Hippocampal Infolding Angle changes during brain development assessed by prenatal MR imaging

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Introduction

Developmental alteration of the hippocampus can be associated with epileptic syndromes or neurodevelopmental delay. The measurement of progressive changes of the hippocampal infolding angle (HIA) has been demonstrated to be useful in assessing the normal development of the hippocampus postnatally (1). To determine the normal values of HIA during prenatal life by MRI can be of value for detecting alterations of early brain development.

Methods

Among about 500 hundred fetal MRI studies, performed at our Institution between August 2000 and September 2004, we retrospectively selected 44 fetal cases with the following characteristics: studies performed for suspected body lesions or brain malformations detected in previous pregnancies, normal brain resulting from prenatal MRI report, normal postnatal ultrasounds or MRI examination. The gestational age (GA) ranged between 20 and 37 weeks, the mean GA was 27 weeks. All MRI studies were preformed with the same 1.5 Tesla scanner, using a surface abdominal coil. The scanning technique was based on single shot fast spin-echo (ss-FSE) T2-weighted 4 mm thick images (TR/TE = 3000/180 ms, fov = 340 mm, matrix = 320 x 256). Coronal sections were positioned orthogonal to axial ones, which had been acquired parallel to the subcallosal plane. The coronal section encompassing the pons was used to perform the measurement of HIA. The crossing lines identifying the HIA were traced using the measurement tool of the main consolle of the scanner. HIA was defined as the angle between the line connecting the lateral margin of the cornu ammonis with the medial superior margin of the subiculum and the line passing through the midline structures (fig. 1).

Results

No statistically significant difference was noted between the right and the left HIA (paired t-test). For this reason the mean value between right and left measurement of the HIA was used to assess the correlation with the GA, by mean of linear regression analysis. A significant positive correlation was found between HIA value and GA (fig. 2). The HIA was generally below 70^0 before 25 weeks and above 70^0 after 30 weeks.

Conclusions

These data confirm the progressive increase of the HIA with GA. The values of HIA (between 70^0 and 75^0), which we measured close to term, tend to the values of HIA recently reported in children (1). The knowledge of normative data of HIA can be useful in order to dating brain insults occurred in utero.

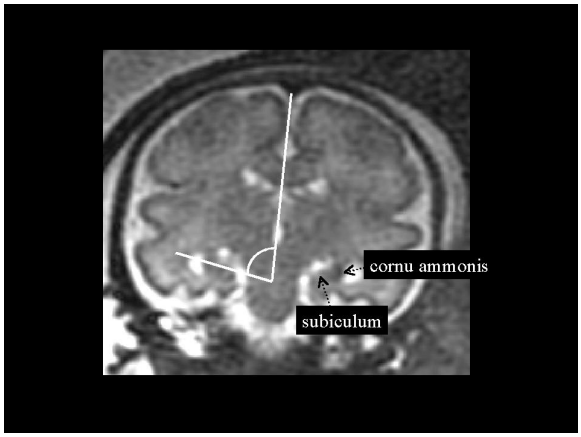

Figure 1

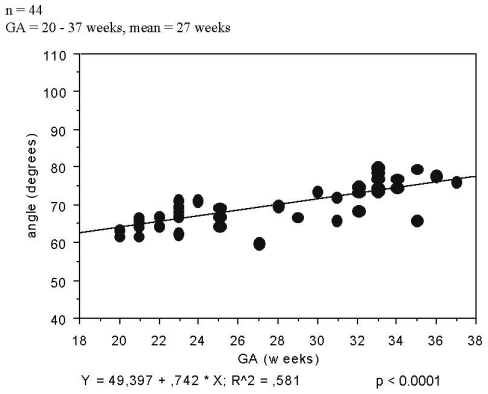

Figure 2

References

1) Okada Y.et Al.. Evaluation of hippocampal infolding using MRI. NeuroReport 2003; 14: 1405 – 1409.