ISSUE 1 / JANUARY 2025

AORA4U

THE OFFICIAL NEWSLETTER OF

ACADEMY OF REGIONAL ANAESTHESIA

AORA INDIA

MESSAGE FROM THE PRESIDENT

Dr Amjad Maniar

Greetings!

It gives me great pleasure to see the revival of the AORA Newsletter! In the past, the AORA Newsletter served as an initiative for us to share concise information regarding anatomy and nerve blocks. Under the enthusiastic guidance of our new academic director and his team, the newsletter shall once again convey interesting aspects of Regional Anaesthesia, Pain Medicine and POCUS.

As many of you who attended AORA 2024 in Hyderabad would have seen, Pain Medicine (Acute and Chronic) as well as POCUS have become essential in a routine day's work for an anaesthesiologist. We at AORA are looking forward to the integration of these fields into our curriculum to enhance the skill set of anaesthesiologists everywhere. Let me also assure everyone that we will continue to bring you the best of regional anaesthesia.

With 2024 drawing to an end, 2025 will have much to look forward to. More newsletters and webinars will follow, but if you really want to rub shoulders with the experts, look out for a number of conferences affiliated to AORA close to you. The showcase event will be the 15th annual conference of AORA to be held at Amritsar between the 18th to 21st September. Tremendous effort and time is put into the planning and execution of these conferences. As always, we look forward to seeing you there.

Here's wishing all of you peace, joy, health and prosperity for the coming year. May your blocks never fail!

Yours truly

Dr Amjad Maniar

President, AORA India

MESSAGE FROM THE SECRETARY

Dr Ujjwalraj Dudhedia

Greetings from the desk of AORA! As we enter 2025 let us all vouch to continue our efforts in improving our skills and knowledge in delivering a better patient care. As an AORAian I feel proud to say that we at AORA pledge to end our patients' sufferings from pain and make their journey of hospitalisation a pleasant tour.

I welcome you all to the latest newsletter of AORA where we take you to the fascinating world of RA which in recent decades has made significant advancement in techniques and technology.

In this issue our Academic Director Dr Hetal Vadera has beautifully crafted the contents to take you through the journey of the Doyen of Indian RA **Dr J Balavenkat.** I am sure it will inspire many more of us as always. Subsequently **Dr TVS Gopal, and Dr Vrushali Ponde** will make the most difficult and dreaded block in RA practice **"The Lumbar Plexus Block" l**ook easy for all of us.

Subsequently **Dr Harshal Wagh** and **Dr Rutuja Mayee** will enlighten us about the role of POCUS in an Anesthesiologists practice which will be followed by a brain teaser activity by our quiz masters **Dr Divesh Arora and Dr Gaurav Agarwal**. Whether you are a seasoned anaesthetist or a novice keen to expand your knowledge, this newsletter aims to keep you informed and inspired. Hope you will like it and spread a word about it with your colleagues who also can find the copies available on our website.

Sukhada Pathanam

Warm Regards

Dr Ujjwalraj Dudhedia

Secretary AORA India

FROM THE DESK OF EDITOR

Dr Hetalkumar Vadera

Dear Readers,

It is with great pride and enthusiasm that I welcome you to the first edition of the Academy of Regional Anaesthesia (AORA) newsletter. As we step into this exciting venture, our goal is clear: **To create a resource that not only informs but inspires.**

This issue reflects our commitment to excellence in regional anaesthesia, featuring topics like the intricacies of the lumbar plexus block, Dr. Balavenkat's heartfelt account of his journey in this field, and a compelling reminder of the indispensability of POCUS for modern anaesthesiologists. To add a touch of fun to learning, we've included a quiz to test and expand your knowledge.

This newsletter is a testament to the shared passion of our community. I invite you to join us in shaping its future by contributing your experiences, insights, and questions. Together, let's make this a space where knowledge grows, and ideas flourish.

Warm regards,

Dr Hetalkumar Vadera
Scientific Chairperson, AORA

Editor,AORA Newsletter

CLICK ON THE AUTHOR'S NAME AND YOU WILL BE DIRECTED TO HIS/ HER ARTICLE:

Dr J Balvenkatasubramanian, Dr Harshal Wagh/Dr Rutuja Mayee, Dr TVS Gopal, Quiz, Dr Vrushali Ponde, Answer Key

EDITORIAL TEAM

My Journey in Anaesthesia: From Baby Steps to Global Leadership in Anaesthesia

Dr J Balavenkatasubramanian, Founder President, AORA INDIA

Pranam To My Teachers First:

I profoundly thank all my teachers and mentors in the Department of Anaesthesia at B.J. Medical College, Pune and PGI, Chandigarh, for teaching me the baby steps in anaesthesia. Anaesthesia as a subject was completely new to me as I had hardly any exposure to this subject as an undergraduate. It was truly a challenge to harness the basic skill sets like starting an intravenous line in paediatric patients, spinal in obese patients, intubations in difficult airways, handling sudden unexpected blood loss and hypotension, delayed recovery from anaesthesia, the need to learn several aspects of many pharmacological agents, drug interactions, cardiovascular instabilities, new monitoring devices etc. I am truly indebted to my seniors and teachers for inculcating important ingredients into my thoughts and deeds.

A Day in the Life of an Anesthesiologist:

I currently work as a Senior Consultant Anaesthesiologist and Academic Director at Ganga Medical Centre and Hospital, Coimbatore, India. I am a regional anaesthesiologist involved in peri-operative care of all my patients, including Acute Pain Service.

Our hospital is a 650-bed tertiary-care referral center for trauma, orthopaedics, reconstructive microvascular surgery, plastic surgery, brachial plexus reconstructive surgery and burns.

Innovating Trauma Care and Establishing as Peri-Operative Physician:

We have been practising “on arrival” blocks for all our trauma patients since 2002. Every trauma patient receives an ultrasound-guided block immediately on arrival, 24 hours a

day. We have the presence of 3 consultant anaesthesiologists in-house at night.

The sequence of our care for trauma victims is primary survey, resuscitation, ultrasound-guided blocks, point-of-care ultrasound (POCUS), and secondary survey. In fact, X-rays are done only after making the limb numb; otherwise, it would be very painful for the patient when X-rays are performed in different positions.

Anesthesiologists perform POCUS, and decisions on laparotomy in abdominal injuries are based on anaesthesiologists' findings rather than waiting for a radiologist.

The best thing about my job is complete patient care in the peri-operative period. The surgeon is engaged in the surgery, drain removal, and ambulation protocol. All the rest is done by anaesthesiologists. It is from the pre-anaesthesia assessment to prehabilitation, psychological counselling, intra-operative care, postoperative care in the High Dependency Unit in the immediate postoperative period, regular ward rounds, and a role in discharge advice.

It is so rewarding to see the patient who came in critically injured, walking back home with a smile. More importantly, it excites us all when patients thank the anaesthesiologists as profoundly as they thank the surgeons.

Sharing Knowledge, Shaping the Future:

The next thing that excites us is training young anaesthesiologists. We train around 100 anaesthesiologists every year through our postdoctoral fellowships of 6 and 12-month durations including the WFSA, AOSRAPM , AORA and Dr MGR Medical University Fellowships and Post Graduation in Anaesthesiology affiliated to the National Board.

It is truly a delight to note that young minds in India want to become more skilful, nearly 600 young Anaesthesiologists appear for our virtual exam and from that we choose the top 90.

The *JOY OF SHARING* excites us! I thank the consultants in my

department who relentlessly teach and are truly passionate to share their skill sets.

My Journey into Regional Anaesthesia

First Baby Steps in Regional Anesthesia:

My baby steps into RA were in my post-graduation at BJ Medical College, Pune and PGI Chandigarh in the early 90s and it was essentially a paraesthesia technique.

Learning from Pioneers to Fuel a Dream:

My turning point was when I got access to the Journal of RAPM, which happened when I shadowed Dr. Mambir Batra, President of ASRA in 1999,
who was at Virginia Mason Medical Center in Seattle, WA. He introduced me to ASRA and the journal. I became an associate member and started receiving the Journal.

I also did acute pain service rounds with Dr. Joseph Neal, where I was amazed at the quality of postoperative pain relief. They both instigated the fire to learn and effectively deliver regional anaesthesia.

Giving Back To Society: Starting a Training Centre:

This led to me starting the Aesculap Academy Regional Anesthesia Guidance Centre, the educational wing of B. Braun at our hospital. We started training five anaesthesiologists every month from across India and neighbouring countries. Until COVID struck us, we had trained 1,447 anaesthesiologists through this program.

Building AORA: A Shared Vision:

I felt very happy when I could join five of my colleagues (Drs. TVS Gopal, Vrushali Ponde, Sandeep Diwan, Satish Kulkarni, and Ashish Mehta) in India who were regional

anaesthesia enthusiasts to start the Academy of Regional Anesthesia (AORA) of India. I am happy to share that this became the premier source for teaching safe regional anaesthesia practice in India. We have one national conference every year and conduct several hands-on workshops across the country. In 2011, we started with six members, and now we have close to 3,000 life members.

Certain important milestones that I want to share:

1. The postdoctoral fellowship in regional anaesthesia affiliated with our Medical University began in 2012 and was the first in India. It is a one-year program.
2. The WFSA Ganga Hospital Regional Anesthesia Fellowship started in 2014. The Educational Committee of the World Federation of Societies of Anaesthesiologists (WFSA) makes the selection, and we train four anaesthesiologists every year from Asia Pacific and Africa. So far, we have trained 34 anaesthesiologists from 18 countries.

