WHEN CAN THE HIPPOCAMPUS BE EVALUATED ON FETAL MRI?

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PURPOSE
To evaluate the hippocampal development from GW 17 onwards, using both in vivo and post-mortem fetal MRI.

BACKGROUND
The hippocampal development begins at gestation week (GW) 8 and the hippocampal sulcus becomes visible on anatomical specimens around GW 10. The hippocampal sulcus progressively deepens and narrows, due to the infolding of the dentate nucleus and cornu ammonis (Figure 1). This folding process is completed at GW 18-21, but the fusion of the walls of the hippocampal fissure continues until the GW 30, leading to a progressive change in its orientation and shape.

The fully rotated hippocampus is oval on coronal slices, being preceded in development by a round or pyramidal shape. An incomplete hippocampal inversion can persist throughout the life in 19% of the population, most often on the left side (1). MR studies of formalin fixed fetal brains have shown the hippocampus (2-4) in great detail, but a lack of spatial resolution and safety issues have until now precluded its full visualization on in vivo fetal MR studies. This evolution, and its relationship to incomplete hippocampal inversion, is of particular interest for our group (1, 6), hence the present study.

RESULTS
Post-mortem studies: 4 fetuses aged 17 and 18 GW. The hippocampal sulcus could be identified in all subjects (figure 2). It was asymmetrical in 2 and narrower in the right side in 2. The general shape of the hippocampal formation could be seen at the T1W sequences, but not at T2W. The collateral sulci could only be seen in 1 subject.

In vivo studies: 31 fetuses from GW 20 to 35. The hippocampal sulcus was visible in all subjects bilaterally. It was asymmetrical in 22, narrower on the right side in 5 and on the left in 4. Until GW 22, the general shape of the infolded hippocampal formation could only be evaluated in 3/24 hippocampi, and bilaterally in 1 fetus. Later, the shape could be seen in 23/38 hippocampi, and in 11 bilaterally. The collateral sulcus could not be detected before GW 22. From GW 31 onwards it was seen in all fetuses. If this sulcus was visible, it could be identified on both sides.

CONCLUSION
The evaluation of the hippocampal morphology is difficult at in vivo fetal MRI, in particular before GW 22. The hippocampal sulcus is probably a good hallmark for hippocampal infolding, but the morphology of the hippocampus itself is not reliably visualised until late stages in pregnancy.

The material is small but it indicates that there are individual variations, even between the two hippocampi of the same individual.

REFERENCES