Editorial

Why should we learn the skills of ultrasound?

The application of ultrasound has been around for a century and has been utilized in clinical settings for seventy years[1]. In Bangladesh Ultrasound has been used in medical practice for over 40 years. Since the early 1980s, it has been used mainly for obstetric, gynecologic, hepatobiliary, and urological diagnoses. The anesthesiologists in Bangladesh haven't used ultrasound in their practice until recently.

In the meantime, there has been a tremendous development in the technology of ultrasound. It has transformed from robust to lightweight and portable; attained better resolution with desired penetration. At the same time, Its relative affordability has made it accessible to individuals.

The ultimate output of the modality is the image of structures. The images are formed as sound waves from the transducer, travel through different body tissues. The sound waves have a frequency crossing the audible range to human ears. They are usually 2-15 megahertz. however, modern ultrasound machines can produce higher-frequency sound waves. The images formed are influenced by the tissue's acoustic impedance. It is known that air-containing organs have low acoustic impedance whereas dense structure like bone has the highest level[2]

Initially, ultrasound was designed to create static images. But it is nowadays capable of producing real-time images or images in motion, which has enabled point-of-care imaging in anaesthesiology like other areas of clinical practice. The ultrasound produces 2-D images. But through observing serial images a three-dimensional perception of anatomical structures is possible. The fourth dimension of time can also be perceived while penetrating something solid like a needle or injecting a liquid like a local anesthetic through tissues.

It seems that the most common use of ultrasound in anaesthesiology is performing regional blocks. It is either used as a sole technique for a list of surgeries or as an important component of perioperative multimodal analgesia. Peripheral nerve blocks like brachial plexus block under imaging have started since the mid-nineties of last century. It has enabled, injecting less amount of anaesthetics surrounding the vicinity of desired nerves and avoiding injury to other structures. Thus, enhancing the overall success rate and reducing any side effects or complications.

At the same time, more precise nerve blocks are possible using ultrasound. Superior trunk block has become possible instead of interscalene nerve block. Thereby a common problem of hemidiaphragmatic paralysis can be avoided in most patients who require it[3].In cases of adults with difficult anatomies or in children, central neuroaxial blocks are utilized similarly to peripheral nerve blocks. Here one can also understand the importance of the modality of ultrasound in chronic pain management.

The Truncal nerve blocks are a new spectrum that has emerged recently from the very early part of the new millennium. Given the limitations of the neuroaxial block, they are being used on patients who are poor candidates for spinal and epidural anaesthesia[4]. These blocks encompass a wide variety of nerves of the chest wall, abdomen, and para-neuroaxial nerves. They are relatively easy to provide and have a lower risk profile than neuroaxial blocks. Transversus abodominis blocks, paravertebral blocks, and quadratus lumborum blocks are all examples[5]. As of other regional blocks, performing truncal blocks are becoming widespread among anaesthesiologists. Novel techniques using ultrasound guidance have started to be described[6].

The practice of anesthesiology emphasizes the importance of vascular access. There are various settings where they are performed. Both central and peripheral vascular access, as well as arterial cannulation, have seen an increase in success rate and decreased complications with ultrasound guidance[7]. These improvements include the reduction of attempts and catheter placement failure and less likelihood to injure surrounding structures thereby reducing hematoma, haemothorax, and pneumothorax-like complications. Ultrasound is also used as a tip navigation technique where the tip of the guide wire useless the catheter tip can be visualized. They thereby help in reducing potential respiratory complications in central venous cannulation. In case of arterial access for blood pressure monitoring and blood gas sampling Doppler probes can be used to identify bleeding points during cannulation along with other advantages[8]. It is also used indicated for

the diagnosis of deep vein thrombosis, and other vascular pathologies.

One can enumerate numerous other significant domains in which ultrasonography is applied in the field of anaesthesiology. It encompasses evaluating and managing conditions related to the airways, lungs, and gastric system. About airways, both supraglottic and infraglottic anatomy assessment, prediction of difficult airway, confirmation of endotracheal tube placement, airway-related nerve blocks, trans-laryngeal processes and prediction of successful extubation can be assessed with ultrasonography aids.

In critically ill patients as well as in emergencies like pneumothorax, pulmonary oedema, pulmonary embolism developing hypoxia, lung ultrasound can help in quick and accurate diagnosis when compared to physical examination combined with chest radiography. It also plays a role in fluid management in critically ill patients[9,10].

There is a high incidence of gastric acid aspiration during the perioperative period[11] and deaths from aspiration pneumonia[12,13,14]. These mainly occur in emergency surgeries, patients with delayed emptying of the stomach and those who are noncompliant with preoperative fasting advice.it is evident that the incidence is related to the gastric volume. The point-of-care ultrasound can assess the type and amount of content in the gastric antrum which usually reflects the amount present in the stomach. Thereby predicting the risk and attempts can be made to reduce the risk.

The importance of transthoracic and transoesophageal echocardiography used by anaesthesiologists cannot be overstated. a potential list of use in this specific area is also settled already[15,16]. It is used mainly by cardiac anaesthesiologists in developed countries and we are well ahead of the reality.

Though Ultrasound is very useful in decision-making and for successful interventions, inexperience may result in misinterpretation[17], missed diagnoses and results in failures. So, a good acquaintance of Sonoanatomy, the physics of ultrasound, and for many procedures needle tip movement and safe spreading of desired liquid is very important. The acquisition comes from acquiring knowledge and training. Point-of-care ultrasound training has been added to the curriculum of anaesthesia residency programs in a few countries. The guidelines also suggest that it should include acquiring knowledge, training on simulators and clinical training; converting the training process in a competency-based manner[18]. Training modalities are practiced at the bed site, in the classroom, using simulation and online modules. Every method has its advantages and limitations[19]. But the important thing is that the learning curve can be steep[20,21]

Ultrasound is becoming of paramount importance in the practice of anaesthesiology along with critical care and pain medicine. Already it is becoming the third eye for the anaesthesilogists. Acquiring skills from the beginning of our training is crucial for us to be a part of the global anaesthesiology practice.

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