The feasibility of STIC combined with HD-flow imaging in displaying the fetal subclavian artery during early pregnancy (11-13+6 W)

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Background

- An ARSA is a relatively common variation; some studies have reported a significant association between an ARSA and trisomy 21, similar to the 22q11.2 microdeletion.
- When an ALSA occurs, together with the left ductus arteriosus, which encircles the trachea and oesophagus in a “U”-shaped ring. Approximately 25% of cases present with vascular ring symptoms, such as the compression of the trachea and/or oesophagus after birth. Approximately 4.3-32% of ALSA patients with a right aortic arch were associated with chromosomal abnormalities, especially the 22q11 microdeletion.
- Many obstetrical ultrasound specialists had been interested in and studied the subclavian artery in detailed sonographic screening during the second trimester (18-24 weeks [W]). The techniques used included real-time colour Doppler flow imaging (CDFI), high-definition flow (HD-flow) and spatio-temporal image correlation (STIC), which had a high display rate (up to 98%). Few studies have investigated the subclavian artery during early pregnancy, most of which reported the display rate of the RSA with real-time dynamic HD-flow, without mentioning the LSA and tracheal display. The display rates of the subclavian artery and the trachea during early pregnancy with the STIC technique have rarely been reported.

Methods

- Eighty-six normal singleton fetuses (crown-rump length: 45-84mm) were enrolled in this study. The image of real-time 2D and the STIC volume data of fetal heart and vessels combined with HD-flow imaging were acquired after routine sonographic screening.
- The cases were divided into three groups: Group A (CRL<55mm), Group B (55mm>CRL<65mm), Group C (CRL>65mm).
- Two senior sonologists analyzed the volume data and the real-time 2D data independently and blindly.
- McNemar Test was used to compare the displaying rates of left and right subclavian arteries by using real-time 2D and the STIC volume data combined with HD-flow imaging. We used Pearson Chi-Square to evaluate the difference of the displaying rates in the three groups. The consistency of two sonologists was assessed by Kappa coefficient.

Objects

- To assess the feasibility of Spatio-temporal image correlation (STIC) combined with high definition flow (HD-flow) imaging for detecting fetal subclavian artery between 11-13 weeks.

Fig. 1: Foetal cardiovascular STIC volume TUI model in early pregnancy (13+3 W)

Fig. 2: Normal subclavian artery images during early pregnancy in different cases

Results

- For the STIC volume data, the display rate of LSA was 66.7%, 69.2%, 84.2% and 75.6% in group A, B, C and all cases, respectively. And the displaying rate of RSA was 89.9%, 87.2%, 89.5% and 88.4% in different groups and total fetuses, respectively.
- For the real-time 2D data, the displaying rate of left and right subclavian artery was 77.8%, 64.1%, 81.1%, 72.9%, 86.9%, 82.1%, 83.8% and 83.5%, in group A, B, C and all cases, respectively.
- No significant difference could be found between the displaying rates by two ultrasonic technologies (all P >0.05). Also, there was no significant difference among the displaying rates of the groups with different CRL (all P >0.05).
- The Kappa value was between 0.62 and 1 for the consistency of the two sonologists in the data analysis (all P < 0.01).

Conclusions

- By STIC technology combined with HD-flow imaging, assessments of the fetal LSA and RSA are feasible in first trimester screening with high consistency between different observers, which can be recommended for clinical use.

References


Disclosure

No conflicts