3-D Ultrasound Visualizes Even Minor Fetal Defects

BY CARL SHERMAN
Contributing Writer

NEW YORK — Three-dimensional ultrasound represents an emerging advance in imaging with important applications in obstetrics, Alfred Z. Abuhamad, M.D., said at an obstetrics symposium sponsored by Columbia University and New York Presbyterian Hospital.

The ability to rotate images, change planes, and manipulate displays according to signal strength makes it possible to visualize skeletal and vascular structures and fluid spaces, in addition to providing detailed views of fetal appearance, said Dr. Abuhamad, professor and chair of obstetrics and gynecology and director of the division of maternal-fetal medicine at Eastern Virginia Medical School, Norfolk.

The term "3-D" is something of a misnomer in that the image is displayed on a 2-D monitor. "[Instead of '3-D'] the term should be volume sonography that gives the appearance of depth," he said. The volume image is created by the summation of 2-D slices from multiple planes, as the probe is steered from side to side.

With a multiplanar display, an image constructed from sagittal, coronal, and transverse planes can be rotated along the x-, y-, and z-axis to visualize the same structure from different angles.

The surface display shows the external aspects of the fetus, allowing the same views as in 2-D ultrasound, to review in "tremendous detail" such fetal abnormalities as clefting of the lip and palate, he said.

With "maximum mode," which manipulates the signal to enhance light (i.e. echoic) objects and dim dark (anechoic) ones, skeletal structures can be visualized, affording a look at the cranium and its fontanelles and sutures. It also facilitates assessment of bone quality and detection of fractures and permits close examination of the vertebral column.

"It's like an x-ray of the fetus," Dr. Abuhamad said.

"Minimum mode" reveals vasculature; while "inversion mode," which dims light structures and highlights dim ones, brings out fluid cavities and makes it possible to visualize such structures as the chambers of the heart and determine the number of gestational sacs, he said.

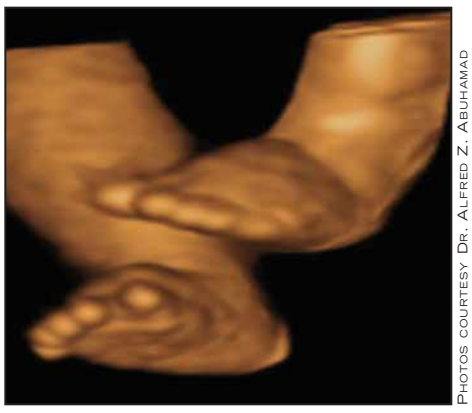
Other image manipulations permit the clinician to see the back of structures and to remove from the image, as with an "electronic scalpel," structures that may obscure features of interest.

The 3-D procedure does not use more power, increase fetal exposure, or magnify the thermal effect, compared with 2-D ultrasound, he said.

Limitations of the technique include a steep learning curve. The technique is highly operator dependent, and the lack of standardization magnifies the possibility of human error, Dr. Abuhamad said. Also, artifacts such as motion of the woman or fetus, surface rendering, and shadowing can interfere with interpretation.

An estimated 10% of ultrasound units currently have this technology, he said. ■

Absence of a T12 rib on one side in a fetus with balanced translocation was missed by 2-D ultrasound, shown by 3-D.



3-D ultrasound clearly shows swelling of the dorsal aspect of both feet in a fetus with Turner syndrome.

PHOTOS COURTESY DR. ALFRED Z. ABUHAMAD

Prenatal Exposure to Pollution May Damage Chromosomes

BY CHRISTINE KILGORE
Contributing Writer

Prenatal exposure to combustion-related air pollution may cause chromosomal abnormalities in fetal tissue, according to findings from a study of 60 New York City newborns.

In studies of other populations, such abnormalities have been linked to an increased risk of leukemia and other cancers, said Kirsti A. Bocskay of the department of environmental health sciences at Columbia University, New York, and her colleagues.

The investigators monitored exposure to polycyclic aromatic hydrocarbons (PAHs)—pollutants found in emissions from cars and other vehicles, residential heating, power generation, and tobacco smoking—among nonsmoking African American and Dominican mothers living in three low-income neighborhoods in the city.

The mothers filled out questionnaires and wore portable air monitors for 48 hours during the third trimester. Chromosomal abnormalities were measured in umbilical cord blood obtained at delivery.

The investigators found 4.7 chromosome abnormalities per 1,000 white blood cells in newborns from mothers with low exposure to PAHs and 7.2 abnormalities per 1,000 white blood cells in newborns from mothers with high exposure to PAHs.

("Low" exposure meant air pollution levels below the average, while "high" exposure referred to above-average levels).

In particular, it was stable chromosomal aberrations—not unstable aberrations—that were increased. Stable aberrations are persistent, rather than transient, markers of cytogenetic damage.

"This study has demonstrated a significant association between prenatal environmental exposure to airborne carcinogenic PAHs and stable aberrations in cord blood at the relatively low environmental concentrations found in New York City," the investigators said (Cancer Epidemiol. Biomarkers Prev. 2005;14:506-11). ■