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Research Article

DIFFUSION-WEIGHTED IMAGING ANALYSIS OF BRAIN AND PLACENTAL PERFUSION IN OMPHALOPAGUS CONJOINED TWINS COMPARED TO SINGLETON FETUSES

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ABSTRACT

A study comparing omphalopagus conjoined twins to singleton fetuses makes use of To examine brain and placental perfusional changes of conjoined twins using diffusion-weighted imaging and apparent diffusion coefficient. On omphalopagus conjoined twins and three singletons with borderline ventriculomegaly, MRIs were performed at the same gestational week as the control group. For both the brain regions ($p = 0.005$) and the placenta ($p = 0.005$), there was a significant ADC difference between the conjoined twins and the control group ($p = 0.018$). As a result of reduced perfusion in the placenta and brain of conjoined twins, ADC values might be lower in these organs than in those of singletons. Pregnancies with monochorionic multiples and singletons are more prevalent will be compared in future studies based on our findings.

Keywords:- Omphalopagus conjoined twins, Diffusion-weighted imaging, Apparent diffusion coefficient, Brain perfusion, Placental perfusion

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INTRODUCTION

Approximately 1 in 250,000 live births are born with conjoined twins [1]. Anatomical connections determine the classification. It is most common to connect the thorax with the omphalopagus (abdomen), whereas it is rare to connect the sacrum with the ischiopagus (pelvis), the face with the rachipagus, and one or more connections between the shoulders with the thorax. They are monozygotic twins, monoamniotic twins, and monochorionic twins. A number of Many types of anomalies can be identified during pregnancy, including heart defects, diaphragmatic hernias, intestinal atresias, and neural tube defects, may occur in association with this disorder [2, 3]. There are 18–33% of Omphalopagus twins, and 80% of them have a fused liver. It is possible for pericardium and heart to be shared in omphalopagus twins, but not the front or umbilicus [4]. The fetal MRI provides a more detailed view of complex anomalies than ultrasound [4, 5]. Literature reports suggest that An apparent diffusion coefficient can be calculated from diffusion weighted imaging (DWI) performed on fetal brains and placentas when using fetal MRI [6th, 7th].

As part of this study, we evaluated omphalopagus conjoined twins' brains and placenta and compared them to singletons by DWI and ADC.

METHODS AND MATERIALS

The patients were required to sign informed consent forms. As a control group, we enrolled A single ton fetus with unilateral borderline ventriculomegaly had

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two separate gallbladders, separate portal and hepatic veins at 28 weeks of age as well as fetal cyanosis MRIs of 28-week-old omphalopagus conjoined twins with shared liver.

On the same day, one or two hours after the Doppler ultrasound, the fetal MRI was performed. Several arteries and veins surround the insertion site of the umbilical cord in omphalopagus conjoined twins. No growth discordance was detected in any of the fetuses and all were appropriate for gestational age. An MRI imaging procedure Three single-shot fast spin-echo sequences were applied to the magnetom at 1.5 T (1.5 T Siemens Magnetom AERA, Erlangen, Germany). HASTE is a T2-weighted half-fourier acquisition turbo spin-echo (TR/TE = 1200/94, flip angle = 150). An analytical method designed to detect calcium in food using minimum nutrition and axial, sagittal, and coronal T2-weighted images with a slice thickness of 4 mm with steady-state precession (TR/TE = 3.75/1.88). The placenta was imaged in the coronal plane and the axial plane as part of routine fetal MR imaging protocol without breath holding. The field of view was 320 by 320 millimeters, the matrix was 256 by 256 millimeters, the slice thickness was 4 millimeters, and the time was 1 m–24 secs.). Each pediatric radiologist reviewed the imaging studies individually and reached consensus on the final decision. Using IDS7 (Sectra Workstation, Linkoping, Sweden), the ADC mapping was performed. T2-weighted images were compared with the ADC-map. We manually placed the same circular region of interest (ROI) at the frontal (ROI = 0.32 cm2) and periatrial (ROI = 0.32 cm2) white matter, bilateral thalami, lentiform nucleus, cerebellum (ROI = 0.43 cm2), and point (ROI = 0.31 cm2) of every fetus symmetrically. Using freehand ROIs (mean = 165 cm2) as large as possible to avoid partial volume effects along the placental surface boundary, DWIs were calculated for placentas. Using a coronal image of each patient, we calculated mean ADC values at the level of umbilical cord insertion. Excluding vascular lakes and areas with increased diffusion on T2-weighted images was done to reduce the risk of error. Figures 1 and 2 provide examples. At IBM SPSS Statistics 22 (IBM SPSS Inc., Chicago, IL), Student t-tests were used for the statistical analysis, and a p value of 0.05 was deemed to be significant.

