

Reply

We appreciate Dr Carvalho's interest in our study, which reported normal values for the 'half peak systolic velocity deceleration time' in the umbilical artery from 532 normal second- and third-trimester fetuses¹. We further used this technique to evaluate placental resistance in seven fetuses with bradycardia, as this Doppler index is independent of the fetal heart rate (FHR). This is not the case for other umbilical artery Doppler indices currently in use, such as the systolic-to-diastolic ratio, resistance index and pulsatility index, which all consider end-diastolic velocities for the calculation and are, therefore, affected by the FHR.

We apologize for overlooking Carvalho *et al.*'s description of a similar Doppler technique used in the descending aorta from 17 children with aortic coarctation². In spite of several methodological and technical differences, including population, medical condition and targeted vessel studied, we fully agree with Dr Carvalho on the similarities between what they called 'time to half peak systolic velocity'² and our technique. However, we derived our impedance index from direct measurement of the spectral Doppler waveform and so, unlike Carvalho *et al.*², we were unable to correlate our measurement with simultaneous electrocardiography. We consider that using electrocardiographic landmarks from systole and diastole and correlating them with the arterial Doppler systolic and diastolic velocities is not completely accurate, as there is a delay between the electrical component of the

cardiac cycle and the corresponding blood flow velocity waveforms in a distant vessel. In the umbilical artery, this delay may be more pronounced than it is in the descending aorta due to the larger distance from the fetal heart. Although the maximum velocity in a given vessel is the direct result of the ventricular systole, the highest velocities are actually recorded during early cardiac diastole; therefore, the correct term to use in describing arterial Doppler flow patterns should be 'maximum velocity' rather than 'peak systolic velocity'.

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References

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