

Pathology and clinical relevance of fetal blood flow measurements.

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A considerable number of studies have appeared on volume blood flow in the umbilical vein and fetal descending aorta (2). Although in vitro experiments demonstrate an acceptable accuracy of volume flow measurements for present pulsed Doppler equipment, studies in the fetal lamb indicate that these measurements should be considered with caution, mainly due to problems related to estimations of fetal vessel size.

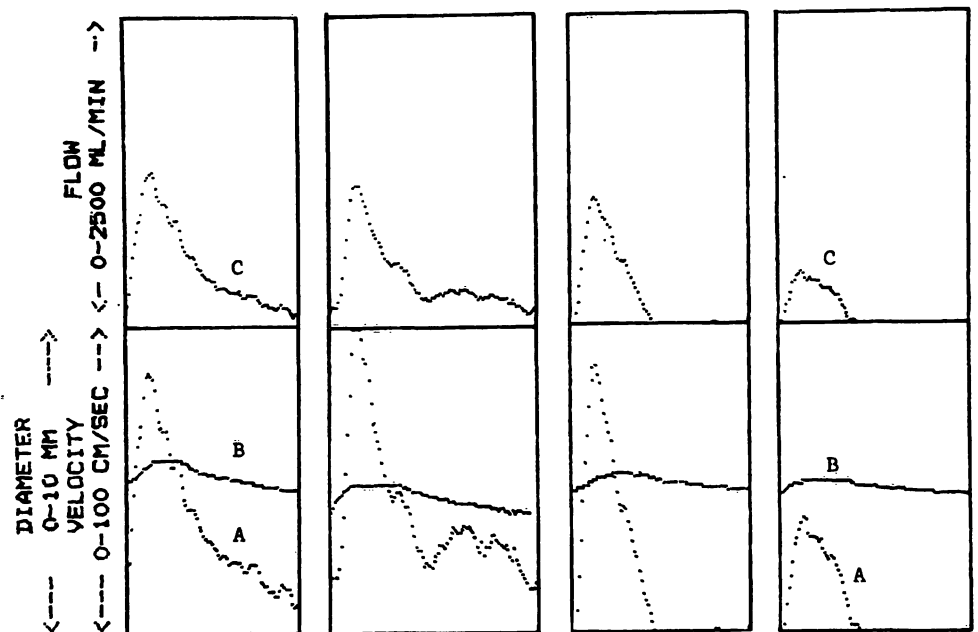
Qualitative analysis of flow velocity waveforms in the fetal thoracic descending aorta and umbilical artery has demonstrated a typically biphasic pattern with a systolic peak and continuing forward velocity throughout diastole. The latter is typical of an arterial supply to a low resistance peripheral vasculature placenta (3,4). A reduction in diastolic flow velocities in the descending aorta and umbilical artery in severe IUGR has been recorded, indicating increased placental vascular resistance (3,4). In Rotterdam, aortic blood flow velocity and pulsatile vessel diameter (T-D recorder) were compared in cardiac cycles of equal R-R intervals ($\pm 5\%$) as obtained by an external ECG (5).

Within one cardiac cycle, both variables were analysed every 5 msec resulting in a total of 80-100 measuring points per cardiac cycle (Apple Computer). Apart from a detailed analysis of the flow velocity and pulsatile vessel diameter profile, it also allows the construction of a volume flow profile within one cycle (Fig.1).

Finally, more information should be collected under physiological circumstances. It has been shown in the fetal lamb, that fetal behavioral states do affect fetal blood flow (1). The application of fetal blood flow measurements to clinical situations can only be adequately assessed in combination with cardiac function studies.

Figure 1.:

Computer printout of mean flow velocity (A), pulsatile vessel diameter (B) and resulting volume flow profile (C) for one cardiac cycle in the thoracic descending aorta. From left to right: normal flow patterns (32 wks), fetal hydrops, severe fetal anaemia (29 wks); severe IUGR (33 wks), note absent diastolic flow; severe IUGR with late FHR decelerations, note reduced systolic and diastolic flow, Caesarean Section, 800g infant at 34 wks, umb. art. pH: 7.05.

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