Fetal Cerebral Oxygenation Measurements by T2*-mapping in Normal Pregnancies and in Pregnancies Complicated by Fetal Heart Defects

MH Lauridsen1,2, N Uldbjerg3, TB Henriksen1, OB. Petersen1, B Stausbal-Grein4, NB Matthiesen1, DA Peters5, S Ringgaard1,6, VE Hjortdal7,7

1 Department of Pediatrics, Aarhus University Hospital, Aarhus, Denmark, 2 Institute for Clinical Medicine, Aarhus University, Aarhus, Denmark, 3 Department of Obstetrics, and Gynecology, Aarhus University Hospital, Aarhus, Denmark
4 Department of Radiology, Aarhus University Hospital, Aarhus, Denmark, 5 Department of Clinical Engineering, Central Denmark Region, Aarhus, Denmark, 6 MR Research Centre, Aarhus University, Aarhus, Denmark, 7 Department of Cardio-Thoracic Surgery, Aarhus University Hospital, Aarhus, Denmark

Background
Structural heart defects are associated with smaller cerebral size and markers of cerebral immaturity as early as in fetal life. Newborns with major heart defects often have visible lesions on cerebral MRI even before surgery and children with major congenital heart defects have increased risk of neurodevelopmental disorders. There are several reasons for this. We aim to explore if fetal cerebral oxygenation is compromised in fetal heart defects.

Materials and Methods
In BOLD MRI, the presence of deoxyhemoglobin decreases the signal. By using serial echo times in a breath-hold, T2* (msec) can be calculated and is presumed to be a proxy for tissue oxygenation. By performing serial T2* measurements at gestational age 30-32 and 36-38 weeks in healthy pregnant women expecting a child with a heart defect as well as in healthy controls expecting healthy singletons, we aim to estimate:

Aim
- is fetal cerebral T2* reduced in fetal heart disease
- does maternal hyperoxygenation increase fetal cerebral T2*
- is low fetal cerebral T2* associated with neurodevelopmental disorders at 18 and 36 months follow-up

Results
We present the cerebral T2* in 11 fetuses with heart defects; transposition of the great arteries (5), coarctation of the aorta (2), tetralogy of fallot (1), hypoplastic right heart syndrome (1), common arterial trunk (1), double outlet right ventricle (1) and 31 healthy fetuses. Cerebral T2* decreases with increasing gestational age. No difference in cerebral T2* between normal fetuses and fetuses with heart disease was detected.

Conclusion
In our study we found no difference in cerebral T2* between normal fetuses and fetuses with heart defects. Study and analysis are ongoing.

Aarhus University Hospital