Fetal Cervical Lymphangioma: Magnetic Resonance Imaging and Three-Dimensional Reconstruction Modelling

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Lymphangioma is a benign congenital malformation of the lymphatic system that has the potential to infiltrate surrounding structures. It constitutes approximately 5%−6% of all the benign lesions in childhood and adolescence, and occurs most frequently in the head, neck, or axilla.[1] Prognosis depends on the presence of other associated features, such as skin edema, hydrops and polyhydramnios, abnormal karyotype, and location and extent of the lesion.[2]

The objective of this report is to describe the creation of a three-dimensional (3D), magnetic resonance imaging (MRI)-based, virtual model of a 35-week fetus with a lymphangioma in the neck. Imaging was obtained with a 1.5-T scanner (Siemens, Erlangen, Germany). T2-weighted true fast imaging with steady state precession (trueFISP) sequence was applied in the sagittal plane (TR: 4.09 ms; TE: 1.75 ms; voxel size: $1.1 \times 1.1 \times 1.1$ mm^3; FoV: 100; PAT: 2; acquisition time: 0.25 s). After the MRI scan, the images were exported in DICOM format to the 3D Slicer program (v4.11.10; Birmingham, United Kingdom). These images were segmented, and the regions of interest were selected. The resulting 3D models were exported to the MeshLab program (Pisa PI, Italy) to correct the construction imperfections. Thereafter, the models were sent to the 3Ds MAX program (v2019; Mill Valley, California, USA) to produce the final images, with better definition of colour and brightness. The time taken to prepare this virtual model was 3 hours. See Figure: (a) MRI (sagittal, coronal, and axial views); arrows; (b) virtual reconstruction of the fetal face (sagittal and frontal views). Note lymphangioma in transparency view (green).

Delivery occurred at 38 weeks by cesarean (see the supplemental Figure for postnatal magnetic resonance imaging).

This case shows how high-quality images can be manipulated with 3D software without losing accuracy. Those images clearly showed the relationship between lymphangioma and soft tissues in the fetal neck in different views. Such images can facilitate a multidisciplinary discussion and may also be a useful tool for patient discussions. Although MRI is an expensive technique, it offers high-resolution contrast for fetal imaging. When ultrasound yields equivocal results, MRI can be used to provide additional information. This virtual modelling technique can be applied at different stages of pregnancy and serve as an innovative contribution to the research on fetal abnormalities.[3]

Figure.
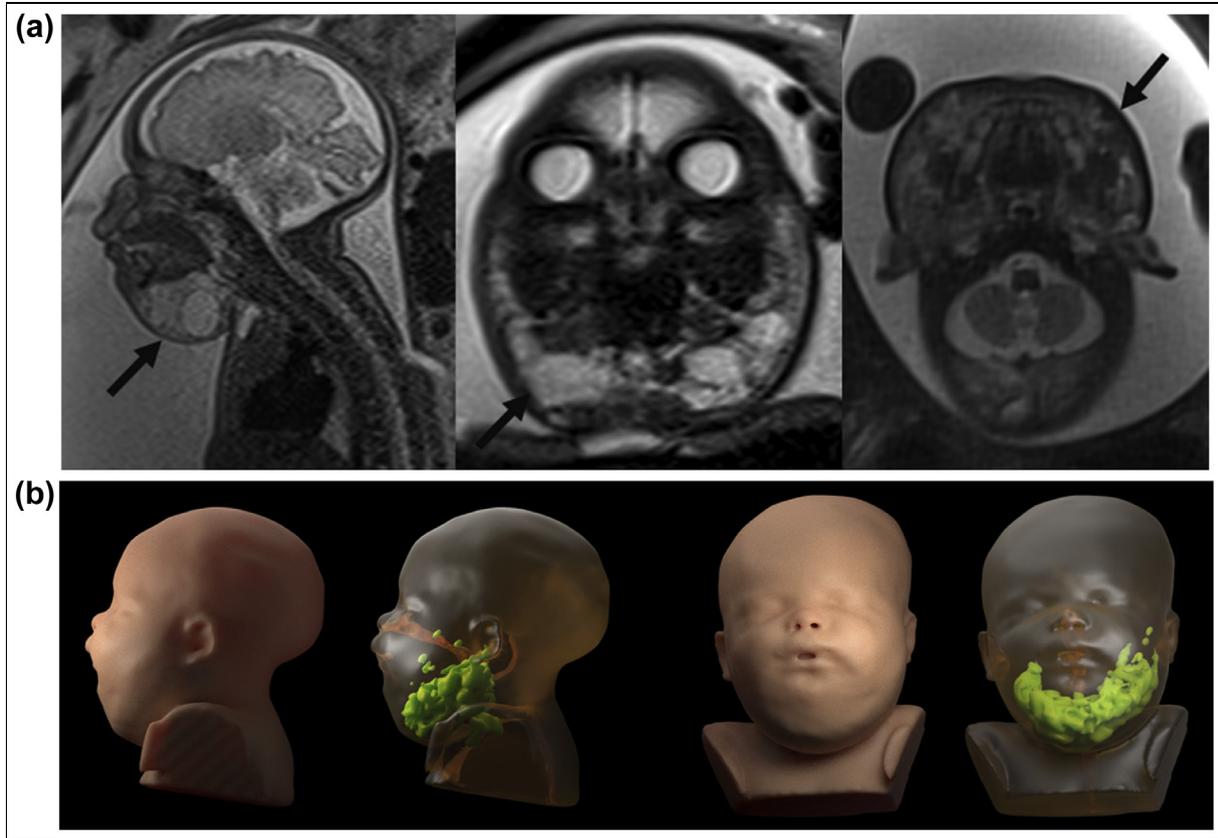
REFERENCES

1. Alqahtani A, Nguyen LT, Flageole H, Shaw K, Laberge JM. 25 years' experience with lymphangiomas in children. J Pediatr Surg 1999;34(7):1456–63.

2. Jiao-Ling L, Hai-Ying W, Wei Z, Jin-Rong L, Kun-Shan C, Qian F. Treatment and prognosis of fetal lymphangioma. Eur J Obstet Gynecol Reprod Biol 2018;231:274–9.

3. Werner H, Lopes J, Ribeiro G, Jesus NR, Santos GR, Alexandria HAF, Ruano R, et al. Three-dimensional virtual cystoscopy: Noninvasive approach for the assessment of urinary tract in fetuses with lower urinary tract obstruction. Prenat Diagn 2017;37(13):1350–2.

APPENDIX

Supplementary Images

Figure. (a) Postnatal magnetic resonance imaging (MRI) at 5 days after delivery (sagittal, coronal, and axial views) (arrows); (b) Postnatal findings.