19th World Congress in Fetal Medicine

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

Tonni G, Guedes Ribeiro B, Lopes J, Ribeiro G, Daltro P; Fazecas TM, Nogueira RA, Rigriguez L Werner H
IRCCS AUSL Reggio Emilia; Department of Obstetrics & Gynecology, Reggio Emilia, Italy

Objective

Advances in image-scanning technology have led to vast improvements in medicine, especially in the diagnosis of fetal anomalies.

Methods

In general, 2 main technologies are used to obtain images within the uterus during pregnancy i. e. Ultrasound (US) and Magnetic Resonance Imaging (MRI). 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. The construction process of the 3D accurate virtual model starts with the 3D modeling volume built through the US and/or MRI slices sequentially mounted, followed by the segmentation process where the Physician selects the important body parts to be analyzed that will be then reconstructed in 3D.

Results

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. 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.

Conclusion

Virtual reality fetal 3D models based on US and MRI were successfully generated. They were remarkably similar to the postnatal appearance of the newborn baby, especially in cases with pathology, increasing the possibilities of digital tools to help fetal medicine researches. The use of US and 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. We have demonstrated that US and MRI data can be used to create a 3D models either in normalcy and in fetal anomalies and may be of value as preoperative time for fetal surgeons, as they can navigate within the fetal anatomy on demand.