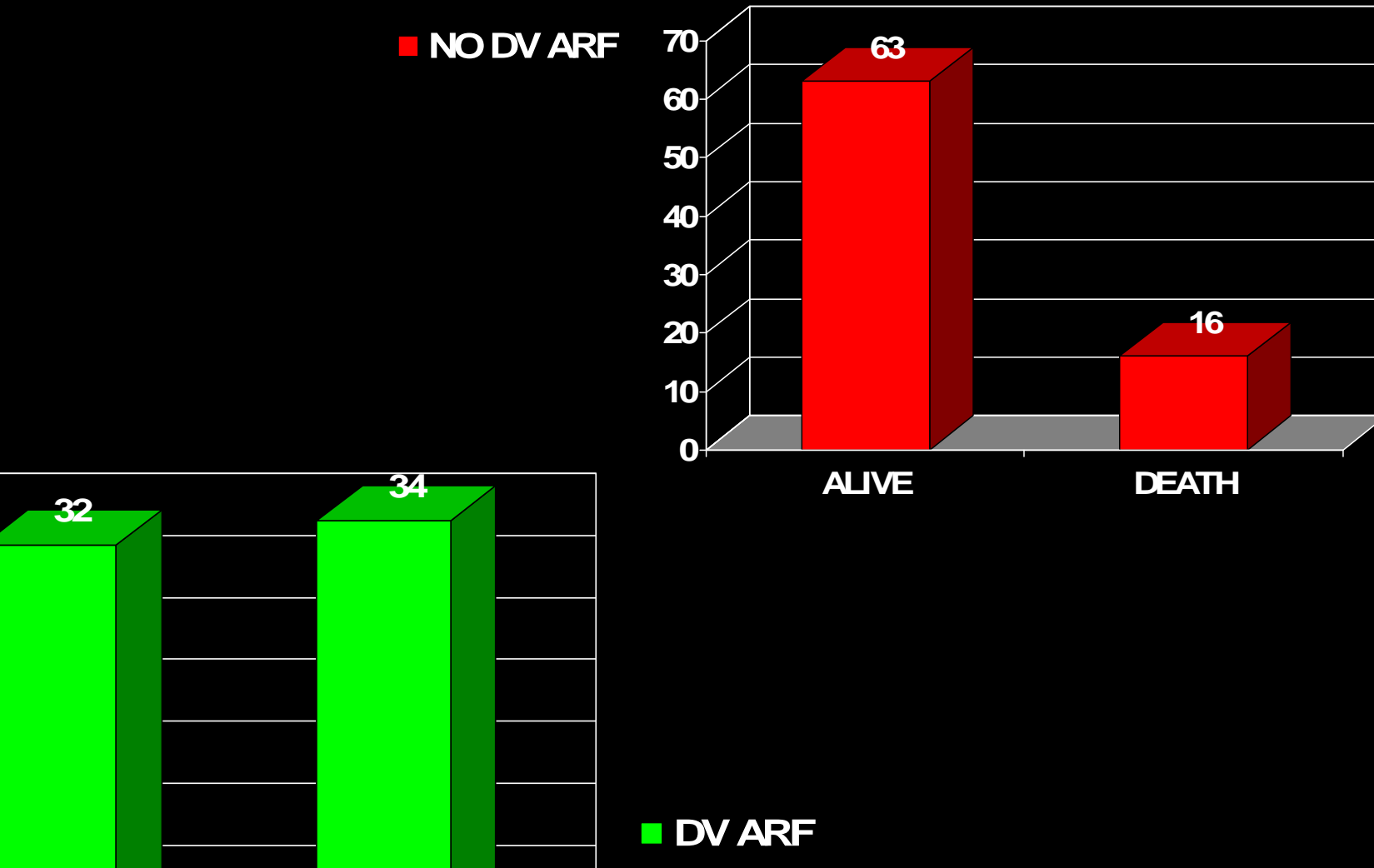
WEIGHT • RDS
• Neonatal Death

ATIONAL AGE • Fetal Death

Neonatal weight and neonatal outcome

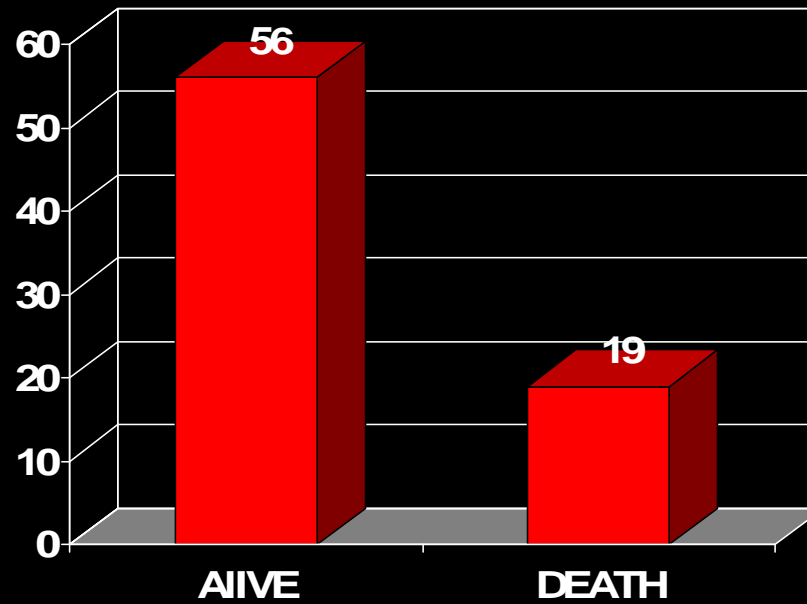


DV ADF or RF vs neonatal mortality



UA RF vs Neonatal mortality

■ NO UA RDF



39

31

■ UA RDF

