

Abnormal ductus venosus peak velocity index measured during fetal echocardiographic examination can predict failure of functional closure of the foramen ovale in the postnatal period.

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Objectives: To investigate the applicability of ductus venosus (DV) wave velocities and/or DV peak velocity index (DV-PVIV) for veins in the prediction of failure of the foramen ovale to close functionally in the early postnatal period.

Methods: For this prospective study, we performed fetal echocardiography on 400 healthy women with uneventful pregnancies between the 20-24th gestational weeks. Ductus venosus blood flow and DV-PVIV data was collected using 2D and PW Doppler echocardiography. All subjects were called for a repeat echocardiography on the 30th postnatal day. Newborns with clearly visible foraminal flaps, interatrial septal defects smaller than 5 mm and right-to-left shunting through the defect were accepted as patent foramen ovale (PFO). Prenatal ductus venosus blood flow velocities and DV-PVIV data of the fetuses with and without PFO on the postnatal 30th day were compared.

Results: Data concerning the BMI of the pregnant women, birth weight and gender of the newborns were similar ($p > 0.05$). A statistically significant difference was detected between the groups with and without PFO in terms of mean DV-PVIV values (0.61 ± 0.12 and 0.73 ± 0.12 , respectively; $p < 0.001$), DV-D wave velocity (52.14 ± 10.70 and 48.23 ± 11.40 , respectively; $p = 0.003$) and DV-a wave velocity (30.55 ± 6.72 and 25.09 ± 6.73 , $p < 0.001$). ROC (receiver operating characteristic) analysis showed that increased DV-PVIV values are related to and predictive of PFO (AUC = 0.75; $p < 0.001$) and that a threshold value of 0.62, which is associated with the highest Youden index, has a sensitivity of 86.8% (95% CI %: 78.1-93.0%) and a specificity of 51.7% (95% CI: 46.1-57.5%).

Conclusions: Ductus venosus peak velocity index for veins detected above 0.62 at the time of fetal echocardiographic examination may be used as an early predictor for failure of functional closure of the foramen ovale.

Figure-1. ROC curve of DV-PVIV for discrimination between the groups with and without PFO.

