Two dimensional visualisation of optic chiasma

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Objective

The purpose of this study is to train ourselves in visualizing and measuring the fetal optic chiasma (OC) using transabdominal and / or transvaginal two-dimensional (2D) ultrasound in the coronal plane. The role of analysing the optic chiasma cannot be down scaled in prognosticating septo-optic dysplasia (SOD) and agenesis of septum pellucidum.

Methods

This is a retrospective study of 124 random cases referred to our centre for various indications. The gestational age of the fetuses included in our study was between 19 weeks to 34 weeks. All the cases were screened by a single fetal medicine expert (FMF certified) using Voluson E10, BT 17 ultrasound machine equipped with RAB6-D and RIC6-12-D vaginal probe. The OC was visualized in the coronal plane by transabdominal and /or transvaginal route. The OC was measured at the level of 3rd ventricle and was seen as a horizontally placed dumbbell-shaped structure of moderate echogenicity. Color Doppler was used in all the cases to clearly demarcate optic chiasma within the arterial box formed by supra cavernous segment of internal carotid artery and anterior cerebral artery. The GA was rounded up to the nearest week with fractions of </= 4 days assigned to earlier week and >/=5 days to the later week 10. The data was then stratified according to gestational age from 19 weeks to 34 weeks. The data was segregated according to normal low risk cases and abnormal cases like IUGR, macrosomia, structural anomalies (CNS and extra CNS) and other high risk factors. There were total 105 normal low risk cases and 19 abnormal cases in our study. Amongst the abnormal cases, there were 8 cases of CNS anomalies including 2 cases of SOD, one case of bilateral anophthalmia with agenesis of corpus callosum (ACC), 3 cases of partial ACC, 1 case of hypoplastic cerebellum where OC was measured.

Results

It was possible to locate and measure OC width by transabdominal and transvaginal route from 19 weeks onwards. Our study demonstrates that visualisation of OC is possible using 2D - TAS/TVS ultrasound and comparing its width with normal range builds our confidence in detecting and counseling abnormal cases, like SOD and agenesis of SP. Abnormally small Optic Chiasma in SOD carries poor prognosis. We were able to get good views of OC in breech presentation by transabdominal route, and in cephalic presentation by transvaginal route. The measurements of OC obtained in our study ranged from the 3rd percentile to 97th percentile and these are in accordance with the study done by F. Vinals et al. Our study did not stress on abnormal cases as the primary purpose of this study was to show that it is possible to accurately measure fetal OC on 2D ultrasound. Our second objective was to obtain the referral values of OC at various gestational ages. As per our knowledge, this is the only study which quotes the lowest (19 weeks) and the highest (34 weeks) readings of optic chiasma measurement. Another novel feature of our study was the visualisation of OC by both transabdominal and/or transvaginal route. Colour doppler was used in all the cases to accurately locate and measure OC. The main limitation of our study is that the inter-observer reproducibility of the findings was not done. Secondly, the number of cases in higher gestational age was less. Thirdly, the number of abnormal cases were few. And lastly, the confirmation of abnormal cases by antenatal or postnatal MRI or autopsy was not done.

Conclusion

Our study demonstrates that it is possible to visualise and measure the fetal OC in 2D coronal plane by ultrasound. Expertise in visualising OC in normal fetuses gives us confidence in reporting the status of OC in abnormal cases and counselling the complicated cases like SOD and agenesis of septum pellucidum.