

Ultrasound-guided Interventions in Chronic Pain: Are We Ready for It Yet?

Intervention is an integral part of chronic pain management, whether it is diagnostic or therapeutic. The precision of correct needle positioning is of utmost importance. Most of the interventions need image guidance for better safety and selectivity. Traditionally anatomical landmarks, computed tomography (CT) or fluoroscopy has been the third eye of an interventional pain physician. However, fluoroscopy is more feasible than CT and safer in account of radiation exposure. Though ultrasound is a well established modality in acute pain management and peripheral nerve blocks, its major role in chronic pain management and interventions, though has passed the embryonic stages but still developing.

Of late there has been a tremendous growth in utilization of ultrasound in pain practice. Most pain management guidelines have moved toward recommending image guidance, such as ultrasound, fluoroscopy or CT scan, for interventional procedures.¹ Ultrasound has emerged as a popular modality in various disciplines because of its numerous advantages. It is generally more affordable and portable than other imaging modalities while avoiding any radiation exposure. Ultrasound provides direct visualization of various tissue structures including muscles, tendons, ligaments, nerves, vessels and bone surfaces. Ultrasound technology now allows visualization of small peripheral nerves and their associated branches. Real time ultrasound guidance of needle placement and medication administration provides an advantage in ensuring accuracy. Furthermore, ultrasound is increasingly being utilized for the diagnosis of various conditions that may be associated with the patient's presentation, such as nerve and joint pathology.²⁻⁴

Between 1982 and 2002, there have been only three publications related to ultrasound-guided techniques in chronic pain management. Again Kapral et al from Vienna group in 1995 described ultrasound imaging for stellate ganglion block: direct visualization of puncture site and local anesthetic.⁵ However, it has been much slower uptake perhaps due to technical limitations of ultrasound, lack of experience, formal training and simply lack of any evidence and publications. There have been more than 42 publications since 2003 and many more are on the way.

Deeper in the forest have more trees. High frequency probe providing high resolution pictures will not penetrate deep tissue. Low frequency probe penetrates

deeper but quality of picture is degraded. Structures like bones are not easily penetrated by ultrasound wave producing scattering and other artifacts.

For pain clinician, deeply localized targets like facet joints/medial branches, epidural, caudal, sacroiliac joints are of interest. In general they can be accessed under ultrasound guidance but in very degenerative spine, in high BMI patient a combination with fluoroscopy is recommended. Level of intervention especially for cervical spine can be quickly confirmed and verified with fluoroscopy and actual procedure performed under direct vision.⁶ In some interventions like suprascapular nerve block/pulsed radiofrequency it can be done solely under ultrasound guidance.

If we talk about ultrasound-guided lumbar procedures various studies have been done in clinical set up. Clinical case series of Lumbar facet medial branch block under ultrasound guidance has been published. Many studies of ultrasound-guided lumbar medial branch block also present in literature, but sadly a final confirmation of the needle placement was done by fluoroscopy. The same stands for intra-articular facet injections too. For selective root injection, there are very few studies. Difficulty in visualizing structures is an issue in this aspect. For ultrasound guided lumbar procedures BMI of the patient is a major limiting factor. The same goes for ultrasound-guided cervical spine interventions. However, feasibility studies are being done in clinical setting or cadavers to find its usefulness.

Many studies regarding ultrasound-guided caudal epidural, sacroiliac joint and piriformis injections are being done these days. Ultrasound has proven handy in these situations. Many cadaveric as well as clinical case series and studies have been published. Ultrasound-guided sympathetic blocks (stellate ganglion, celiac plexus, etc.) are in practice. To minimize complications like avoiding intravascular injections, esophageal injury and a direct deposition of drugs around the ganglion makes it more attractive for ultrasound-guided stellate ganglion block. There are many studies as well as case reports. Another area where ultrasound has a promising future is neuromodulation, where percutaneous electrodes can be placed.

A barrier of introduction of ultrasound in chronic pain interventions is that large scale studies or randomized

controlled trials may not be ethical to execute while comparing to fluoroscopy or CT. Even though this popular tool has shown its excellence in acute pain interventions, to call it a sole tool of chronic pain interventions is definitely not the right time. Further development of ultrasound in chronic pain interventions depends on training and education to the existing as well as new pain physicians.

Even though every conference has an ultrasound-guided chronic pain intervention station and it is constantly growing in numbers, ultrasound should be introduced into fellowship and training curriculum vigorously from the beginning. Though embryonic stage has been over for ultrasound, it still needs to grow mature in the hands of pain physicians for chronic pain interventions. With its added advantage of visualizing soft tissues as well as real time drug spread, least radiation exposure and portability it is definitely a greater tool which should be more into use keeping in mind that image interpretation ability of variable bony and deeper structures and dye spread needs more expertise and time to learn. Hence, some studies have described combining both fluoroscopy and ultrasound to increase

its procedural accuracy throughout the initial use in clinical set up and in training as well. Then only, we can bring ultrasound in chronic pain interventions from clinical studies to clinics. A better future of ultrasound in chronic pain is awaited, hopefully.

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Samarjit Dey

Assistant Professor

Department of Anesthesiology, MES Medical College and Hospital
Perinthalmanna, Malappuram, Kerala, India

