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ERASING THE NEED FOR ABORTION

The Use of Pulse Doppler During the Limited Obstetric Ultrasound Exam

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The American Institute of Ultrasound Medicine (AIUM) is the recognized authority on the safe practice of ultrasonography in the United States. In 2013, AIUM developed a comprehensive practice guideline for the performance of obstetric ultrasound examinations.[1] These guidelines were developed in conjunction with the American College of Radiology (ACR), the American College of Obstetricians and Gynecologists (ACOG), and the Society of Radiologists in Ultrasound (SRU).

According to the AIUM guidelines, fetal ultrasound should be performed when there is a valid medical reason, and the lowest possible ultrasonic exposure settings should be used to gain the necessary diagnostic information. A limited exam may be performed for a limited purpose such as the evaluation of fetal cardiac activity and fetal position.

A standard obstetric sonogram in the first trimester includes evaluation of the presence, size, location, and number of gestational sacs. The gestational sac is examined for the presence of a yolk sac and embryo/fetus. When an embryo/fetus is detected, it should be measured and cardiac activity recorded. It is recommended that cardiac activity be recorded by 2-dimensional video clip or M-mode imaging, but the use of spectral Doppler is not necessarily disallowed. The uterus, cervix, adnexa, and cul-de-sac region should be examined.[1]

Diagnostic ultrasound is generally perceived by users and patients as a safe technique with no adverse effects.[2] Since ultrasound is so widely used in pregnancy, it is essential for all practitioners to ensure that its use remains safe. Ultrasound (with Doppler) causes thermal and mechanical effects in tissue which are increased as the output power is increased.

In the last 20 years there has been a general trend towards increased output with the increased use of pulsed “spectral Doppler”. In response to these increases, recommendations for the safe use of ultrasound have been issued by several bodies.

Ultrasound is a mechanical energy in which a pressure wave travels through tissue. Reflection and scattering back to the transducer are used to form the image. The physical effects specific to the ultrasound exam (including Doppler) during the first trimester is particularly focused on the potential for thermal effects. As the ultrasound waves are absorbed, their energy is converted into heat. The thermal index is the ration of the power used to cause a maximum temperature increase of $1^{o}C$. A thermal index of 1 indicates a power causing a temperature increase of $1^{o}C$. A thermal index of 2 would be twice that power but would not necessarily indicate a peak temperature rise of $2^{o}C$.[3]

In pulsed wave Doppler, short bursts of ultrasound energy are emitted at regular intervals. Up to the present, Doppler ultrasound has not been associated with any ill effect to the mother or fetus when used at the manufacturer's recommended safety level. (94 mW/cm^2).[4]

"Although the potential for embryonic effects from Doppler imaging exists, there is little evidence that ultrasound is teratogenic."[5] According to WFUMB (World Federation for Ultrasound in Medicine and Biology) a diagnostic exposure that produces a maximum temperature rise of no more than 1.5 above normal physiological levels (37^{o}C) may be used without reservation. Furthermore, when performing Doppler ultrasound, the displayed Thermal Index (TI) should be less than or equal to 1.0 and exposure time should be kept as short as possible.[6] (WFUMB states no more than 5-10 minutes and not to exceed 60 minutes. CompassCare standards state no more than 10 seconds or less than .2% of the maximum recommendation.) Furthermore, the thermal index may be controlled on the ultrasound machine and displayed on the monitor.

It is the goal of a pregnancy resource center is to give excellent care with prudence, safety, and diligence. Additionally, we have discovered that it is sometimes difficult to confirm fetal cardiac activity in the early weeks of the first trimester and have found that Doppler is more effective than the "M" mode in picking up the heartbeat, thereby facilitating confirmation of a viable pregnancy.

The predominant question when performing screening examinations is whether patient outcome is significantly improved by the routine use of ultrasonography and Doppler. It has been our experience that the routine use of ultrasound with Doppler has significantly improved patient outcomes meaning the physician can more quickly assess the patient's condition and the patient is more readily informed.

It is important and helpful that a pregnancy resource center's medical director authorize the safe use of Doppler during the limited ultrasound examinations of patients in order to clearly determine the cardiac activity of the unborn child thereby diagnosing fetal viability.

1. Obstetric Ultrasound Examinations. AIUM, 2013 http://www.aium.org/resources/guidelines/obstetric.pdf
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3. Safety in Diagnostic Ultrasound in Fetal Scanning. http://sonoworld.com/Client/Fetus/html/doppler/capitulos-html/chapter_02.htm
4. Fetal Growth Assessment by Ultrasound. Diagnostic Ultrasonography. Sixth Ed. Vol. 2 2006
5. The Obstetric Ultrasound Examination. Ultrasonography in Obstetrics and Gynecology. Fifth Ed. 2008.
6. WFUMB Statement on the Safe Use of Doppler Ultrasound. http://wfumb.squarespace.com/safety-statements/