

Choroid plexus of the fourth ventricle in first- and second-trimester fetuses

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Objective

To describe the sonographic appearance and position of the choroid plexus of the fourth ventricle (4V-CP) between 12 and 21 weeks' gestation in normal fetuses and in fetuses with Dandy – Walker malformation (DWM) or Blake's pouch cyst (BPC).

Methods

The study population comprised 90 prospectively recruited normal singleton pregnancies and 41 pregnancies identified retrospectively from our institutional database that had a suspected posterior fossa anomaly at 12-13 weeks' gestation based on the ultrasound finding of abnormal hindbrain spaces. In all cases the final diagnosis was confirmed by prenatal and/or postnatal magnetic resonance imaging or postmortem examination. All pregnancies underwent a detailed ultra-sound assessment, including a dedicated examination of the posterior fossa, at 12-13, 15-16 and 20-21 weeks of gestation. Two-dimensional ultrasound images of the midsagittal and coronal views of the brain through the posterior fontanelle and three-dimensional volume datasets were obtained. Multiplanar orthogonal image correlation with volume contrast imaging was used as the reference visualization mode. Two independent operators, blinded to the fetal outcome, were asked to classify the 4V-CP as visible or not visible in both normal and abnormal cases, and to assess if the 4V-CP was positioned inside or outside the cyst in fetuses with DWM and BPC.

Results

Of the 41 fetuses with apparently isolated cystic posterior fossa anomaly in the first trimester, 8 were diagnosed with DWM, 29 were diagnosed with BPC and 4 were found to be normal in the second trimester. The position of the 4V-CP differed between DWM, BPC and normal cases in the first- and second-trimester ultrasound examinations. In particular, in normal fetuses no cyst was present and, in the midsagittal and coronal planes of the posterior fossa, the 4V-CP appeared as an echogenic oval-shaped structure located inside the 4V apparently attached to the cerebellar vermis. In fetuses with DWM, the 4V-CP was not visible in the midsagittal view because it was displaced infero-laterally by the cyst. In contrast, in the coronal view of the posterior brain, the 4V-CP was visualized in all cases with DWM at 12-13 weeks, with a moderate decrease in the visualization rate at 15-16 weeks (87.5%) and at 20-21 weeks (75%). In the coronal view, the 4V-CP was classified as being outside the cyst in all DWM cases at 12-13 weeks and in 87.5% and 75% of cases at 15-16 and 20-21 weeks, respectively. In fetuses with BPC, the 4V-CP was visualized in all cases in both the midsagittal and coronal views at 12-13 weeks and in 100% and 96.6% of cases, respectively, at 15-16 weeks. In the coronal view, the 4V-CP was classified as being inside the cyst in 28 (96.6%), 27 (93.1%) and 25 (86.2%) cases at 12-13, 15-16 and 20-21 weeks, respectively. The medial segment of the 4V-CP was visualized near the inferior part of the vermis.

Conclusion

Our study shows that longitudinal ultrasound assessment of the 4V-CP and its temporal changes from 12 to 21 weeks is feasible. The 4V-CP is located inside the cyst, just below the vermis, in BPC and outside the cyst, infero-laterally displaced and distant from the vermian margin, in DWM. The position of the 4V-CP is a new useful sonographic marker that can help differentiate between DWM and BPC as early as in the first trimester of pregnancy.