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Gestation-specific reference intervals for fetal cardiac Doppler indices from 12 to 40 weeks of gestation

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ABSTRACT

We aimed to establish gestation age specific reference intervals for Doppler indices of fetal cardiac function from 12 to 40 weeks of pregnancy. In a cross-sectional observational study of singleton pregnancies, examinations were performed in 221 women evenly distributed across each week of pregnancy. Blood flow through the four cardiac valves was examined with Doppler. For the atrioventricular valves, velocity and duration of early (E) and atrial (A) waves and the interval (a) between E/A complexes was recorded. For the outflow valves, the duration (b), peak and average velocity of flow in systole was measured. Myocardial performance index (MPI) was calculated as $(a - b)/b$. Outlet valve diameters were measured and cardiac outputs were calculated. Gestation age specific ranges were constructed for all these parameters. We demonstrated that the cardiac output, peak systolic and time-averaged velocity increase with advancing gestation. However the MPI and E/A ratios show little change across gestation. Fetal cardiac physiology can be studied and Doppler indices reliably measured as early as the late first trimester of pregnancy. Establishing gestation age specific ranges for various cardiac indices throughout pregnancy will help the study of development of fetal cardiac function.

KEYWORDS

Cardiac Doppler; Fetal; Gestation Age; Reference Range; Ultrasound

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References

- [1] Tei, C., Dujardin, K., Hodge, D., et al. (1996) Doppler index combining systolic and diastolic myocardial performance: Clinical value in cardiac amyloidosis. *Journal of the American College of Cardiology*, 28, 658-664.
- [2] Williams, R., Ritter, S., Tani, L.Y., et al. (2000) Quantitative assessment of ventricular function in children with single ventricle using the Doppler myocardial performance index. *American Journal of Cardiology*, 86, 1106-1110. doi:10.1016/S0002-9149(00)01168-1
- [3] Ichizuka, K., Matsuoka, R., Hasegawa, J., et al. (2005) The Tei index for evaluation of fetal myocardial performance in sick fetuses. *Early Human Development*, 81, 273-279. doi: 10.1016/j.earlhumdev.2004.07.003
- [4] Crispi, F., Hernandez-Andrade, E., Pelsers, M.M.A.L., et al. (2008) Cardiac dysfunction and cell damage across clinical stages of severity in growth restricted fetuses. *American Journal of Obstetrics & Gynecology*, 199, 254.e1-254.e8.
- [5] Hanson, M.A. and Gluckman, P.D. (2005) Developmental processes and the induction of cardiovascular function: Conceptual aspects. *The Journal of Physiology*, 565, 27-34. doi:10.1113/jphysiol.2004.082339

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- [6] Davis, L., Thornburg, K.L. and Giraud, G.D. (2005) The effects of anaemia as a programming agent in the fetal heart. *The Journal of Physiology*, 565, 35-41. doi:10.1113/jphysiol.2004.082388
- [7] Battista, M.C., Calvo, E., Chorvatova, A., et al. (2005) Intra-uterine growth restriction and the programming of left ventricular remodelling in female rats. *The Journal of Physiology*, 565, 197-205. doi: 10.1113/jphysiol.2004.078139
- [8] Mielke, G. and Benda, N. (2001) Cardiac output and central distribution of blood flow in the human fetus. *Circulation*, 103, 1662-1668. doi:10.1161/01.CIR.103.12.1662
- [9] Friedman, D., Buyon, J., Kim, M., et al. (2003) Fetal cardiac function assessed by Doppler myocardial performance index (Tei index). *Ultrasound in Obstetrics & Gynecology*, 21, 33-36 doi: 10.1002/uog.11
- [10] Kiserud, T., Ebbing, C., Kessler, J., et al. (2006) Fetal cardiac output, distribution to the placenta and impact of placental compromise. *Ultrasound in Obstetrics & Gynecology*, 28, 126-136 doi: 10.1002/uog.2832
- [11] Arduini, D., Rizzo, G., Romanini, C., et al. (1995) Fetal cardiac output measurement in normal and pathologic states. In: Copel, J.A. and Reed, K.L., *Doppler Ultrasound in Obstetrics and Gynecology*, Springer Publishing Company, New York, Chap 27.
- [12] Fernandez Pineda, L., Tamariz-Martel Moreno, A., Maitre Azcarate, M.J., et al. (2000) Contribution of Doppler atrioventricular flow waves to ventricular filling in the human fetus. *Pediatric Cardiology*, 21, 422-428. doi: 10.1007/s002460010101
- [13] Tsutsumi, T., Ishii, M., Eto, G., et al. (1999) Serial evaluation for myocardial performance in fetuses and neonates using a new Doppler Index. *Pediatrics International*, 41, 722-727. doi:10.1046/j.1442-200x.1999.01155.x
- [14] Mori, Y., Rice, M.J., McDonald, R.W., et al. (2001) Evaluation of systolic and diastolic ventricular