EDITORIAL VIEW

Ultrasound is here to stay!

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ABSTRACT

Only in a few decades, ultrasonography has revolutionized the diagnostic approach in many of the medical specialties. Although the obstetricians were the first ones to use it to the advantage of the patients, many other medical and surgical specialties followed them. Anesthesiologists were not very late in this race, and they soon studied and found its multiple uses in the practice of anesthesiology, interventional pain management, intensive care, trauma and resuscitation. Huge cost on the ultrasound machines, administrative inertias and lack of adequate training facilities have been the main obstacles in adopting this modality to its full potential in non-developed countries. It's the need of the time that cheaper but adequate versions of the machines are developed and due stress is laid on the professional training in its use at all postgraduate training courses.

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Medical ultrasound is commonly known as ultrasonography (USG) or as diagnostic sonography. It uses the application of ultrasound for diagnostic imaging. USG means graphically recording the results of an ultrasound (US) examination. It is used to visualize internal body tissues e.g. tendons, muscles, joints, blood vessels, nerves, bones and visceral organs.

The advent of USG was based on the principle used to detect industrial flaws in ships. Not surprisingly, it was first used in clinical practice by an obstetrician Ian Donald, who developed the first prototype system with an engineer Tom Brown. Obstetricians quickly picked up the new modality to grasp its advantages to the benefit of the mothers and neonates. US, thus helped save the most maternal and fetal lives than any other modality. General surgeons were the next, who requested USG examination of abdomen and its contents to confirm or rule out the diagnosis. It remained the domain of the radiologists till very recent times. Only a few decades back we witnessed radiologists struggling with newly acquired ultrasound machines, which had been added to their armament with the rapid advancement in diagnostic radiology, but with which technology, our old friends had no formal training in their college years. The training mostly comprised of self-learning on live humans, by hit and trial methods and through instructional manuals and videos. It led to many a misadventures, as the surgeons and other colleagues started to rely heavily on the results of ultrasonic examination for definitive diagnoses of complex diseases. Slowly the level of expertise in the corps of radiology improved, so the number of machines in the hospitals also increased to a point that no radiology department was considered complete without ultrasound specialists or the machines.[1] The postgraduate training in radiology was also exponentially improved, so that all radiologists were now also considered as ultrasonologists. The level of expertise, however, varied as it is in all other specialties.

It was roughly at this turbulent period when the advantages of the presence of an ultrasound machine in the operating rooms were recognized. Many a times a situation would arise, when the services of a good radiologist and his portable US machine had to be summoned to an operating room suite to help take some crucial decisions. The number of such visits were ever-increasing and the anesthesiologists were quick to grasp the situation to their advantage. Why not to get hold of few machines for the operating rooms? Precisely this was the era in which a new generation of radiologists - interventional radiologists was born. The machines were now better developed, enough to show us the fine vessels and the nerves with precision, to be targeted therapeutically. It was soon proved that US guided central venous cannulation was fast, easier and safer. The peripheral arteries and veins were the next to be cannulated with the help of US.[2]

Regional anesthesia techniques, involving nerve roots, peripheral nerves or nerve plexuses were largely attempted under landmark guidance. The technique required prolonged experience, a high degree of precision, and focus to the detail, to be successful. Still, the results remained variable, and frequent failures led to this very important branch of anesthesia slide into disrepute. The advent of US ushered a new era of safety and precision in the field of regional anesthesia.[3,4]

The neural structures are usually located superficially in children, so that higher frequency US probes can be used for better resolution. Moreover, the spine interspaces and intervertebral foramina allow the ultrasonic beam to penetrate through, to visualize deeper structures.[5,6] So, the US has particularly a very important use in regional techniques in pediatric patients. It also increases the safety factor manyfold in this population of the patients.[5,6]

A renewed interest in nerve blocks gave birth to the concept of a balanced anesthesia, in which the operator tries to derive maximum benefits of he each modality, while minimizing the associated side effects and / or complications. The rapid progress in this visual guidance modality has been the main driving force behind the birth of modern interventional pain management. Earlier, C-arm fluoroscopy and injections of radio opaque dye were used to visualize the intended target. It left much to chance and exposed the patient, as well as the staff, to very high doses of radiation. The equipment was bulky and costly and required the services of a trained radiographer. Visualization with MRI had even more problems than the fluoroscope technique, as the patient, the staff and the procedure trolley had to be moved to the MRI suite. USG solved these problems and eliminated the radiation hazard to a large extent, although some practitioners still prefer to use it alongwith USG and dye injections to achieve the precision and accuracy about the site to deposit the drug. Moreover, fluoroscopes cannot be used in obstetric patients. This reminds us that US was first used for clinical purposes in 1956 in Glasgow, after an obstetrician Ian Donald and engineer Tom Brown developed the first prototype systems based on an instrument used to detect industrial flaws in ships.[1]

The old generation of anesthesiologists was slow to get hold of the changing trends, but the newly qualified ones were bold enough to learn and embrace this new skill and bring it to good use. The machines were costly and the inertia of the administrators at the reigns of the hospitals was too much to overcome. This was the single large factor which materially slowed up the development of this fine diagnostic modality in our country, and put hurdles in keeping pace with the advanced countries. But this dark period is hopefully over, and the anesthesiologists of most of the developed countries have learnt and apply the skills of US not only in vascular access and regional nerve techniques but also in complex areas, like spinal or epidural analgesia and the diagnosis and treatment of musculoskeletal disorders.[7]

With more progress the application of the same principle in the shape of echocardiography revolutionized the medical branch of cardiology. It is now used to diagnose heart disease, whether ischemic or valvular, at very early stages. Rather, the technique has now been in practice to diagnose fetal cardiac and other abnormalities during intrauterine life and has helped in intrauterine surgical corrective procedures. Perioperative echocardiography has helped timely diagnosis of potentially fatal cardiac dysfunction and quick interventions to save so many lives. This indication of US has been slow to be picked up by our anesthesiologists, but the time has come that learning US and echocardiography skills becomes essential part of anesthesiology training.[8]

In the very recent past US has found many new applications in the OR and ICU setting. It has been shown to be useful in preanesthesia clinics in diagnosis of airway abnormalities, either congenital or acquired, and potential difficult intubation which may alert an anesthesiologist to take adequate precautions or to modify his plan of anesthesia. Similarly, it has been advocated for its accuracy in confirmation of correct placement of endotracheal or

gastric tubes.[9-12] Surgeons may use it for visualizing vocal cord movements to diagnose recurrent nerve damage after a thyroidectomy.[13]

Anaesthesia, Pain & Intensive Care has been on the fore-front to introduce and propagate US in Pakistan and surrounding countries. Uptill now, the journal has published more than thirty papers on the use of US.[14-17] The first title picture based upon the use of US in transversus abdominis plane block was published in August 2012, in connection with a special editorial on the same topic.[18] Later on a special issue on US was published in September 2015, which comprised of more than thirty full length articles and editorials on this particular theme (http://www.apicareonline.com/table-of-contents/20150701/).

It is sad that majority of hospitals in non-developed countries lack this useful diagnostic and therapeutic tool. Only some of the bigger hospitals enjoy free availability of US. The anesthesia societies need to make administrators at all levels recognize its importance and stress upon early procurement for all operating room complexes and ICU's. The societies have also the responsibility to get US included in the list of essential equipment by medical practice regulating authorities for ORC and ICU's. On the sidelines, US training must be a part of every postgraduate training curriculum for the specialties of anesthesiology, pain management, intensive care and resuscitation.

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