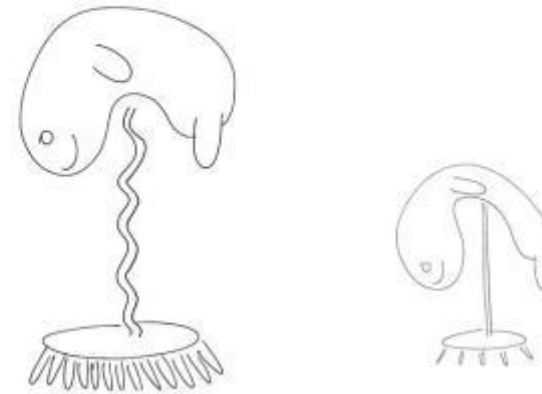


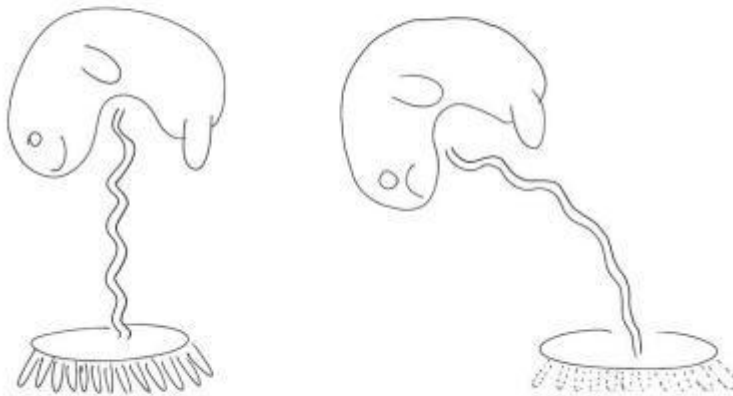
Monitoring fetal growth

Jon Hyett
RPA Women and Babies
Royal Prince Alfred Hospital, Sydney

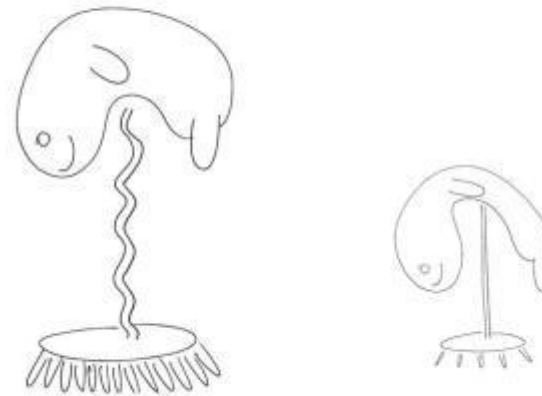
Growth restriction: placental insufficiency