3. We have many success stories of our fellows Dr Nyandwi from Rwanda starting his own centre to teach in Kigali, Dr Dahlia Arancel Starting RASPHIL in the Philippines, Dr Fadzai becoming the Secretary of her National society in Zimbabwe, Dr Simiyu becoming the President of the Kenyan Anaesthesia society, Dr Ambrose Rukewe, Nigeria authoring a handbook of Regional Anaesthesia

4. When we conducted the 2019 AORA India National Conference in Coimbatore with more than 1,700 delegates from 42 countries and more than 38 international faculty members, Professor Narinder Rawal from Sweden said, “This is one of the best regional anaesthesia conferences that I have ever attended.” Professor Vincent Chan from Canada said, ”An amazing meeting of high standards.”

Cultivating Research and Writing:

I urge youngsters to get into the editorial board of the Journals.

Being a part of the editorial board is a great learning experience. We grow more as we read more. We get fascinated by creative ideas and

innovative writing. It truly helps us to grow holistically and practice evidence-based medicine. So, being an Editorial Board member is a true GIFT, it enriches us profoundly.

We also need youngsters to publish more in Regional Anaesthesia

There are several facets of regional anaesthesia that need to be deciphered. We need input from every part of the world about experiences with regional anaesthesia. To equate regional anaesthesia with general anaesthesia in every aspect would take a long time. But this time can be minimised if more authors share their experiences with the world by generating good articles.

When a patient smiles at you in the immediate postoperative period after undergoing a major surgery, thanks to regional analgesia as a part of multimodal analgesia.

Certain proudest career moments I would like to share:

1. Becoming the founding president of the Academy of Regional Anaesthesia (AORA) of India
2. Serving as the President of the Asian Oceanic Society of Regional Anaesthesia and Pain Medicine from 2019 to 2022
3. Serving currently as the Secretary of World Federation of Society of Anaesthesiologists, President of Indian Society of Anaesthesiologists, Director Scientific Affairs of the AOSRAPM, Member Newsletter Committee of ASRA PM, Member, Educational Committee of WFSA and Advisor to AORA India.
4. Taking the responsibility of chair of the regional anaesthesia track at the World Congress of Anaesthesiologists 2021 Prague, 2024 in Singapore and Educational Track Co-chair of WCA 2026, Morocco
5. Addressing the Inaugural session of the World Congress of Regional Anaesthesia held in Paris Conducted by ESRA PM in my capacity as President of AOSRAPM in the year 2023
6. Serving as an editorial board member of the most prestigious

journal of regional anaesthesia in the world ... RAPM.

7. Getting invited to serve as a faculty member at the ASRA World Congress in New York City in 2018, two decades after starting my learning in regional anaesthesia in the same country – the USA.
8. Being appointed as the chairman of the Scientific Committee of the National Conference of Indian Society of Anaesthesiologists (ISACON) in 2002, when I was just 37 years old.
9. Delivering the most prestigious anaesthesia oration of India, the "Dr. Venkat Rao Memorial Oration" at ISACON 2014 (my oration topic was "Leadership in Anesthesia: Challenges and Solutions").

When the surgeon acknowledges our work and tells the nervous patient, "*Do not worry, we have a very good anaesthesiologists team who will nullify your pain after the surgery through their magic injections.*" It is truly gratifying to be an anaesthesiologist and help people when they need us the most to alleviate their pain and suffering.

I convey my gratitude to all my teachers, mentors, colleagues at Ganga Hospital, my patients and my AORA family, ISA family, WFSA Family, AOSRAPM Family for giving me all the essential ingredients and guidance to grow in the direction I sought to.

Dr J. Balavenkatasubramanian,

Senior Consultant & Academic Director,

Department of Anaesthesia & Peri-operative Care

Ganga Medical Centre & Hospitals Pvt. Ltd.

LUMBAR PLEXUS BLOCK WITH DUAL GUIDANCE

Dr. T.V.S.Gopal

INTRODUCTION

The lumbar plexus block of lumbar nerve roots from L1 – L4 comprises a sufficient volume of local anaesthetic injection into the psoas major muscle, at the junction of the anterior two-thirds and posterior third. This being a fairly deep injection, lumbar plexus block calls for experience and a thorough understanding of related anatomy and techniques. The incidence of bleeding complications is high due to the presence of branches of lumbar arteries and veins in proximity to the tip of the needle.

EVOLUTION OF TECHNIQUES

Though Winnie *et al* first described the landmark based posterior approach to the lumbar plexus in 1974, Chayen and colleagues proposed the 'loss of resistance' technique in 1976. They surmised that lumbar nerve roots lay in a 'compartment' between the psoas major and quadratus lumborum muscles, which we now know not to exist. Thus, the origin of the term 'psoas compartment'. K S Parkinson *et al* in 1989 first used peripheral nerve stimulation as objective guidance.Ultrasound guidance for the lumbar plexus block was pioneered by Kirchmair et al in 2001. The preferred standard in contemporary practice is to combine peripheral nerve stimulation and ultrasound guidance.

INDICATIONS

A combination of lumbar plexus and sacral plexus block provides surgical anaesthesia & analgesia to the entire lower limb. Therefore, though technically more challenging, it is suitable for elderly patients with significant co-morbidities who may not tolerate haemodynamic perturbations

following a neuraxial block. The lumbar plexus block is indicated for procedures involving the hip joint, femur and knee. Placement of a catheter extends analgesia in the postoperative period.

Prerequisites :

1. Prior discussion with surgeon.
2. Adequate Counselling of Patient.
3. Informed Consent.
4. Good IV Access.
5. Proper positioning.
6. Identification & marking of Surface Anatomical Landmarks.
7. Peripheral Nerve Stimulator (PNS) machine, Ultrasound machine, 100 mm Insulated Block Needle.
8. Local Anaesthetic Drugs, ECG electrode for anodal connection & Syringes.
9. Emergency Drugs for Resuscitation of LAST.

PERIPHERAL NERVE STIMULATION (PNS) GUIDANCE

In spite of advances in ultrasound technology, the one block that relies heavily on elicitation of muscle twitch from electrical stimulation as objective end point is the lumbar plexus block.

Position : in the lateral position with the side to be operated on facing up.

Entry Point: the approach commonly adopted is Capdevila's modification of Winnie's approach. The Posterior Superior Iliac Spine (PSIS) is identified, a line drawn cephalad, another line drawn laterally from the L4-L5 interspace, the needle entry point at the junction of medial two-thirds & lateral one-third.

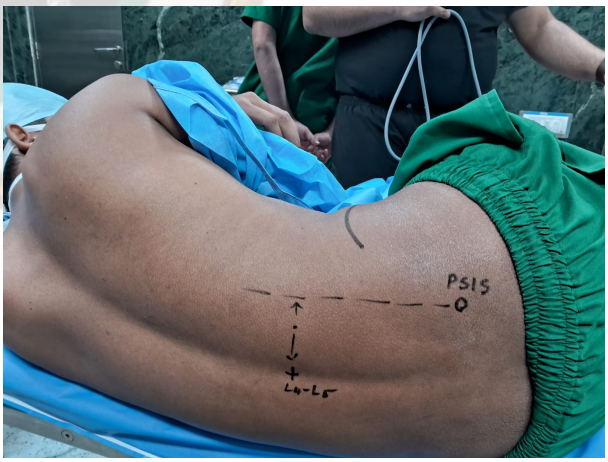


Figure 1

(PSIS – posterior superior iliac spine, L4 – L5 interspace)

PNS Settings: A stimulus with an initial current setting of 1.2 - 1.4 mA with a pulse width of 0.1

milliseconds and frequency of 1 or 2 MHz. Once desirable muscle twitch is obtained, the current is gradually reduced to 0.4 mA.

Needle Approach: the needle is directed to preferentially contact the transverse process of the L4 vertebra, upon which the needle is redirected cephalad or caudad and advanced with caution till quadriceps contraction is elicited. The distance from the skin to the transverse process depends on the patient's body habitus. From the transverse process, the lumbar plexus is encountered at a depth NOT exceeding 2.0 cm.

Muscle Twitch : the desired twitch is quadriceps contraction. If twitch of back muscles is observed, the needle is superficial and stimulating the erector spinae muscles. Hamstrings twitch indicated caudad stimulation involving the lumbosacral trunk. Flexion of thigh indicates psoas muscle contraction anterior to the lumbar plexus.

Local Anaesthetic Injection : for surgical anaesthesia, we inject 20 mls of plain, 0.375% bupivacaine (0.4 ml/kg) by slow, fractionated injection with intermittent aspiration. Rapid injections against resistance should be avoided due to the possibility of retrograde epidural spread of LA, as proven by the study of Gadsden *et al* in 2008.

ULTRASOUND GUIDED TECHNIQUE

Though the preferred technique is to combine ultrasound guidance with PNS. in our institution, we utilise ultrasound for a pre-procedural scan to confirm landmarks and depth to the plexus and also to confirm the spread of local anaesthetic in real-time motion as the injection is made.

Broadly, the two views with curved low frequency transducer are :

Paramedian Sagittal & Paramedian Transverse Oblique (The latter is more preferred)

The Paramedian Sagittal view targets the contiguous transverse processes, aptly called the 'ultrasound trident' (acoustic shadows) and the acoustic windows in between – the psoas major muscle. The needle is advanced either out of plane or in plane (from caudad to cephalad). Quadriceps contraction confirms correct needle tip placement.

