

Ultrasound Guided Procedures in Pain Management

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Traditionally interventional procedures in Pain Medicine are performed under fluoroscopy or CT guidance. Only minor interventions are done blindly relying on superficial anatomical landmarks.

CT is reserved mainly for major interventions such as spinal cord stimulation , celiac plexus block or known difficult selective spinal nerve root blocks. It involves a huge amount of radiation forcing the operator to move in-out of the room.

Understandably access to CT scanner is not always easily available even in the most modern hospitals.

Fluoroscopy is a standard aid in visualizing invasive procedures at the pain clinics across the world. Even interlaminar epidurals are routinely performed under X-ray control when contrast injection confirms position and spread of solution . Author's audit in 2004 showed that more than 60% of epidurals are performed under fluoroscopy guidance, numbers being likely more than 90% at present (1) In difficult spine cases fluoroscopy is of great help , contrast deficits inform about anatomical obstacles and legal aspects are not to be forgotten. However , the soft tissue cannot be visualized and also exposes patient and the provider to the risk of radiation. It also requires more manpower as radiographer assistance is usually mandatory.

Ultrasound brings a new dimension to intervention in pain management. Between 1982- and 2002 there have been only 3 publications related to ultrasound guided techniques. There have been 42 publications since 2003 and numbers are growing rapidly.(2) US systems are more available and affordable nowadays. Portable devices provide high resolution and quality pictures. Ultrasound imaging allows real-time visualisation of needle and surrounding structures especially while operating in so called " tiger area" eg. Stellate ganglion. All peripheral neural structures and soft tissue can be easily shown in 2D dimension.

Merging experience from various specialities seems to be a way forward. Musculoskeletal US experts (radiologists, rheumatologists) may help to develop skills in joint injections . Trigger point injections (including Botulinum Toxin A) are no longer to be blind but specific groups of muscle can be targeted and potential complications (pneumothorax , intraperitoneal , intravascular injection) avoided.

Anaesthetists with experience with peripheral nerve blocks under ultrasound guidance naturally progress to blocks in field of chronic pain.

What are the limitations ?

Deeper in the forest are 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 waves producing scattering and other artefacts.

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 obese 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. In some interventions like suprascapular or occipital nerve block/ pulsed radiofrequency fluoroscopy can be completely abandoned. (personal experience).

Below a list of intervention potentially possible under US guidance and few comments included.

Head & Neck

Greater Occipital Nerve- can be visualized between inferior oblique muscle and semispinalis or more superficial between semispinalis and trapezius. It is more proximal approach than traditional and fits the concept of opening the muscle compartment potentially responsible for the symptoms .

Extraforaminal cervical nerve roots - Excellent view of a nerve root can be obtain and in plain needle visibility as the targeted structures are superficial. One need to be aware of the relevant blood vessel in the vicinity of the vertebral foramen . It is mandatory to use a non- particulate steroids !!

Superficial cervical plexus - small branches of the plexus are not always easy to find but the right plane always can be identified . Greater auricular nerve is the biggest.

Cervical facet/ medial branch block- great caution required due to proximity of vertebral artery. Needle direction should be from anterior to posterior to avoid accidental vertebral artery puncture.

Stellate ganglion - Once you identify all the surrounding structures you will never think about stellate ganglion block without Ultrasound !

Suprascapular Nerve - Just a slight modification of a standard landmark technique- you will see scapular notch, supraspinatus and trapezius above and with some probe adjustment transverse scapular ligament with artery above and nerve below and medial.

Trunk and abdomen

Intercostal nerve block - rib ,pleura, muscle layers can be distinguished . That's all what you need.

Ilioinguinal /iliohypogastric nerves – after a good teaching at workshop it should take no more than 5 seconds to identify the structures(at least when Phillip Peng is your teacher)

TAP- Can be identified even in obese and elderly with some limitations. Sometimes in high BMI patients out of plane techniques can be preferable to in-plane

Coeliac Plexus - This technique was successfully used in anterior approach even before “ era of ultrasound “ . However due to decreased number of blocks performed, potential serious complications CT is considered as a gold standard

Lumbar Spine

Facet joints / medial branch – both longitudinal and transverse approach can be used. High quality equipment, low frequency probe required. Even so in severe degeneration and high BMI reliable pictures might be difficult to obtain.

Lumbar plexus, paraspinal muscle injections – transverse processes and adjacent muscle can be identified to simplify the needle trajectory

Sacroiliac Joint - according to the study first 30 injections might not be exactly on the spot but if you keep practice after 60 you will achieve accuracy more than 90%. If you think about quite common procedure and amount of radiation it might be worth it .

Piriformis muscle & pudendal nerve - once deeper pelvis flagpost under US are found CT and fluoroscopy can be abandoned

Lower Limb

LCT- Lateral cutaneous nerve of the thigh – challenging structure to find due to superficial position and anatomical variety .Nothing is impossible if you follow the rules

Hip joint . & Knee joint and other joints - to have a choice between blind technique and fluoroscopy Ultrasound is a reasonable alternative . It is not a rocket science and at some stage you start to think about making diagnosis.

Useful websites:

www.lsora.co.uk

www.nysora.com

www.usra.ca

www.neuraxiom.com

www.painultrasound.com

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