Growth restriction: placental failure

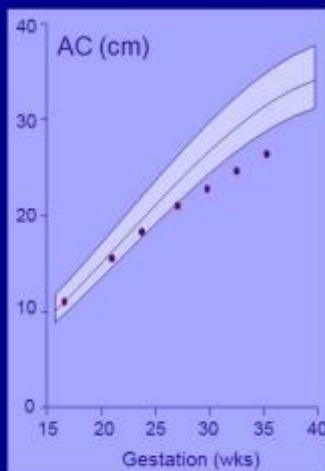


Growth restriction: placental insufficiency



Small Fetuses

Defining IUGR



Normal
75%

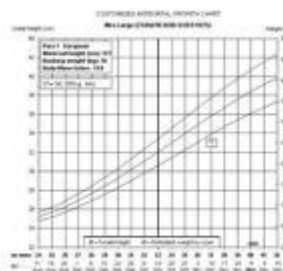
Abnormal
5%

Starved
20%



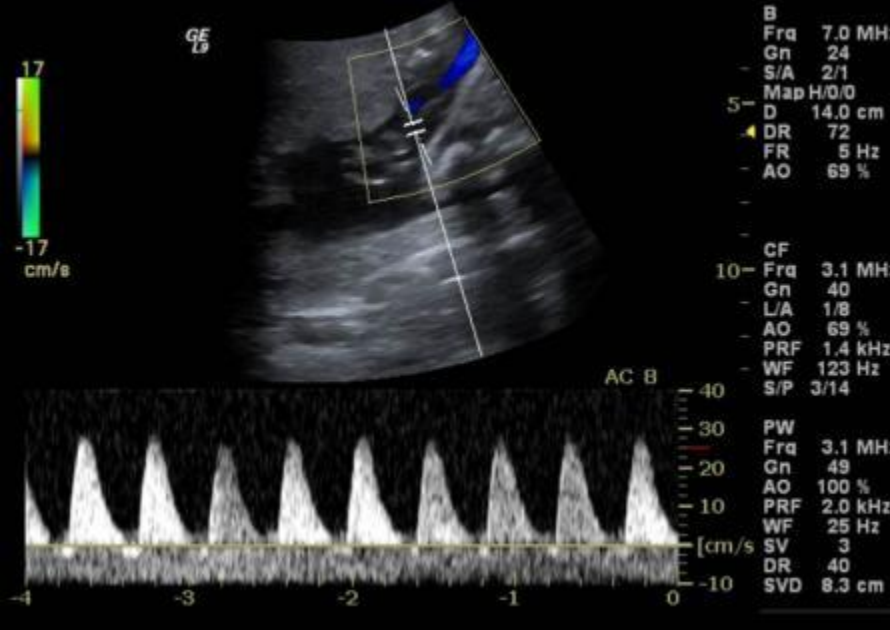
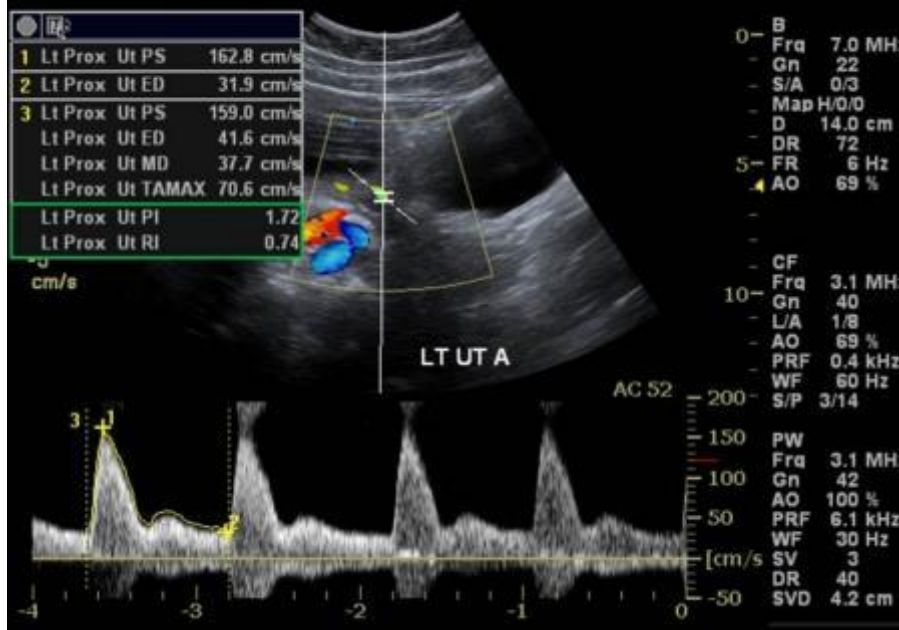
Should we use customized growth charts?

	Total		Stillbirth (n = 908)		Neonatal death* (n = 214)		
	n	n	Rate/1000	OR (95%CI)	n	Rate/1000	OR (95%CI)
Non-SGA _{pop} /non-SGA _{cut}	286,675	564	2.0	1.0	152	0.5	1.0
SGA _{pop} /non-SGA _{cut}	8884	21	2.4	1.2 (0.8-1.9)	4	0.5	0.9 (0.3-2.3)
Non-SGA _{pop} /SGA _{cut}	8887	106	11.9	6.1 (5.0-7.5)	19	2.2	4.1 (2.5-6.6)
SGA _{pop} /SGA _{cut}	21,931	217	9.9	5.1 (4.3-5.9)	39	1.8	3.4 (2.4-4.8)