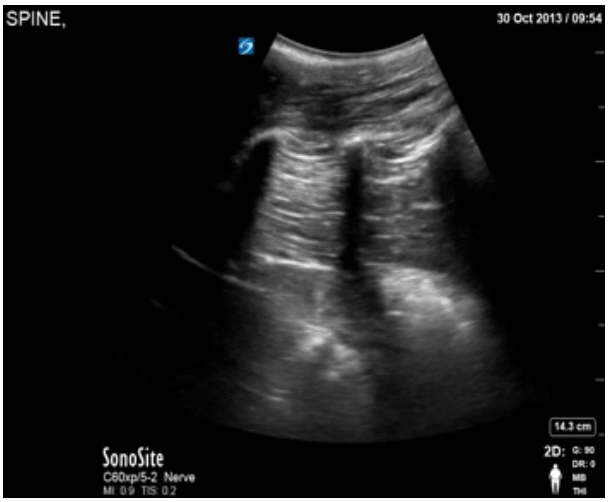


Figure 2 (The Ultrasound Trident – Paramedian Sagittal Transverse Process View)

Paramedian Transverse Oblique View

A. Placement just lateral to the transverse process – both the transverse process view and articular process views are obtained.

Figure 3

(Paramedian Transverse Oblique View lateral to transverse process)

B. Placement in the flank to view the Ultrasound Shamrock. The shamrock, considered a holy flower in the Republic of Ireland due to the comparison with the Holy Trinity by Saint Patrick, consists of three clovers and a stem.

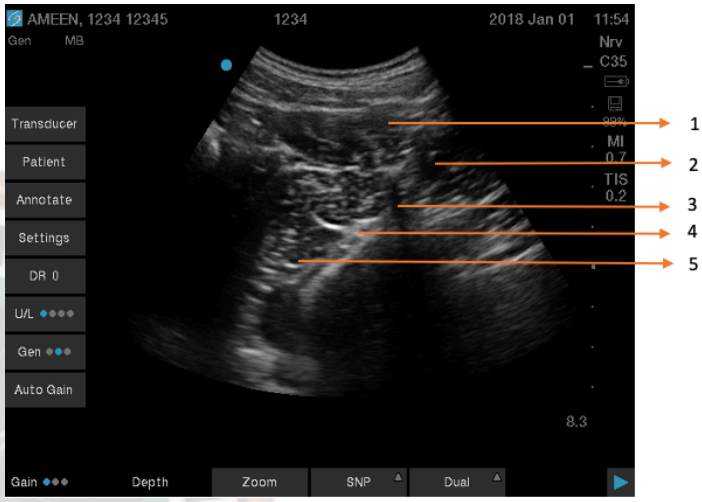


Figure 4

(The Ultrasound Shamrock – 1. Quadratus Lumborum, 2. Erector Spinae, 3. Transverse Process, 4. Lumbar Nerve Root, 5. Psoas Major)

C. Ideally, needle placement is preferred with the articular process view as there is no transverse process to walk off and the needle may be placed in the vicinity of the lumbar nerve root.

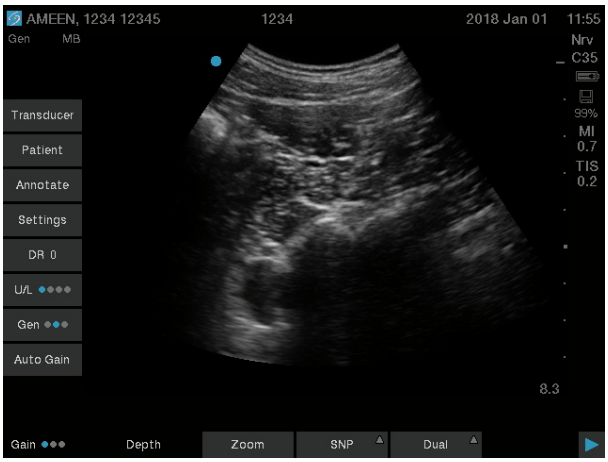


Figure 5

(Articular Process View)

D. Once you are close to the plexus, PNS should be turned on with 1 mA current. Once you get the desired response at 0.5 mA, inject LA after careful aspiration.

Figure 6

(Placement of Curved Transducer in the Flank)

Figure 7

(Needle Placement In Plane with Ultrasound Beam)

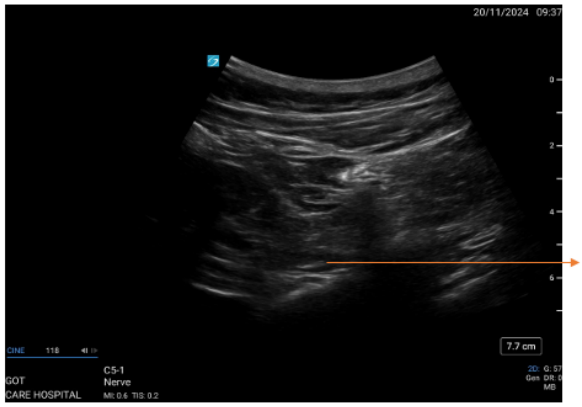


Figure 8

(1. Lumbar Nerve Root surrounded by Hypoechoic Local Anaesthetic)

Complications

1. Bleeding and Haematoma Formation

   - Risk increases in patients with coagulopathy or on anticoagulants. The deep nature of the lumbar plexus block (LPB)

makes controlling bleeding challenging.

2. Infection
   - Though rare, infections can occur due to poor aseptic techniques.
3. Neurological Injury
   - Direct needle trauma to nerves or intraneural injection may cause nerve damage. Ischemia due to vascular compromise is another concern.
4. Local Anaesthetic Systemic Toxicity (LAST)
   - Unintentional intravascular injection or excessive dosage can lead to LAST.
5. Haematoma or Retroperitoneal Haemorrhage
   - Accidental vascular puncture of large vessels like the iliolumbar artery can lead to bleeding in the retroperitoneal space.
6. Psoas Muscle Abscess
   - Rare but serious, associated with prolonged catheter use.
7. Quadriceps Weakness and Falls
   - Due to involvement of the femoral nerve, patients may experience difficulty ambulating post-procedure.
8. Inadvertent Epidural or Subarachnoid Injection
   - It is the most feared complication of LPB. It can cause unintended effects like hypotension, bradycardia, or total spinal anaesthesia which can lead to cardiac arrest.

Contraindications

1. *Absolute*
   - Patient refusal
   - Local infection at the needle insertion site
   - Known allergy to local anaesthetics
   - Coagulopathy or anticoagulant therapy (relative depending on severity)
   - Severe hypovolemia

2. *Relative*
   - Previous surgery altering local anatomy
   - Inexperienced operator in high-risk cases.

Why Dual Guidance Is Better ?

Dual guidance combines **ultrasound (USG)** and **peripheral nerve stimulator (PNS)** for greater precision and safety.

1. Enhanced Visualisation with Ultrasound
   - Real-time visualisation of anatomical structures (e.g., lumbar transverse processes, psoas muscle, and nerves).
   - Ability to avoid critical structures like blood vessels and kidneys.
2. Functional Confirmation with PNS
   - Provides confirmation of proximity to the nerve by observing muscle contractions.
   - Reduces reliance on visual landmarks, useful in cases of distorted anatomy.
3. Minimize Risks
   - USG reduces the likelihood of vascular puncture and intraneural injection.
   - PNS helps verify correct needle positioning even if sonographic imaging is suboptimal.
4. Optimised Local Anaesthetic Spread
   - USG ensures proper deposition around the lumbar plexus.
   - PNS ensures functional engagement of the desired nerves.
5. Reduced Need for Higher Volumes of Local Anaesthetic
   - Dual confirmation allows for a more targeted block, reducing the required dose and minimizing systemic toxicity risks.
6. Higher Success Rates
   - Combining anatomical visualisation and functional confirmation improves block success, especially in complex cases.

By using dual guidance, you combine the advantages of both techniques to achieve a safer, more effective lumbar plexus block.

CONCLUSION:

The lumbar plexus block is an **advanced block** that should be performed with caution due to the potential for epidural spread, subcapsular renal puncture, retroperitoneal haematoma, LAST and plexopathy. Owing to the deep location of the plexus, it is

contraindicated in patients on antiplatelet drugs, and guidelines pertaining to cessation of these drugs for performance of neuraxial block apply to the lumbar plexus block as well. Yet, in elderly, frail and sick patients with hip fractures, when performed along with sacral plexus block, it is a viable option for the provision of surgical anaesthesia with minimal haemodynamic fluctuations.

TIPS AND TRICKS

1. Shamrock approach offers the best visibility and is technical easier to perform than other approaches.

2. Always aspirate for CSF and blood before injection of LA. CSF egress is slow so an attempt should be made to keep the hub of the injection port open to atmosphere.

