Identification of negative DV a-waves through semi quantitative analysis of blood flow

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Objective

To develop an objective method for identifying abnormal / negative DV a-wave by semi-quantitative analysis of DV waveform.

Methods

DV flows were classified by experts into normal, false or real negative a-wave. We calculated the S/V, S/D and V/D ratios, where S - ventricular systole (S-wave) V – ventricular tele-diastolic relaxation, D - passive ventricular diastolic filling (waveform D). We included retrospectively singleton fetuses (CRL 45-84 mm) from 2009-2016 with negative DV a-wave and we classified them to two groups,with possible or with real negative DV a-wave. 439 normal pregnancies, with positive DV a-wave, prospectively evaluated from 2015-2016, formed the control group.

Results

We analised 436 cases with a-wave positive, 37 with a-wave false positive and 24 with a-wave real negative at the DV level. The average values of S/V and S/D ratios were significantly different among all three study groups, having a progressive increase from the normal towards the true negative form, 1.48±0.15, 1.67±0.17 and 2.08±0.75 for S/V; 1.19±0.06, 1.23±0.06 and 1.33±0.15 for S/D (means ± standard deviation), respectively. Mean value for V/D ratio was greater for the positive a-wave group, but there were no significant differences between groups with the a-wave false or real negative. S/d and S/v can discriminate real negative waves from those apparently negative, the area under ROC curve being 75% and 74%, respectively.

Conclusion

Negative DV waveforms are associated with a complete modification of the flow architecture. With a limited accuracy, semi-quantitative assessment of DV blood flow waveform can facilitate recognition of negative a-waves.