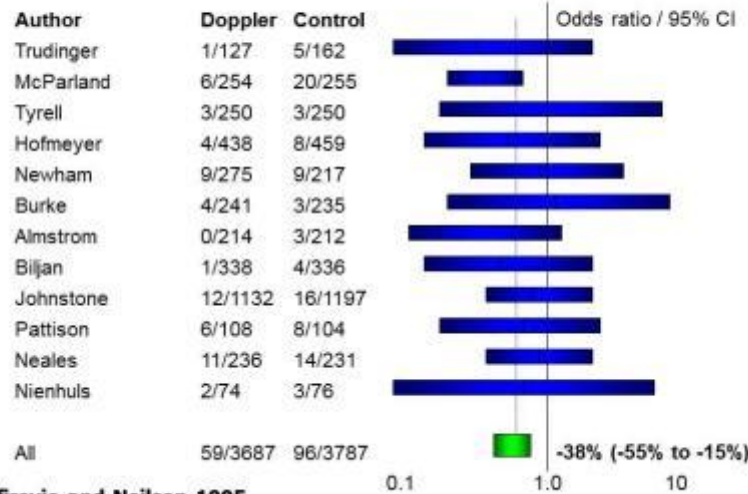


Clausson *et al.* BJOG 2001

- 85% of customized SGA babies born > 37/40
- Offer better correlation with bad outcomes
- Reduces the false positive (IoL) rate
- Recommended in international guidelines

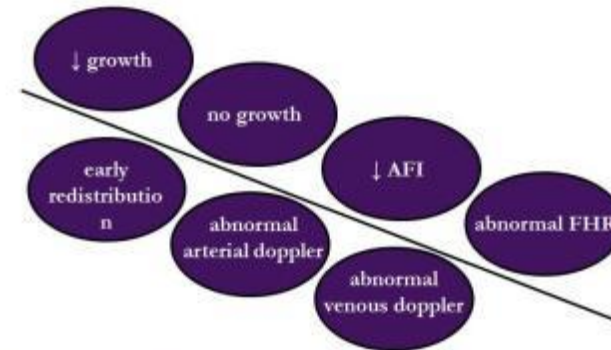


Predicting perinatal mortality: UmbArt Doppler



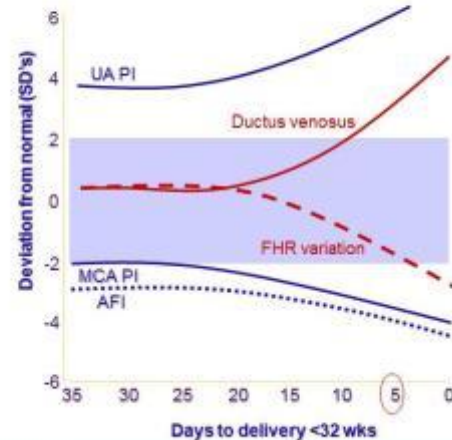
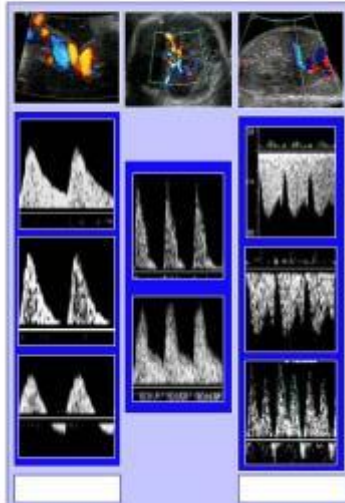
Alfirevic and Neilson 1995

