



1ST TRIMESTER DIAGNOSIS OF NEURAL TUBE DEFECT

Radiodiagnosis

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KEYWORDS

Introduction:

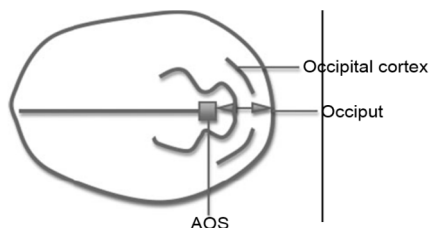
The diagnosis of neural tube defect by lemon sign and banana sign is at 2nd trimester scan. These features are rarely present in the first trimester. The early diagnosis of open spina bifida is challenging and a 2nd trimester scan is still regarded as necessary to detect most cases especially the isolated ones.

Chaoui et al recently described the "Intracranial Translucency", the antero-posterior dimension of the 4th ventricle in the mid saggital plane as the new first trimester sonographic marker for open spina bifida. Many markers have been described as potentially valuable signs in the 1st trimester. However, the search continues for a 1st trimester sonographic landmark that is comparable to the easily recognizable and highly predictive mid trimester "banana shaped cerebellum".

Aim of Study :

The aim of this study was to compare the two markers for diagnosing open neural tube defect in the 1st trimester. The 'Intracranial Translucency' in the mid-sagittal plane and the position of 'mid-brain and aqueduct of sylvius' in the axial plane in terms of the ease of obtaining the plane and the confidence in interpretation of the image.

(a)



(b)



Figure 1 Schematic diagram (a) and normal transvaginal ultrasound image (b) depicting correct insonation plane for fetal midbrain and measurement of aqueduct of Sylvius (AOS)-to-occiput distance

Methods:

The fetal medicine and Ultrasonography centre is a tertiary centre for fetal diagnosis of chromosomal and structural abnormalities in the low and high risk pregnancies by ultrasonography. We follow the FMF guidelines and FMF software (FMF operator no: 84864) for NT risk estimation.

The examination is performed routinely by transabdominal and

transvaginal approach in each patient. Since mid 2012 we have examined routinely the fetal mid-brain in the axial view and Intracranial Translucency in the Nuchal Translucency view.

In this retrospective study, we have analyzed the images in 2 planes - the NT plane and the transthalamic axial plane. These 2 planes are taken for all the patients either transabdominally or transvaginally depending on which provided the better insonation plane for optimal visualization of midbrain..

The IT was located in the NT view and the midbrain was visualized in the transthalamic axial view in which BPD is measured. The aqueduct of sylvius is easily identified in the 1st trimester as a prominent echogenic 'box' traversing the midbrain. The position of mid-brain and aqueduct of sylvius was identified in relation to the distance from occiput.

Duration of study: 01.09.2012 to 01.09.2018

Total number of scan: 9678

NT scan : 926

7 cases of NTD detected in 1st trimester NT scan

Results:

We were able to demonstrate the position of midbrain and aqueduct of sylvius in almost all the cases of 1st trimester scan where the CRL was more than 55mm.

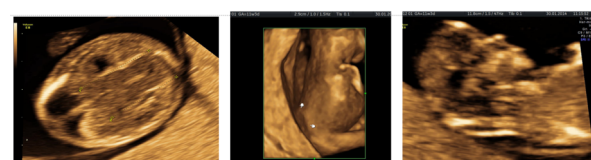
Among the 7 abnormal cases, the sonographic appearance of an unusual midbrain appearance raised doubts about open neural tube defect, which was confirmed by 4D examination (surface rendering image). In all the abnormal fetuses the IT was also obliterated in the NT view image.

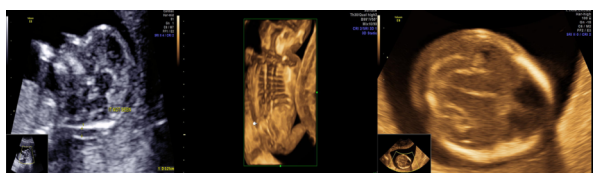
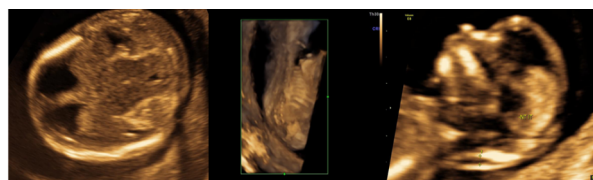
In all these abnormal cases the midbrain was displaced posteriorly towards occiput and the aqueduct of sylvius also appeared juxtaposed to the occiput. This abnormality was more eye catching than the obliteration of IT in the NT view.

Case 1



Case 2



Case 3**Case 4****Case 5****Case 6****Case 7****Discussion:**

In the open spinal lesions, due to leakage of CSF in the amniotic fluid there is inferior displacement of the brain. The IT seen in the mid-sagittal plane has gained widespread recognition. This absence was attributed to the compression of the 4th ventricle. Difficulties with image acquisition and interpretation in the mid-sagittal plane can be due to non-visualisation of the 4th ventricle due to post acoustic shadowing from the frontal bones and mis-identification of the cisterna magna as the 4th ventricle.

In our all cases of open spina bifida, the mid-sagittal view when seen alone was not easy to interpret for us. Whereas, posterior displacement of midbrain and aqueduct of sylvius to the point of virtual juxtaposition with occiput was easily seen and interpreted with confidence. This abnormality presented a striking visual diagnostic clue. This observation of virtual juxta position of the midbrain to the occiput is much easier to interpret than linear hypoechoic regions in the mid-sagittal plane.

The strength of this new marker for first-trimester neural tube defects lies in the ease of acquisition of the appropriate ultrasound plane using the transabdominal or transvaginal approach, the readily recognizable abnormal midbrain position seen in axial plane in both normal and abnormal fetuses. Just as the banana-shaped cerebellum is a striking feature in the axial plane at mid-trimester, so too is the midbrain position in the first trimester.

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