3. Always use colour doppler to identify position of lumbar arteries.

4. Too medial an injection is to be avoided so as to reduce incidence of epidural injection.

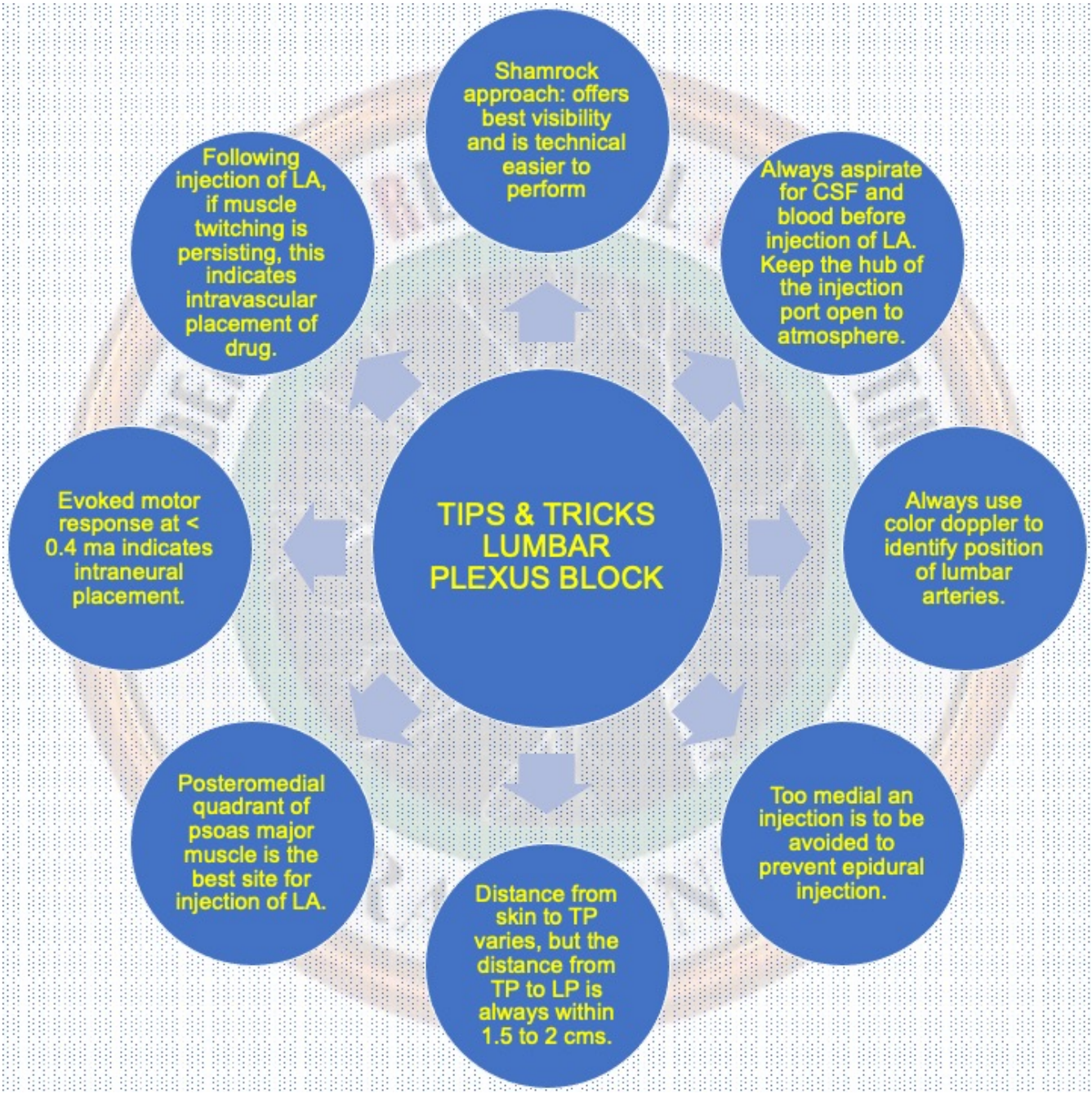
5. Distance from skin to TP varies with body habitus, but the distance from TP to LP is always within 1.5 to 2 cm.

6. Posteromedial quadrant of psoas major muscle is the best site for injection of LA.

7. Evoked motor response at <0.4 ma indicates intraneural placement.

8. Following injection of LA, if muscle twitching is persisting, this indicates intravascular needle tip.

INFOGRAPHICS : TIPS & TRICKS - LPB



DISCLAIMER: Images shown in this article is on a volunteer. Strict aseptic precautions are a must while performing blocks on patients.

References

1 Chayen D, Nathan H, Chayen M. The psoas compartment block. Anesthesiology. 1976 Jul;45(1):95-9.

2. Kirchmair L, Entner T, Wissel J, Moriggl B, Kapral S, Mitterschiffthaler G. A study of the paravertebral anatomy for ultrasound-guided posterior lumbar plexus block. Anesth Analg. 2001 Aug;93(2):477-81.

3. Capdevila X, Macaire P, Dadure C, Choquet O, Biboulet P, Ryckwaert Y, D'Athis F. Continuous psoas compartment block for postoperative analgesia after total hip arthroplasty: new landmarks, technical guidelines, and clinical evaluation. Anesth Analg. 2002 Jun;94(6):1606-13.

4. Gadsden JC, Lindenmuth DM, Hadzic A, Xu D, Somasundarum L, Flisinski KA. Lumbar plexus block using high-pressure injection leads to contralateral and epidural spread. Anesthesiology. 2008 Oct;109(4):683-8.

5. Lumbar paravertebral sonography and considerations for ultrasound-guided lumbar plexus block. Manoj K Karmakar; Hadzic's Textbook of Regional Anesthesia and Acute Pain Management, Second Edition: Chapter 39, 721-39

Dr. T.V.S.Gopal
Clinical Director
Anaesthesiology, Surgical Intensive Care & Acute Pain Management
Care Hospitals, Hyderabad
Managing Director,
Axon Anaesthesia Associates Pvt. Ltd.

LUMBAR PLEXUS BLOCK IN PAEDIATRIC PATIENTS

Dr. Vrushali Ponde

"A day where you witness at least one baby's smile is always a day well spent." – Unknown.

Introduction :

Regional anaesthesia is one of the most effective tools for managing peri-operative pain in paediatric patients. This is well-supported by both literature and everyday clinical practice. A plethora of techniques are available, ranging from entry-level, simple procedures to more complex blocks.

The lumbar plexus block, also known as the psoas compartment block, is one of the more advanced techniques. This write-up explores the block in detail.

This block was described by Winnie in 1974. This was followed by contributions from Dalens et al, in the year 1988 on its application in children[VP1] [1]. Over the decades, the block has evolved significantly with the advent of better equipment and ultrasound guidance.

However, due to the advanced nature of this block and the availability of simpler alternatives such as the fascia iliaca compartment block (FICB) and supra-inguinal fascia iliaca block (SIFI), it is not performed as frequently.

Indications

The lumbar plexus (LP) block is effective for providing pain relief during surgeries involving the hip, proximal femur, and anterior thigh.

It can be combined with a sciatic nerve block to achieve complete analgesia for one side of the lower limb.

Note:

The posterior capsule of the hip is supplied by the sciatic nerve.

The obturator nerve is not covered in approximately 10% of cases, further limiting its suitability as a stand-alone anaesthetic approach.

Anatomy

The lumbar plexus originates from the ventral rami of the L1–L4 nerve roots. It also receives a variable contribution from T12 and L5. These roots and their branches are positioned within a potential space embedded in the substance of the psoas major muscle, known as the psoas compartment. The iliohypogastric, ilioinguinal, and genitofemoral nerves are the most superior branches, providing sensory innervation to the inguinal region. They emerge from the ventral rami of T12–L1, L1, and L1–L2, respectively. Consequently, performing a posterior lumbar plexus block at the L4–L5 level is likely to result in an incomplete or absent block of these nerves.

Anatomy to avoid complication: Apart from above, it is important to understand the surrounding structures. Once we understand these, we can contemplate and avoid complications. These are as follows. The psoas muscle lies in front of the transverse processes of the lumbar vertebrae. The erector spinae muscle group is positioned behind and towards the center, while the quadratus lumborum muscle is situated to the side of the psoas muscle. The kidney is located in front of and to the side of the psoas muscle, typically at the L2-L3 level, though in young children, infants, or individuals with pronounced thoracolumbar spinal curvature, it may be found lower, around the L4-L5 level. The dorsal branch of the lumbar artery runs between the psoas muscle and the transverse process, while the psoas compartment contains a network of arteries. Hence the possibility of damage to the kidney and intravascular injection of LA is a real concern.

Technique

LPB can be performed with landmarks or PNS or USG approach. However, it is best to perform with dual modality. The USG guides the needle puncture point and trajectory, and the end motor response of PNS dictates the injection point [2].

In children, it is always given along with general anaesthesia. (any block for that matter, is given under general anaesthesia). If dual modality is used, which is usually

the case for this block, we do not administer muscle relaxants.

Patient position: Lateral decubitus with the side to be blocked uppermost.

Probe placement: ***Fig. 1***

Figure 1: The prove and the needle placement for lumbar plexus block. Note that the orientation marker is towards the posterior of the patient.

Position of the probe. Linear high frequency probe is used in small children. A Curvilinear low frequency probe is used in adolescents. The orientation marker is towards the posterior of the patient as shown in **Figure 1**

Needle insertion: In-plane as shown in Figure 1

Ultrasound scan

This scan is explained in Figure 2.