Fetal response to placental insufficiency

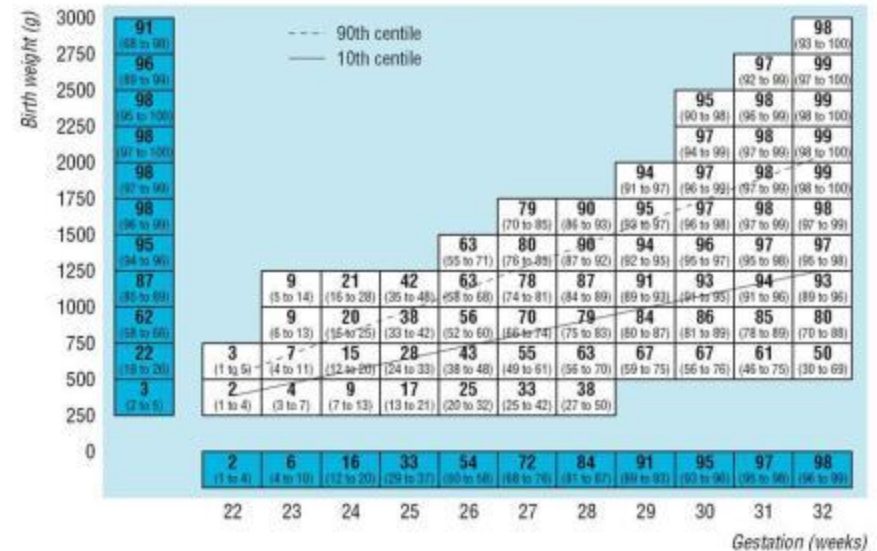


↑ umbilical arterial resistance

Fetal response to placental insufficiency

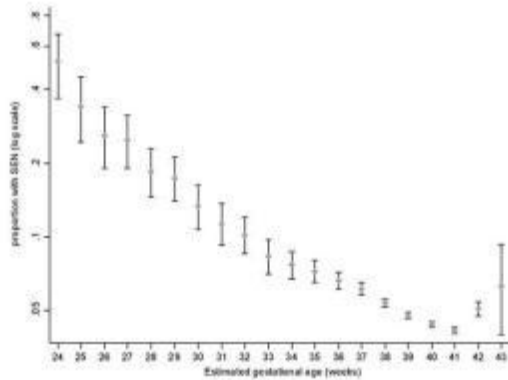


Hecher et al 2001, Baschat et al 2001, Bilardo et al 2004



Draper et al. BMJ 1999 / 2003

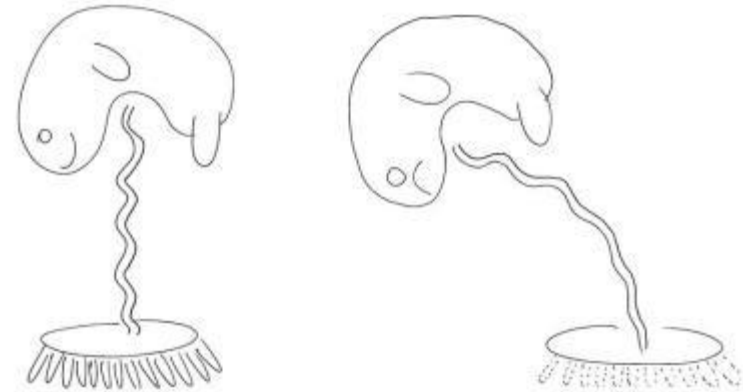
Early delivery and special needs



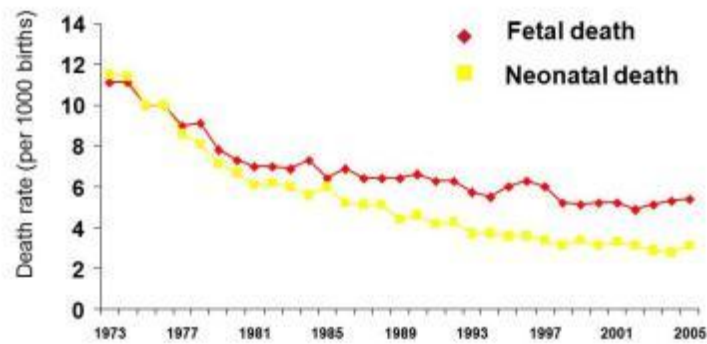
MacKay et al. PLOS 2010

13

Growth restriction: placental failure

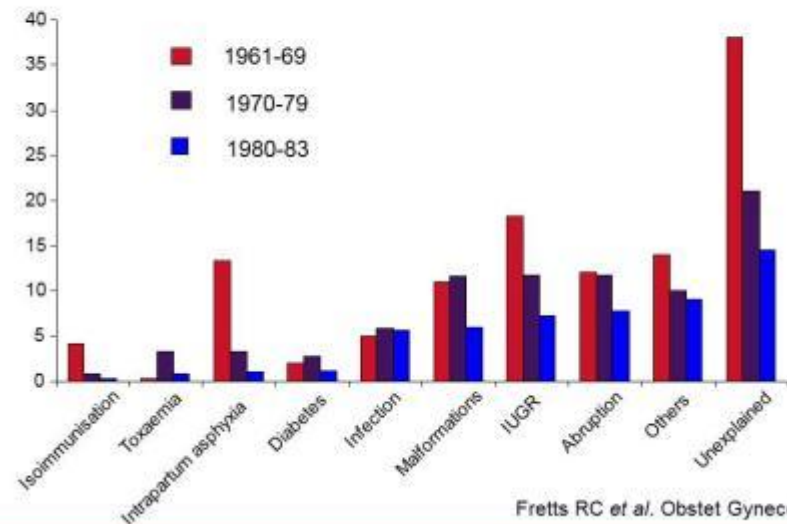


Fetal and Neonatal Mortality



Australian Bureau of Statistics

Cause of stillbirth



Fretts RC et al. Obstet Gynecol 1992

Antenatal risk factors: neonatal encephalopathy

Risk Factor	Odds Ratio
Maternal Age (>35 years)	6.01
Parity (<1 birth)	1.81
Infertility Rx	4.43
Preeclampsia	6.30
Thyroid disease	9.70
