

Biosafety of Ultrasound in Clinical Practice

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Ultrasound is one of the most commonly used imaging modality for diagnosis and treatment of disease in the current era of evidence based medicine. Because of its portability and easy access, it is used in offices, labor room, clinics, and emergency departments and in the community. Many diagnostic and treatment algorithms advocate use of ultrasound and it is commonly used in children and pregnant women because it is generally considered as safe imaging modality. Bioeffects of ultrasound had been identified in previous animal studies by using similar acoustic parameters that are used in humans. Ultrasound waves could produce cavitation in tissues in the conjugation with gaseous bubbles, and its predictability can be estimated by mechanical index (MI). Contrast used in ultrasound is usually comprised of microbubbles which may accentuate a cavitation in human tissue. The collapse of these cavitations may produce heating and high pressure in the studied tissue. The thermal index (TI) demonstrates the potential of an ultrasound induced rise in temperature in the tissue along the beam. This effect is greater in the tissues which are within the direct beam of ultrasound.

This resultant heat may produce nuclear damage cascading fetal abnormalities. TI and MI are the on-screen indicators to demonstrate the potential of ultrasound induced bioeffects, recommended by the US Food and Drug administration in its output display standard (ODS) and it is the responsibility of operator to keep the intensity as low as reasonably achievable (ALARA). Previous researches have shown worldwide poor biosafety knowledge of ultrasound end users [1-2]. This needs urgent attention by all stakeholders including professional societies and research organizations. Ultrasound biosafety should be taught and included in any ultrasound curriculum.

References

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