RESULTS

Each patient's brain region and placenta did not exhibit any diffusion restriction. In two conjoined fetuses It was determined that there was no difference in the ADC values (for frontal and periatrial white matter, bilateral thalami, lentiform nuclei, cerebellum, and pons) between groups (p = 0.453). Compared with the control group, con[1]joined twins' ADC values were significantly lower (mean = 1.450 x 0.17 x 103 mm2 /s) (p = 0.018). Compared to the control group, conjoined twins' placentas had a significant decrease in ADC values (p = 0.005) (Table 1). An attempt to deliver two male babies by caesarean section was performed at 30 weeks of pregnancy born weighing 1250 grams and 1000 grams, respectively. A successful separation of male babies took place after two days. There were no abnormalities reported on the transfontanel ultrasounds of either twin. In their ultrasound examinations, neither hemorrhage nor infarction was detected. Preoperatively, Despite having a common liver, two gallbladders were diagnosed separately as well as two portal systems. In the newborn intensive care unit, they were both alive.

Table 1: Values of the ADC (mm2 /s) for the fetal brain and the placenta

The fetal region	(I) fetus*	(II) fetus*	Control group*	*p*
WM in the front	1.678	1.677	1.840 ± 0.02	0.003
WM in the periatria	1.649	1.637	1.840 ± 0.03	0.004
Throat	1.305	1.308	1.440 ± 0.03	0.014
Nuclei lentiformes	1.327	1.375	1.490 ± 0.01	0.003
The cerebellum	1.410	1.442	1.570 ± 0.01	0.005
It's pon	1.211	1.219	1.360 ± 0.02	0.004
The placenta	1.961		2.170 ± 0.04	0.005

***The mean ADC is 10−3 mm2/s.**
WM stands for white matter.

DISCUSSION

There is a predominance of females in conjoined twins of the Omphalopagus and conjoined twins of the Ephesus. It is typically recommended to deliver conjoined twins by caesarean section when they are 36–38 weeks pregnant, but many are delivered prematurely, Our case is similar. Conjoined twinning is hypothesized to be the result of fusion, conjoined twins are formed when the embryos fail to split completely After fertilization on days 13 and 15. Depending on the complexity of the fusion, conjoined twins have a better chance of being separated postnatally. Surgical success and the extent of fusion determine the postnatal outcome. Mental-motor development is enhanced by the separation of organs and vasculature. There is a challenge to detecting fusion anomalies in omphalopagus twins, such as the liver and gastrointestinal systems. In addition to fetal structures and abnormalities, fetal MRI is more useful in assessing delivery management and parental counseling during pregnancy than prenatal ultrasound.

ADC provides information about cell membrane integrity and tissue cellularity whereas DWI provides information about tissue integrity. There are many factors that affect ADC values, including cellularity, maturation of neurons, and myelination. It was noted by [6, 7] that normal fetuses have different ADC values depending on the region of the brain. For instance, supratentorial white matter had a higher ADC value compared to Grey matter, cerebral cortex, and pons. Myelination does not significantly affect the white matter of the frontal lobes due to gestational aging. Cerebellar and thalamic ADC values decline significantly, High concentrations of these cells are found in the pons, basal ganglia, and periatria regions. Both brain and placenta perfusional changes were detected earlier than myelination with ADC calculations. In the literature [9, 10], fetuses survived The transfusion of twins with focal ischemic areas and a low ADC value in co-twins and twin-to-twins. In human and animal models, DWI and perfusion mapping Perfusion of the placenta was decreased in IUGR [11–14]. As compared to normal singleton fetuses, twins have developmental delays. Due to the fact that monochorionic twins share the same placenta, IUGR may be more complicated to treat when compared to singleton pregnancies. Monochorionic twins are less likely to have perfusional problems due to their different anatomical structures [15]. Compared to singleton pregnancies, conjoined twins have decreased placental perfusion, leading to decreased ADC values in the placenta and brain. As far as I am aware, there has not been a report of a nomogram for ADC values in twins. The study has therefore been the first to calculate ADC values in conjoined twins with normal Doppler findings. Despite the fact that conjoined twins do not show diffusion restriction, they have differences in perfusion between them and normal singleton fetuses.

At the same gestational week, omphalopagus conjoined twins have reduced cerebral and placental perfusion, potentially resulting in developmental delays. Future studies comparing monochorionic multiple pregnancies with singletons based on our results would be able to build off of our findings

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