Measurement of Sylvian fissure angles at 18-30 weeks’ gestation in cases with neuronal migration disorder.

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Introduction

The migration of cells from their origins to the final position within the ventricular zone may be impaired in a number of ways, including disturbed cell proliferation, abnormal cell fate determination, premature programmed cell death in primary neurogenesis, failure of differentiation in particular cells, improper timing of the birth of a neuron, and disorders of mechanical motors and cytoskeletal dynamics of cells, and/or molecular signals that initiate movement, which are essential to guide cell migration and inform it of the final position. Cortical maldevelopment or migration disorder has been diagnosed in the third trimester when the gyration becomes conspicuous. As one of sonographic findings, Sylvian fissure maldevelopment may help for early detection of migration disorder.

Aim of this study

The aim of this study was to evaluate the Sylvian fissure development by assessing the Sylvian fissure angles in cases with neuronal migration disorder.

Methods

This was a retrospective study of 22 cases of neuronal migration disorder. Cases with stored three-dimensional (3D) brain volume acquired at 18+0 and 30+6 weeks of gestation at an ultrasound-based research clinic between January 2010 and December 2017 were identified through a database. To confirm the final clinical diagnoses of brain abnormalities, postmortem histological findings or prenatal or postnatal magnetic resonance images were used. For the measurement of the Sylvian fissure angles, anterior coronal plane of the fetal brain through transvaginal 3D volume multiplanar imaging was visualized as a single image from the three orthogonal views. The right and left Sylvian fissure angles were measured between a horizontal reference line (0 degree) and two lines drawn along the right and left upper sides of the Sylvian fissures. The Sylvian fissure angles of both sides were plotted on the graphs of the reference ranges for gestational age in weeks.

Conclusion

The Sylvian fissure is one of the first apparent sulci on the fetal cerebral surface. This study has shown that the appearance of the Sylvian fissure, as defined by the Sylvian fissure angle, has delayed development in most cases of neuronal migration disorder prior to the diagnosis of the condition. The Sylvian fissure angle may potentially be a strong indicator for the subsequent development of neuronal migration disorder, before the time point when the gyri and sulci become obvious on the fetal brain surface.