3D Volume Ultrasound in Obstetrics

Beryl Benacerraf M.D.
Harvard Medical School

3D is Volume Scanning
It’s all about the displays

- Obtaining a volume of information has got to be better than a single slice!!!!
- The volume contains ALL of the information available and we can display the images in ANY plane, using lots of different methods. We have only begun to explore the ways that we can display it.

Surface Rendering

- Since 3D interpretation is dependent on the practitioner’s brain and skill, the ability to actually display the image enables us to discuss the anatomy with our colleagues and patients -
- Sometimes we are surprised by the display!

What is 3D Ultrasound?

- The value of having a volume rather than a slice.
- Surface Rendering at Interfaces
- Inverse mode and other tools.
- Tomographic cuts parallel to each other

Slide courtesy of Alfred Abuhamad
• 3D imaging in the first trimester
• Major push towards first trimester diagnoses (nuchal translucency screening now recommended for everyone)

9 weeks, CRL 21mm

Amniotic Band
3D Imaging of the Face: Ears

- In families with histories of ear malformations, the fetal ear can be better evaluated with 3D surface rendering than with 2D.
3D Imaging of the Face

Clefts

- Plastic surgeons & patients are better able to see the defect.
- Whether 3D adds to the actual Dx. Some think 3D shows the anom better.
- Knowing where it is on 2D guides the 3D! 3D not a screening technique.
**Tessier Clefts**

- Clefts may involve the mouth, cheeks, eyes, ears and forehead and may continue into the hairline - Also known as oro-ocular clefts
- Type 4 - Along tearduct, side of nose - from lip to eye.
- Type 5 - Lateral to tearduct to floor of orbit
Embryology

- The rare medial facial cleft occurs from lack of fusion of the two medial nasal prominences. This form of clefting is associated with holoprosencephaly & chromosomal defects, etc...
Osteogenesis Imperfecta Congenita
**Three Right Angled Planes (MPR)**

- This technology provides the ability to see anatomic sections in an orientation different from the acquisition section.
- The sonologists needs to manipulate the volume to display just the right plane.
- This has the potential of make the acquisition plane irrelevant in the future.

*Examples of uses:*
Just the right plane!

Inverse Mode

- Surface rendering the entire inside of a volume
- To see all cystic areas within the volume at once - not just a slice.
Inversion Mode

Tomographic Ultrasound Imaging (TUI)

• Multislice display of the volume at fixed (flexible intervals) like other forms of cross-sectional imaging. Slices 1-4mm apart
Clinical Benefit - TUI type of displays

- Type of display that CT and MR have used for decades.

- All the relevant anatomy is captured at once and the patient time on the table is vastly reduced.

- The entire scan is retained for a "virtual scan" done off line using all these display methods.

Volume scanning is in it’s infancy!!!