Antepartum haemorrhage	3.57
Gestation (>41 weeks)	3.34
Birthweight (<3 rd centile)	38.23

Badawi *et al.* BMJ 1998

nRBC production and chronic fetal hypoxia



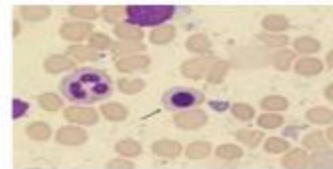
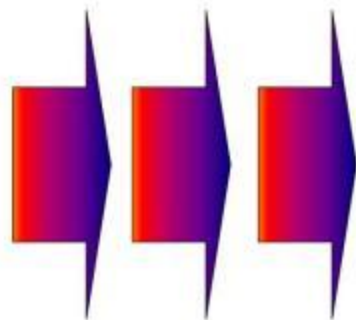
	BWT (<10 th centile)	BWT (>10 th centile)	Total
%fat (<10 th centile)	5	8	13
%fat (>10 th centile)	19	191	210
Total	24	199	223

Compared to PEAPOD, using birth weight to define growth restriction:

detects	38%
false positive rate	91%

Raaba, MSc 2011

nRBC production and chronic fetal hypoxia



	Controls N=45	Acute Distress n=11	Chronic Distress N=21
nRBCs/100WBC	7.56	11.18*	24.43*
pH	7.28	7.27	7.20*

Saracoglu *et al.* 2000

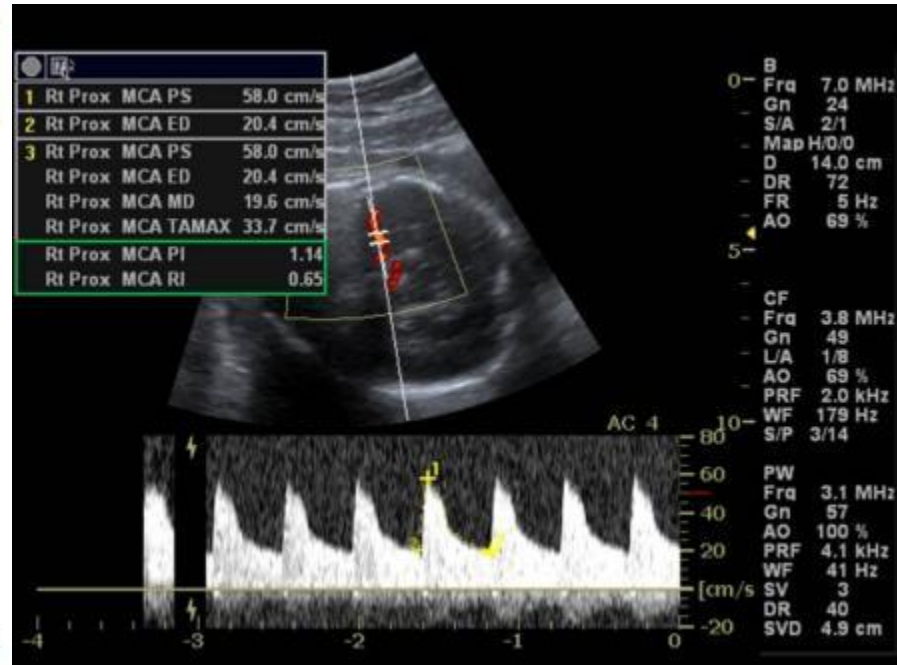
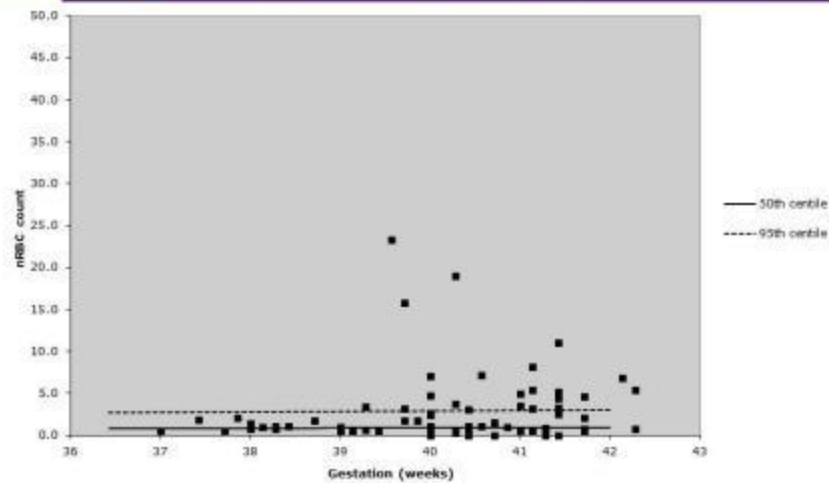
Chronic hypoxia → Decompensation in labour → Death / disability