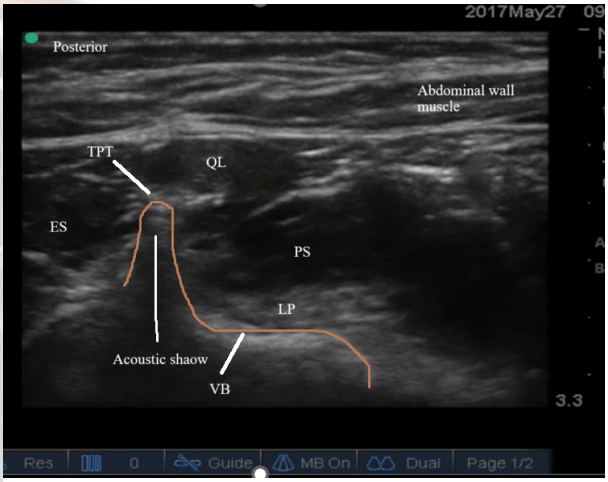


Figure 2. Scan of a 10 Kg child.

TPT: Tip of the transverse process

QL: Quadratus Lumborum

PS: Psoas Muscle

LP: Lumbar Plexus

ES: Erector spinae

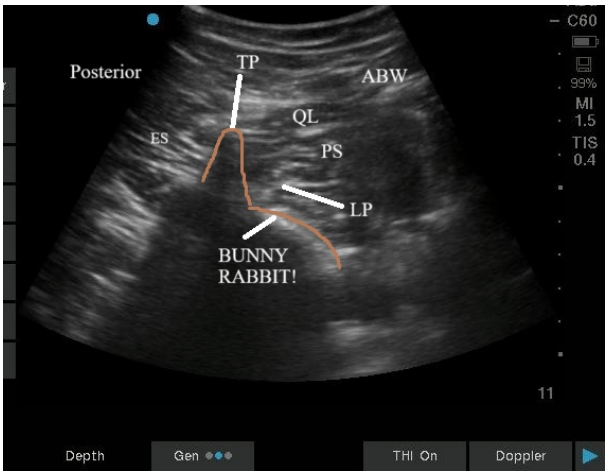


Figure 3. Scan of a 15 yrs, 70 kg child.

TPT: Tip of the transverse process

QL: Quadratus Lumborum

PS: Psoas Muscle

LP: Lumbar Plexus

ES: Erector spinae

We observe a distinct difference between the scans of smaller children and those of grown adolescents. The latter closely resemble adult anatomy.

Table 1 reports these differences vividly.

The needle is carefully positioned near the lumbar plexus, and nerve stimulation is initiated at a current of 1 mA, gradually reduced to 0.5 mA. Quadriceps contractions are confirmed at a current strength below 0.5 mA and should disappear at 0.3 mA. In younger children, due to the suppleness of their tissues and fascial planes, an adequate motor response at 0.5 mA is considered acceptable to minimise the need for multiple needle passes.

Local Anaesthetic

Dose: Adjusted to the child's weight and age to avoid toxicity.

Commonly used drugs: Ropivacaine 0.2-0.25% or Bupivacaine 0.25%.

Volume: Typically 0.5-0.75 mL/kg for adequate spread.

Advantages

- Effective analgesia for lower limb surgeries
- Reduces systemic opioid requirements
- Prolonged postoperative pain relief

Table 1

Aspect	***Smaller Children***	***Adolescents and Adults***
Depth of Lumbar Plexus	More superficial; shallower depth.	Deeper; varies more significantly with weight.
Ultrasound Frequency	Higher frequencies can be used, allowing for better image resolution.	Lower frequencies are often needed due to greater tissue depth.
Tissue Penetration	Less sonographic tissue penetration is required.	Greater sonographic tissue penetration is required.
Fibrous Structures in Psoas	Fewer fibrous structures in the psoas muscle.	More fibrous structures in the psoas muscle.
Tissue Contrast	Greater contrast between hypoechoic muscle and hyperechoic neural structures.	Reduced contrast, making neural structures harder to distinguish.
Visibility of Neural Structures	Lumbar plexus nerves are more easily visualized.	Visualization of nerves is more challenging.

Table 1: This table highlights the key differences between smaller children and adolescents and adults

Table 2

Aspect	***Advantages of Unilateral Lumbar Plexus Block (LP Block)***	***Comparison to Central-Neuraxial Blockade or Caudal Block***
Sympathectomy	Unilateral sympathectomy reduces risk of intraoperative haemodynamic instability.	Central-neuraxial blockade may cause bilateral sympathectomy and greater haemodynamic instability.
Motor and Sensory Preservation	Motor and sensory function of the opposite lower limb is preserved.	Central-neuraxial blockade affects motor and sensory function in both lower limbs.
Duration of Analgesia	Provides longer duration of analgesia compared to single-injection caudal block.	Single-injection caudal block offers shorter analgesic duration.
Opioid Requirements	Reduces postoperative opioid requirements.	Single-injection caudal block may require higher opioid use for pain control.
Urinary Retention	Does not cause urinary retention; urinary catheterisation is not required.	Central-neuraxial blockade often causes urinary retention, necessitating catheterisation.
Postoperative Mobilisation	Allows earlier postoperative mobilisation.	Central-neuraxial blockade may delay mobilisation.

Table 2 . Reports the advantages of unilateral lumbar plexus block and its comparison to central neuraxial block.

Challenges in Pediatrics

- Smaller anatomical structures require precise needle placement.
- Risk of complications (e.g., haematoma, nerve injury) is higher if anatomical variations are present.
- Requires experienced hands, especially in neonates and infants.

Complications

- Local anaesthetic systemic toxicity (LAST)
- Haematoma due to vascular puncture
- Infection
- Nerve injury

Combining the lumbar plexus block with other regional techniques, like the sciatic nerve block, can provide comprehensive analgesia for surgeries involving the entire lower limb. However, meticulous technique and adherence to safety protocols are essential for achieving the best outcomes in paediatric patients.

Summary

The lumbar plexus originates from the anterior rami of the L1 to L4 lumbar nerve roots, with potential contributions from T12 and L5. It provides innervation to the hip joint, the anterior and medial compartments of the thigh, and the femur.

The lumbar plexus block is an effective technique for providing analgesia during surgeries involving the hip, proximal femur, and anterior thigh. When combined with a sciatic nerve block, it can achieve complete unilateral lower limb analgesia.

This block is performed within the psoas muscle, a non-compressible area, making it a ‘deep’ peripheral nerve block. Due to the risk of haemorrhage associated with accidental vascular or renal puncture, it is contraindicated in patients with coagulation disorders.

Ultrasound guidance is invaluable in identifying critical anatomical landmarks such as the transverse process, psoas muscle, and surrounding blood vessels for accurate block placement. However, as the lumbar plexus nerves can be challenging to visualise, a combined

approach using ultrasound and peripheral nerve stimulation is often recommended to minimise the risk of nerve injury.

The lumbar plexus block requires advanced regional anaesthesia and ultrasound expertise due to the complexity of the sono-anatomy, the deep location of the plexus, and the potential complications, including hematoma or epidural spread.

The deep positioning of the lumbar plexus also allows for the secure placement of a catheter. Continuous infusion through the catheter extends the duration of analgesia, making this technique highly beneficial in certain clinical scenarios.

References :

1. Dalens B, Tanguy A, Vanneuville G. Lumbar plexus block in children: a comparison of two procedures in 50 patients. Anesth Analg. 1988 Aug;67(8):750-8.
2. Boretsky K, Hernandez MA, Eastburn E, Sullivan C. Ultrasound-guided lumbar plexus block in children and adolescents using a transverse lumbar paravertebral sonogram: Initial experience. Paediatr Anaesth. 2018 Mar;28(3):291-5.

Dr Vrushali Ponde

Founder Director,
Children Anaesthesia Services,
Mumbai.

POCUS: Transforming Anaesthesiologist to Peri-operative Physician

Dr Harshal Wagh, Dr Rujuta Mayi

Introduction:

The landscape of anaesthesia has changed dramatically over the last decade and continues to evolve at a rapid pace. The integration of new technologies into clinical practice has transformed the way we approach patient care, offering more accurate and timely decision-making tools that enhance patient safety and improve outcomes. One such innovation that has rapidly gained traction in anaesthesiology is Point-of-Care Ultrasound (POCUS).

POCUS, a bedside utilisation of ultrasound imaging information to guide appropriate diagnoses, medical interventions, and acute procedures is considered to be “the stethoscope of the twenty-first century.” It is meant not only for emergency physicians, intensive care doctors or cardiologists any longer but is rapidly becoming a cornerstone of anaesthesia practice.

The I-AIM (Indication, Acquisition, Interpretation, Medical Decision) framework described by *Bahner et al.* delineates POCUS to be a goal-directed application compared to a comprehensive ultrasound exam. As anaesthesiologists, we are often at the forefront of managing complex patients in dynamic, high-pressure environments. From preoperative assessment, intra-operative monitoring to postoperative care, POCUS can expand our skillset and significantly enhance our decision-making ability and ultimately help improve patient outcomes.

We will delve into the reasons why all anaesthesiologists should learn and incorporate POCUS into their clinical practice. We will explore how POCUS is transforming the role of anaesthesiologists and why its proficiency is becoming essential for delivering the best possible care to our patients. Whether you are looking to add new skills to your clinical toolbox or seeking to understand why POCUS is becoming the standard of care, this guide will provide you with comprehensive insights into its practical and clinical benefits.

