Helping Mothers to Better Understand Their Child’s Fetal Cardiac Anomaly with 3D printing
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References
1 Ruedinger et al, Circulation, 2018

Giving mothers 3D-printed fetal hearts at the appropriate gestational age

What are we doing with it?

Did it work?

- The 3D printed heart provided the maximum amount of helpfulness to understand the baby’s cardiac anatomy, the upcoming treatment, and to form realistic expectations of the outcome.
- Maximum scores for its ability to aid in physician-patient interaction and communication

Future Directions:
- Increase sample population to include more than one normal heart, several congenital heart defects, and multiple patient/physician consult surveys

How it’s made

1. Fetal Ultrasound
2. Segment Geometry
3. Virtual Model
4. 3D-Printed Heart Model

Figure 1: 3D model of fetal heart with Tetralogy of Fallot. The heart wall is removed so the TOF characteristics can be seen by the mother

Figure 2: Fetal echocardiogram of the heart.

Figure 3: Segment the heart geometry in Mimics (Materialise)

Figure 4: The 3D geometry is imported into 3-Matic for post-processing and smoothing. Measurement checks are made with literature.

Figure 5: The real-size 3D printed model is made out of a photopolymer resin (Form2, FormLabs).

Patient Group Education Assessment

<table>
<thead>
<tr>
<th>Patient-Specific 3D printed models ...</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. provided information I needed...</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. helped me to understand my child’s CHD...</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. helped me to understand the treatment...</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. ... gave me a sense of control...</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. ... gave me a sense of hope...</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. showed me how I can contribute to the treatment...</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

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Permission given by Amber Noggle

Fetal Medicine Foundation