nRBC counts in term infants admitted to NICU

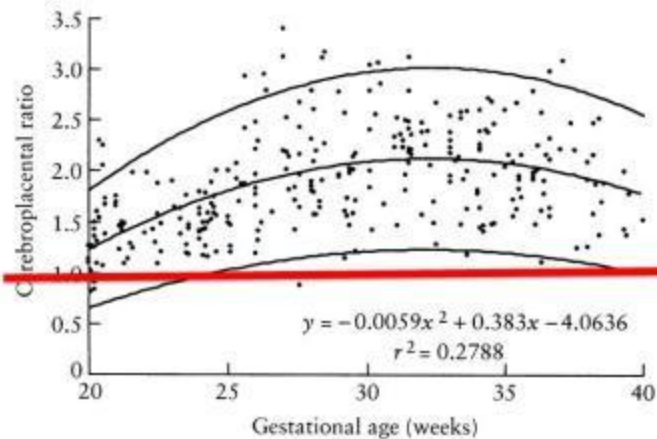
Indication admission	for N	%	Raised nRBC		RR	p-value
			Expected	Observed		
IUGR	41	8.2	2.1	10	1.88	<0.001
Acidosis	74	14.9	3.7	23	2.02	<0.001
Respiratory	231	46.8	11.6	24	1.37	0.014
Sepsis	65	13.1	3.3	4	1.15	0.68
Metabolic	34	6.8	1.7	6	1.61	0.06
Jaundice	24	4.8	1.2	3	1.57	0.17
Birth trauma	14	2.8	0.7	0	0.48	0.56
NAS	14	2.8	0.7	2	1.39	0.72
Total	497	100	25.9	72	1.55	<0.001

Raaba, MSc 2011

nRBC count in Acidotic neonates admitted to NICU



The Cerebroplacental Doppler Ratio (CPR)



MCA Doppler and Late Onset IUGR

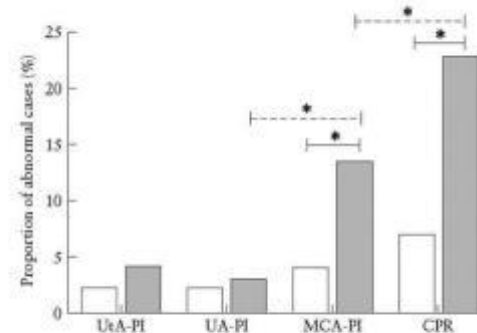


Figure 1 Proportion of abnormal Doppler findings at 37 weeks' gestation (□) and last examination before delivery (■) (*McNemar $P < 0.05$). CPR, cerebroplacental ratio; MCA, middle cerebral artery; PI, pulsatility index; UA, umbilical artery; UtA, uterine artery.

Table 3. Comparison of Standard Diagnostic Tests in Prediction of Adverse Perinatal Outcome (Prevalence: 27.7%)

	MCA	UA	Cerebral-umbilical ratio
Sensitivity	24.0	64.0	68.0
Specificity	100.0	90.7	98.4
Positive predictive value	100.0	72.7	94.4
Negative predictive value	77.3	86.7	88.8
Accuracy	78.8	83.3	90.0

MCA = middle cerebral artery; UA = umbilical artery.
Data are presented as percentages.