

# Recent advances in ultrasound imaging



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Ultrasound is currently the most cost effective, non-invasive diagnostic radiological modality, devoid of the harmful effects of radiation. Ultrasound allows Radiologists to do real time imaging of the internal anatomy of the body. With the recent technological advances and the advent of high resolution ultrasound imaging, with the help of various higher frequency transducers, new frontiers have opened up for superficial imaging. It is widely being applied in musculoskeletal imaging and to evaluate tiny lesions in the skin, neck and almost all parts of body. The high frequency linear probes of L 18-4 MHz and HL 18-4 MHz are a unique combination of high sensitivity and greater penetration allowing a good detail of superficial neck, superficial joints and muscles and tendons. Its excellent Doppler flow sensitivity helps in visualizing vascularity in areas of concern. The small footprint and the greater maneuverability of the little hockey stick transducer allows us to evaluate hard to reach or difficult areas, such as fingers or by the side of trachea for small pathologies in neck. Apart from musculoskeletal ultrasound, it is used in peripheral vascular, nerve studies, small parts and neck ultrasound. It is also quite beneficial for intraoperative use. Innovations in elastography allow us to measure the stiffness of the tissue, which helps us in suggesting whether the tissue could be benign or malignant as normal tissue is usually soft on elastography and malignant tissue is stiffer. These can be color coded to give a nice visual representation both to the patient and to the referring clinician. Currently this application is being widely utilized to measure the stiffness of liver parenchyma and in evaluation of breast masses. Application of elastography in the thyroid tissue and other soft tissue lesions is also gaining a lot of popularity.

Antenatal ultrasound has been the cornerstone in the management of all obstetrics and gynecology patients for a very long time. Now with the newer modes and real time 3D more anomalies can be diagnosed with increased confidence. Newer applications such as 3D imaging provide a lot of additional valuable diagnostic information in the

gynecological evaluation of the uterus and the ovaries. It allows us to understand the anatomical details in the third dimension, which was not possible on routine 2D imaging. Application of 3D imaging With contrast-enhanced imaging, the Radiologist can image blood perfusion and blood flow, and more easily differentiate malignant tumors from the benign, among other functions. It can thus be used to characterize the lesions to some extent like CT and MRI. It is portable and finds a lot of use in bedside imaging of critically ill patients. It is widely used in interventional radiology to do guided procedures, the newer and better transducers are only making it better and easier.

Ultrasound gives incredible real time insight into the patient's body and is widely applied across all diverse clinical specialties for all the various body parts. POCUS also called point of care ultrasound is a very essential tool in the medical armamentarium for both diagnostic and therapeutic purposes. Its therapeutic applications with high intensity focused ultrasound (HIFU) and micro bubble assisted delivery of drugs and genes are very promising. Ultrasound examination is interactive and allows the doctor to connect with the patient and modify the examination instantly as needed in each case. This unique real time feature combined with the state of art technology make it one of the most popular diagnostic modality.

With rapid technological advancement and use of more sophisticated computed algorithms more and more smaller systems are being manufactured, leading to may be small pocket held devices. The newer matrix array transducers being smaller than the previous generations, allowing a small foot print access over areas of narrow window availability. They also produce less strain on the operator. Wireless transducers are now available for use in select cases. Devices compatible with tablets are being developed.

To conclude, both due to the radiation concerns associated with the X rays and CT scans and with the latest new advancements in ultrasound technology, ultrasound has reemerged from being forgotten modality to play an increasing important role in all diagnostic clinics and hospitals. This trend is only expected to grow in the future.