Role of POCUS in Enhanced Preoperative Assessment

The preoperative assessment is the foundation of anaesthesiology care, where decisions are made regarding the anaesthetic plan based on the patient's medical history, clinical findings, and risk factors. Traditionally, this assessment has relied heavily on physical examination, laboratory tests, and sometimes imaging studies. As anaesthesiologists, we are tasked with making rapid decisions based on sometimes incomplete, unclear information or facts that may have changed over time. However, POCUS offers an opportunity for more precise, real-time and dynamic evaluations, providing immediate and accurate insights that can improve our assessment and decision-making process.

1) Airway Assessment:

POCUS has added a new dimension to airway management by allowing for real-time imaging of airway anatomy. This is especially important for patients with known or suspected difficult airway, obesity or a previous history of head and neck surgery.

POCUS in Airway Assessment and management:

- **Airway Anatomy**: Ultrasound can help visualise the structure of the upper airway, including the vocal cords, epiglottis, and surrounding tissues. This can provide useful information when considering the best method of intubation.
- **Prediction of Difficult Intubation**: the measurement of anterior neck has shown that the distance from skin to hyoid bone is highly predictive of difficult mask ventilation and intubation.
- **Front of neck airway**: Identification of the cricothyroid membrane is more accurate than palpation alone and can prove time saving and lifesaving in emergencies.
- Confirmation of endotracheal intubation
- Ultrasound guided nerve blocks for airway anaesthetisation (glossopharyngeal and superior laryngeal nerve blocks)
- **Assessment of neck for pathologies:** Identification of Zenker diverticulum or aberrant vertebral artery before performing a stellate ganglion block can avoid potential complications.

2) *Cardiovascular Assessment*

Many patients present with unknown or poorly controlled conditions such as heart failure, valvular disease, or undiagnosed hypertension. Traditional diagnostic tools, like echocardiography or invasive hemodynamic monitoring, are not always readily available or feasible during the preoperative evaluation. POCUS offers a solution by enabling anaesthesiologists to perform a rapid and focused assessment of the heart.

- **Left ventricular function**: Ultrasound can quickly assess left ventricular function to identify signs of systolic or diastolic dysfunction. An impaired ejection fraction may suggest the need for more cautious fluid management or the use of specific anaesthetic agents that reduce myocardial depression.
- **Valvular disease**: POCUS can also help detect significant valvular lesions (such as mitral regurgitation or aortic stenosis) that may affect peri-operative management. Early identification of such conditions allows for proactive management strategies and potential referral for further investigation.
- **Pulmonary pressures**: Right heart dysfunction and elevated pulmonary pressures are significant concerns in patients with known pulmonary hypertension, chronic obstructive pulmonary disease (COPD), or interstitial lung disease (ILD). POCUS can provide a preliminary assessment of the right heart and help us identify signs of right ventricular strain, allowing for more appropriate anaesthetic planning.

3) *Lung Assessment*

POCUS offers a non-invasive method to visualise the lungs, thus improving the accuracy of our assessments. It can be used to assess an acute or critically ill patient with respiratory distress or an extension to physical examination.

- **Pneumothorax**: For patients with trauma, lung disease, or those undergoing thoracic surgery, the risk of pneumothorax is a significant concern. POCUS allows us to visualise the pleura and detect signs of pneumothorax early, leading to prompt intervention.

- **Pleural effusion**: POCUS can help differentiate pleural effusion from lung consolidation, which is not always possible with a chest radiograph.
- **Assessment of diaphragmatic function**: POCUS can be used to look for pre/post block diaphragmatic function, monitor the return of diaphragmatic function and differentiate between block complication and another cause of respiratory insufficiency. Diaphragmatic thickness assessment by ultrasound can be a surrogate marker to aid decision making with respect to extubation in intubated patients in the ICU.

4) Gastric assessment:

Gastric POCUS gives us a fair idea of stomach contents as they relate to aspiration risk. It is useful when there is clinical uncertainty regarding the status of "nil by mouth" and stomach contents, I.e., liquid or solid.

5) e-FAST:

Indications are:

- Ongoing assessment of trauma patients.
- Critical patients recovering post-operatively.
- Hip arthroscopy patients with severe post-op pain or showing signs of haemodynamic instability.
- Patients with ascites.
- Patients with peritoneal dialysis.
- Patients following any abdominal surgery.

Having this real-time data allows anaesthesiologists to make more informed decisions, optimising both the anaesthetic plan and the patient's - management.

II. Intra-operative Decision-Making

Anaesthesia care during surgery is dynamic, requiring constant monitoring of the patient's physiological status, making rapid decisions based on subtle changes. Intra-operative complications such as hypotension, arrhythmias, or inadequate ventilation can emerge suddenly and may be difficult to detect with traditional monitoring. POCUS enables anaesthesiologists to perform focused assessments during surgery, allowing for more precise interventions.

1) Fluid Management and Volume Status

One of the most crucial aspects of anaesthesia care is managing a patient's volume status—ensuring they are neither over- nor under-resuscitated. Traditional methods of assessing fluid status, such as measuring blood pressure or central venous pressure (CVP), can be imprecise and often fail to provide a clear picture of a patient's actual volume status. POCUS, particularly through assessment of the inferior vena cava (IVC), offers a more accurate, real-time evaluation. The **VEXUS** score is designed to assess the presence and degree of venous congestion or fluid overload, which is often associated with poor outcomes in critically ill or surgical patients. The primary components of the VEXUS score include:

1. **Inferior Vena Cava (IVC) Collapsibility:**

- The IVC diameter and its collapse with respiration are used to assess central venous pressure (CVP). A lack of IVC collapse during inspiration suggests increased venous pressure and may indicate fluid overload or right heart dysfunction.

2. **Renal Venous Flow:**

- The Doppler pattern of renal veins is assessed for signs of venous congestion. In fluid overload or cardiogenic shock, there may be reversed renal venous flow or decreased renal venous return, suggesting kidney congestion.

3. **Hepatic Vein Doppler Flow:**

- Doppler flow patterns in the hepatic veins are also assessed. A reversed flow pattern in the hepatic veins can suggest congestion due to high central venous pressures, which may occur in conditions like heart failure or fluid overload.

4. **Jugular Venous Pressure (JVP):**

- Although not always included in all VEXUS protocols, JVP can provide additional information on fluid status. Elevated JVP suggests increased right atrial pressure, which can correlate with systemic venous congestion.

These ultrasound measurements are combined into a VEXUS score that indicates the degree of venous congestion. A higher score suggests a higher degree of congestion,

which may indicate fluid overload or impaired cardiac function.

- **IVC assessment**: The diameter and collapsibility of the IVC during respiration can provide valuable information regarding a patient's circulating volume. A small, non-collapsing IVC suggests hypovolemia, while a distended IVC that does not collapse suggests volume overload or fluid retention.
- **Cardiac output**: In critically ill or high-risk patients, POCUS can be used to assess cardiac output and determine whether a decrease in cardiac function is contributing to hypotension or inadequate tissue perfusion.

2) Hemodynamic Monitoring

For patients undergoing major surgery or those with complex comorbidities, real-time haemodynamic monitoring is vital. Invasive techniques such as pulmonary artery catheters or continuous cardiac output monitoring may not always be available, particularly in resource-limited settings. POCUS, with its ability to visualise cardiac function and flow, can be used to monitor haemodynamic changes during surgery, guiding interventions such as fluid resuscitation, or vasoactive drug administration.

3) Intracranial pressure monitoring:

- **Transcranial Doppler (TCD) ultrasound** is a non-invasive tool used to assess cerebral haemodynamics, including blood flow velocities in the intracranial vessels. It is particularly valuable in peri-operative patient management, allowing anaesthesiologists to monitor and optimise brain perfusion, prevent cerebral complications, and guide interventions in real-time.
- **The optic nerve sheath diameter (ONSD):**

It has gained attention as a potential non-invasive biomarker in the peri-operative setting. The diameter of the optic nerve sheath, which surrounds the optic nerve, is influenced by intracranial pressure (ICP). Since the optic nerve sheath is an extension of the dura mater, changes in ICP are transmitted to it, making the ONSD a useful surrogate for monitoring ICP. It

helps in the early detection of elevated ICP, guiding fluid management, and ensuring optimal care for patients undergoing surgery, particularly those with neurological concerns.

III. Post-operative Monitoring and Complication Detection

The role of the anaesthesiologist does not end when the patient is transferred from the operating room to the recovery room. The postoperative period is when complications can arise, and early identification of issues can significantly impact patient outcomes. POCUS is increasingly being used for ongoing monitoring after surgery, particularly in critically ill or high-risk patients.

1) Assessing Fluid Balance

POCUS allows anaesthesiologists to rapidly assess a patient's fluid status by measuring IVC collapsibility and checking for signs of pulmonary oedema, helping to guide fluid management and prevent common postoperative complications.

2) Detecting Postoperative Complications

After surgery, patients are at risk for a variety of complications, including pleural effusion, pneumonia, atelectasis, deep vein thrombosis (DVT) and pulmonary embolism. POCUS allows for early detection of these issues before they become clinically apparent.

- **DVT**: Postoperative DVT is a common complication, especially in orthopaedic, abdominal, or thoracic surgeries. POCUS allows for the immediate evaluation of the deep veins in the legs, enabling quick diagnosis and appropriate anticoagulation therapy if needed.

IV. Improved Patient Safety

POCUS significantly enhances patient safety throughout the peri-operative period by enabling anaesthesiologists to detect issues early, assess critical parameters in real time, and guide management strategies with precision. The ability to visualise internal structures and monitor physiological changes in real time empowers

anaesthesiologists to take corrective actions before problems become life-threatening.

