Objective:
To generate physical fetal models using images obtained by 3DUS and MRI, in order to guide additive manufacturing technology.

Methods: Images from 76 pregnant women, including 9 sets of twins, were used. Scans were performed using high-resolution 3DUS (Voluson E8/E10 and 4DView, GE Medical). In cases of abnormalities, MRI (Magneton Avanto and Aera, Siemens) was performed on the same day as 3DUS. All 3DUS and MRI files were exported to a workstation in DICOM format for segmentation done by a 3D modeling technician and supervised by the physician in charge. The 3D structure of the fetus is reconstructed by generating skinning surfaces that joined the resulting profiles. Segmentation software that converts medical images into numerical models were used for 3D virtual model reconstruction, and the models were exported into a STL format and converted into an "OBJ" extension for post-processing surface adjustment. The volumetric surface was smoothed, to be later compared and analyzed as a topographic construction. It is important to highlight that the imaging fusion of real time 3DUS and MRI was feasible. In Voluson E10 version BT17, the images were exported directly in STL format.

Results:
Physical models based upon 3DUS and MRI were successfully generated. They were similar to the postnatal appearance of the aborted fetus or newborns, especially in pathological cases.

Conclusions:
The use of 3DUS and MRI may improve our understanding of fetal anatomical characteristics, and these technologies can be used for educational purposes and as a method for parents to visualize their unborn baby. Maternal–Fetal Bonding was improved in cases of blind pregnant women with the use of 3D physical models. The images can be segmented and applied separately or combined to construct 3D virtual and physical models.