Combination of Magnetic Resonance Imaging and Virtual Reality Systems to Generate Immersive Fetal 3D Visualizations

Wednesday 12:45-1:15 PM | PD230-SD-WEB1 | PD Community, Learning Center Station #1

PURPOSE

Advances in image-scanning technology have led to vast improvements in medicine, especially in the diagnosis of fetal anomalies. In general, three main technologies are used to obtain images within the uterus during pregnancy i.e. Ultrasound (US), Magnetic Resonance Imaging (MRI) and Computed Tomography (CT). MRI offers high-resolution fetal images with excellent contrast that allow visualization of internal tissues. When US yields unexpected results, MRI is generally used, because it provides additional information about fetal abnormalities and conditions for which US cannot provide high-quality images.

METHOD AND MATERIALS

The construction process of the 3D accurate virtual model starts with the 3D modeling volume built through the MRI slices sequentially mounted, followed by the segmentation process where the Physician selects the important body parts to be analyzed that will then be reconstructed in 3D. Having the accurate 3D model (womb, umbilical, cord, placenta and fetus) the final stage is the programming of the virtual device (Oculus Rift 2), including the heartbeat sounds of the fetus to improve the immersive sensation. The navigation through internal paths can be pre-defined by the physician responsible for the patient in order to highlight the main subjects to be studied by the fetal medicine team as well for parents understanding.

RESULTS

Virtual reality fetal 3D models based on MRI were successfully generated. They were remarkably similar to the postnatal appearances of the newborn baby, especially in cases with pathology, increasing the possibilities of digital tools to help fetal medicine researches.

CONCLUSION

The use of MRI may improve our understanding of fetal anatomical characteristics, and can be used for educational purposes and as a method for parents to visualize their unborn baby. The images can be segmented and applied on virtual reality immersive technologies.

CLINICAL RELEVANCE/APPLICATION

We have demonstrated that MRI data can be used to create a 3D model, including of the respiratory tract in a normal fetus. We believe that this technique could become a useful tool for the assessment of fetal airway patency and for other possible applications.