For instance, ultrasound can help prevent complications related to invasive procedures, such as accidental arterial puncture during central venous catheter placement or nerve injury during regional anaesthesia. Additionally, monitoring cardiac function, fluid status, and pulmonary pressures can help prevent postoperative complications like heart failure, pulmonary oedema or hypotension.

Why should Anaesthetists learn POCUS?

Professional Development:

- Proficiency in POCUS enhances an anaesthesiologist's skillset, making them more versatile and valuable within multidisciplinary teams.
- Medical education programs are increasingly incorporating ultrasound into their curriculum, and hospitals are investing in portable ultrasound machines to enable point-of-care imaging.
- Learning POCUS not only enhances an anaesthesiologist's clinical capabilities but also aligns with broader trends in medicine toward real-time, bedside diagnostics.
- By embracing ultrasound, technology will keep anaesthesiologists at the forefront of clinical practice and improve the quality of care we provide to our patients and **it will help transforming anaesthesiologists to peri-operative physician.**

Conclusion

The adoption of POCUS in anaesthesiology represents a significant opportunity for improving patient outcomes, enhancing safety, and refining our clinical decision-making processes. By learning POCUS, anaesthesiologists gain a valuable tool for assessing patients before, during, and after surgery, and for performing more accurate, safer procedures. As this technology becomes more widespread and its benefits more apparent, mastering POCUS will become an essential component of modern anaesthesia practice.

We should explore training opportunities, familiarise ourselves with the basic principles of POCUS, and consider how this powerful tool

can enhance patient care. The future of anaesthesiology is dynamic and exciting, and POCUS is a key part of that future.

References

1. Buczowski S, Gaus J, Rehder K. Point-of-care ultrasound in anaesthesiology: a new era of clinical practice. Anaesth Intensive Care. 2023;51(1):32-8.

2. Kraemer M, Schürmann R. Venous excess ultrasound (VEXUS) in critically ill patients: A new tool for assessing venous congestion. J Clin Monit Comput. 2022;36(5):1021-30.

3. Raimondi F, Peccerillo M. Ultrasonography of the optic nerve sheath diameter for the assessment of intracranial pressure in perioperative anaesthesia. Curr Opin Anaesthesiol. 2023;36(6):855-60.

4. Ali M, Patel M. Transcranial Doppler ultrasound in perioperative anaesthesia: A review of its applications and clinical relevance. Anaesthesia. 2022;77(3):348-56.

5. Kimmell J, Mullen J. Intraoperative use of point-of-care ultrasound for fluid management: A systematic review. J Clin Anesth. 2022;75:110420.

6. Gottfried J, Sharma S. Ultrasound assessment of lung pathology: New perspectives in the perioperative setting. Br J Anaesth. 2023;131(2):280-9.

7. Roberts S, Brown P. The role of gastric ultrasound in the prevention of aspiration risk in anaesthesia. Eur J Anaesthesiol. 2022;39(8):531-7. Sharma V, Kumar A. Point-of-care ultrasound in cardiovascular assessment during anaesthesia: Techniques and clinical applications. J Cardiothorac Vasc Anesth. 2023;37(6):1327-34.

Dr Harshal Wagh

Consultant, Dept of Anaesthesia

Kokilaben Ambani Hospital,Mumbai

Dr Rutuja Mayee

Clinical Associate

Kokilaben Ambani Hospital,Mumbai

QUIZ

Dr Divesh Arora, Dr Gaurav Agrawal

1. Which of the following is TRUE regarding the anatomical relationship of the lumbar plexus?

A) The femoral nerve lies posterior to the iliac vessels as it exits the pelvis.

B) The ilioinguinal and iliohypogastric nerves originate from L2–L3 and course deep to the inguinal ligament.

C) The obturator nerve passes through the pelvic cavity before exiting via the obturator canal.

D) The lateral femoral cutaneous nerve emerges at the medial border of the psoas major muscle.

2. Which feature distinguishes the posterior division of the lumbar plexus from its anterior division?

A) The posterior division primarily provides sensory innervation to the medial thigh.

B) The posterior division gives rise to the obturator nerve.

C) The posterior division contributes to the lateral femoral cutaneous nerve and femoral nerve.

D) The posterior division exclusively supplies motor innervation to pelvic muscles.

3. Which statement best describes the anatomical course of the genitofemoral nerve?

A) It exits through the obturator foramen and divides into genital and femoral branches.

B) It pierces the psoas major muscle and lies on its anterior surface.

C) It travels along the lateral border of the iliacus muscle to supply the inguinal ligament.

D) It originates from L3–L4 and supplies the skin over the medial thigh.

4. During an ultrasound-guided lumbar plexus block, what is the primary target for needle placement?

A) Medial 2/3rd of the psoas major muscle near the nerve roots.

B) Anterior 2/3rd and posterior 1/3rd of the psoas major muscle near the nerve roots.

C) Lateral edge of the psoas major muscle near the nerve roots.

D) Fascia iliaca compartment.

5. During an ultrasound-guided lumbar plexus block, the **"shamrock sign"** refers to the appearance of which anatomical structures?

A) Lumbar vertebral bodies and the psoas muscle.

B) Transverse process, psoas major, and quadratus lumborum muscle.

C) Erector spinae, iliopsoas, and multifidus muscle.

D) Transverse process, vertebral foramen, and spinous process.

6. During an ultrasound-guided lumbar plexus block, which of the following best describes the typical sonographic appearance of the transverse process at the L3 vertebral level?

A) A hyper echoic structure with a "trident" or "camel hump" appearance in cross-section.

B) A hypo echoic cylindrical structure surrounded by hyper-echoic fascial layers.

C) A hyper echoic flat line with an acoustic shadow posteriorly.

D) A hyper echoic elliptical structure anterior to the quadratus lumborum muscle.

7. Which statement best describes the dosing strategy of local anaesthetics for lumbar plexus blocks in children?

A) Based on the child's weight and maximum safe dose

B) Calculated using adult doses adjusted for age

C) Standardised by body surface area (BSA) across all ages

D) Independent of weight and based solely on plexus depth

8. Which complication is uniquely more likely in paediatric patients during lumbar plexus block than in adults?

A) Retroperitoneal haematoma

B) Persistent motor deficit

C) Subarachnoid injection due to dural sac extension

D) Intramuscular hematoma

9. During a PNS-guided lumbar plexus block, at what current intensity should motor responses ideally disappear, indicating optimal proximity to the nerve?

A) <0.2 mA

B) 0.2-0.5 mA

C) 0.5-1.0 mA

D) >1.0 mA

10. When performing a PNS-guided lumbar plexus block, stimulation of which nerve produces hip flexion?

A) Femoral nerve

B) Obturator nerve

C) Lateral femoral cutaneous nerve

D) Iliohypogastric nerve

11. Which of the following ultrasound parameters is most commonly used to assess gastric volume?

A) Measurement of the gastric wall thickness

B) Measurement of the antral cross-sectional area

C) Measurement of gastric pH levels

D) Measurement of the oesophageal sphincter pressure

12. What is the role of POCUS in assessing volume status in anaesthetised patients?

A) It helps determine the exact fluid balance by measuring urine output.

B) It provides real-time visualization of inferior vena cava (IVC) collapse or distention, which can suggest fluid responsiveness.

C) It measures the size of the left atrium to estimate preload status.

D) It monitors changes in blood pressure during fluid administration.

13. Which of the following is a key advantage of using ultrasound for assessing the airway in morbidly obese patients?

A) It allows for direct visualization of the vocal cords during intubation.

B) It can help visualise the trachea and surrounding structures, providing valuable information despite limited neck mobility or visibility.

C) It can measure the exact depth of the endotracheal tube insertion.

D) It is a faster and more efficient technique than CT scans or fluoroscopy for airway assessment.

14. When performing an ultrasound-guided nerve block using the in-plane approach, which maneuver is most crucial for ensuring accurate needle placement?

A) Keeping the needle parallel to the probe to visualise the entire needle shaft.

B) Inserting the needle perpendicular to the skin to maximise tissue penetration.

C) Using a curvilinear probe to improve depth visualisation.

D) Steadying the probe with the non-dominant hand while inserting the needle with the dominant hand.

15. When performing an ultrasound-guided nerve block, what is the role of acoustic shadowing, and how does it affect the image quality?

A) Acoustic shadowing occurs when sound waves are completely absorbed by dense tissues, creating a dark area on the ultrasound image that can obscure underlying structures.

B) Acoustic shadowing enhances the visualisation of surrounding tissues, improving nerve localisation.

C) Acoustic shadowing improves the visibility of vascular structures beneath the nerve.

D) Acoustic shadowing is caused by the reflection of sound waves from the nerve, providing clearer images of the nerve's surface.

16. When performing an ultrasound-guided block, how does increasing the gain affect the image quality, and when should it be used?

A) Increasing the gain brightens the entire image, making it easier to identify nerves, but it also may amplify background noise.

B) Increasing the gain improves the penetration of sound waves and is useful for imaging deep structures.

C) Increasing the gain enhances the resolution of superficial structures, but it should be avoided when imaging deep nerves.

D) Increasing the gain only improves the quality of the color Doppler image, not the gray-scale imaging.

17. When performing an ultrasound-guided nerve block, what is the ideal needle insertion technique for ensuring that the needle tip remains in the same plane as the target nerve (in-plane approach)?

A) Insert the needle at a 45° angle to the skin, ensuring the needle tip is perpendicular to the ultrasound beam.

B) Insert the needle at a 90° angle to the skin, keeping the needle parallel to the ultrasound probe.

C) Insert the needle at a 30° angle to the skin, ensuring the needle is oriented perpendicular to the nerve.

D) Insert the needle obliquely at a 45° angle to the ultrasound probe to improve needle visibility.

18. What is the primary benefit of using a hydro dissection technique during an ultrasound-guided nerve block?

A) It allows for a larger volume of anaesthetic to be injected around the nerve.

B) It helps to separate the nerve from surrounding tissues, improving needle visibility and safety.

C) It enhances the speed of the needle insertion, reducing procedure time.

D) It increases the needle's visibility in deeper structures, making it easier to reach target nerves.

19. In the context of peripheral nerve stimulation for regional anaesthesia, which of the following statements best explains the relationship between rheobase and chronaxie?

A) The rheobase and chronaxie are independent of one another and do not influence each other during nerve stimulation.

B) Rheobase and chronaxie are inversely related—lower rheobase values correlate with higher chronaxie values.

C) The rheobase is used to define the optimal current for stimulation, while the chronaxie is used to define the optimal pulse width for stimulation.

D) Rheobase and chronaxie are both inversely related to nerve depth, with deeper nerves requiring lower values of both.

20. In the context of peripheral nerve stimulators, what does the "current threshold" (mA) represent during the nerve localisation process?

A) The minimum current needed to generate a sensory response in the target nerve.

B) The current required to produce an observable muscle twitch in a specific muscle group.

C) The current intensity that results in the maximum duration of nerve block.

D) The electrical current needed to reach the nerve's threshold for electrical conduction.

ANSWER KEY

Dr Divesh Arora, Dr Gaurav Agrawal

Question 1:

Answer: C) The obturator nerve passes through the pelvic cavity before exiting via the obturator canal.

Explanation: Obturator nerve formed by the fusion of anterior divisions of ventral rami of L2-L4 exits medial to psoas major muscle and passes through pelvic cavity and exits through obturator foramen to enter the thigh.

Question 2:

Answer: C) The posterior division contributes to the lateral femoral cutaneous nerve and femoral nerve.

Explanation: Anterior divisions give rise to genitofemoral and obturator nerve.

Question 3:

Answer: B) It pierces the psoas major muscle and lies on its anterior surface.

Explanation: Genitofemoral nerve originates from the anterior division of L1 and L2 nerve roots and is the only nerve of lumbar plexus which exits through the anterior surface of psoas major muscle.

Question 4:

Answer: B) Anterior 2/3rd and posterior 1/3rd of the psoas major muscle near the nerve roots.

Explanation: Formation of plexus takes place in the psoas compartment which is sandwiched between anterior 2/3rd and posterior 1/3rd of the psoas major muscle.

Question 5:

Answer: B) Transverse process, psoas major, and quadratus lumborum muscle.

Explanation: Shamrock sign or thumbs up sign represents the vertebral body, transverse process with the attachment of psoas major muscle anteriorly, quadratus muscle attached to tip of transverse

process and erector spinae group of muscles attached posteriorly.

Question 6:

Answer: C) A hyper echoic flat line with an acoustic shadow posteriorly.

Explanation: Whenever the ultrasound beam strikes a bony surface, the bone appears as a hyper echoic flat line with an acoustic dropout. Trident sign is seen in longitudinal probe orientation.

Question 7:

Answer: A) Based on the child's weight and maximum safe dose

Explanation: Local anaesthetic dosing in children is primarily based on weight to prevent toxicity, considering the maximum safe dose for the chosen anaesthetic.

Question 8:

Answer: C) Subarachnoid injection due to dural sac extension

Explanation: In paediatric patients, the dural sac and spinal cord extend lower (often to L3 or L4), increasing the risk of subarachnoid injection if the needle is advanced too deeply

Question 9:

Answer: B) 0.2-0.5 mA

Explanation: The ideal current intensity for effective nerve localisation during a PNS-guided block is between 0.2-0.5 mA. Responses at <0.2 mA may indicate intraneural placement.

Question 10:

Answer: A) Femoral nerve

Explanation: Stimulation of the femoral nerve during a lumbar plexus block can result in hip flexion and knee extension due to the mixed motor and sensory innervation of the femoral nerve.

Question 11:

Answer: B) Measurement of the antral cross-sectional area

Explanation: The **antral cross-sectional area** of the stomach is the most commonly used ultrasound parameter to assess **gastric volume**. By measuring the antrum, which is the lower part of the stomach, the cross-sectional area can be used to estimate the stomach's volume.

Question 12:

Answer: B) It provides real-time visualisation of inferior vena cava (IVC) collapse or distention, which can suggest fluid responsiveness.

Explanation: **POCUS** is often used to evaluate the **inferior vena cava (IVC)** during anaesthesia to assess **volume status**. **IVC distention** suggests fluid overload, while **IVC collapse** may indicate hypovolemia or responsiveness to fluid administration. This real-time imaging can guide fluid management in peri-operative patients.

Question 13:

Answer: B) It can help visualise the trachea and surrounding structures, providing valuable information despite limited neck mobility or visibility.

Explanation: **Ultrasound** is particularly beneficial in **morbidly obese** patients, where **neck mobility** and **external landmarks** may be difficult to palpate or identify due to excess adipose tissue. **Ultrasound** can help visualise the **trachea**, **thyroid cartilage**, **cricoid ring**, and **tracheal axis**, providing real-time information to guide airway management strategies.

Question 14:

Answer: A) Keeping the needle parallel to the probe to visualise the entire needle shaft.

Explanation: The **in-plane approach** requires keeping the needle parallel to the ultrasound probe to visualise the entire needle shaft and tip in the same imaging plane. This allows for precise control of the needle placement, minimising the risk of injury to surrounding structures and improving the accuracy of the block.

Question 15:

Answer: A) Acoustic shadowing occurs when sound waves are completely absorbed by dense tissues, creating a dark area on the ultrasound image that can obscure underlying structures.

Explanation: Acoustic shadowing occurs when sound waves encounter dense or highly reflective structures (such as bone or calcifications), which absorb or reflect most of the sound, leaving a dark shadow behind on the image. While this can be useful for identifying bone structures, it can obscure underlying soft tissues, including nerves. Careful probe placement and adjustment are

necessary to minimise acoustic shadowing when imaging nerves, especially in areas close to bone.

Question 16:

Answer: A) Increasing the gain brightens the entire image, making it easier to identify nerves, but it also may amplify background noise.

Explanation: Increasing the gain increases the overall brightness of the ultrasound image, which can help visualise nerves and other structures more clearly, especially in patients with higher body mass index (BMI) or when imaging superficial nerves. However, it can also amplify noise and artefacts, which may reduce image clarity if set too high. The gain should be adjusted to balance visibility and minimize noise.

Question 17:

Answer: D) Insert the needle obliquely at a 45° angle to the ultrasound probe to improve needle visibility.

Explanation: In the **in-plane approach**, the needle should be inserted at a 45° angle to the ultrasound probe. This orientation ensures that both the needle and the nerve are visualised in a single image, providing better control and reducing the risk of inadvertent injury to nearby structures.

Question 18:

Answer: B) It helps to separate the nerve from surrounding tissues, improving needle visibility and safety.

Explanation: **Hydro dissection** involves injecting a small amount of fluid (often saline) around the nerve, which helps to separate the nerve from surrounding tissues. This technique improves **needle visibility**, makes it easier to visualise the needle tip, and enhances the safety of the procedure by creating a clear space between the nerve and nearby structures (such as blood vessels or muscles).

Question 19:

Answer: C) The rheobase is used to define the optimal current for stimulation, while the chronaxie is used to define the optimal pulse width for stimulation.

Explanation: Rheobase and chronaxie are related but measure different aspects of nerve

excitability. Rheobase defines the minimum current intensity needed to generate a nerve response at long pulse widths, while chronaxie defines the pulse duration needed to elicit a nerve response when the current intensity is twice the rheobase. Together, they help determine the most effective parameters for nerve stimulation during a regional block.

Explanation: The "current threshold" refers to the minimum current that elicits a visible muscle twitch in the target muscle, which helps in confirming the proximity of the needle to the target nerve during the process of nerve localisation.

Question 20:

Answer: B) The current required to produce an observable muscle twitch in a specific muscle group.

Dr Divesh Arora,

H.O.D., Dept of Anaesthesia

Asian Institute Of Medical Sciences,

Faridabad. (Delhi NCR)

Dr Gaurav Agarwal,

Sr Consultant,

Dept Of Anaesthesia and Pain Management,

Care Hospital, Bhubaneshwar.

AORA EVENT CALENDER

AORA 2025

15th Annual Conference of The Academy of Regional Anaesthesia of India

Theme : Evolving Trends In Regional Anaesthesia

18th-21st September 2025 | Radisson Blu, Amritsar

WEBSITE IS LIVE

www.aoraindia2025.com

SEIZE THE OPPORTUNITY BEFORE IT'S GONE

Category	Early Bird Registration Till 31st January 2025
Pre Conference CME	₹ 3,500
AORA Member - Conference with Banquet	₹ 12,000
Non - AORA Member - Conference with Banquet	₹ 13,500
PG Students & Senior Residents& AORA Fellows	₹ 10,000
Accompanying Person	₹ 10,500
Workshop	₹ 3,500

*The above fee is inclusive of 18% GST.

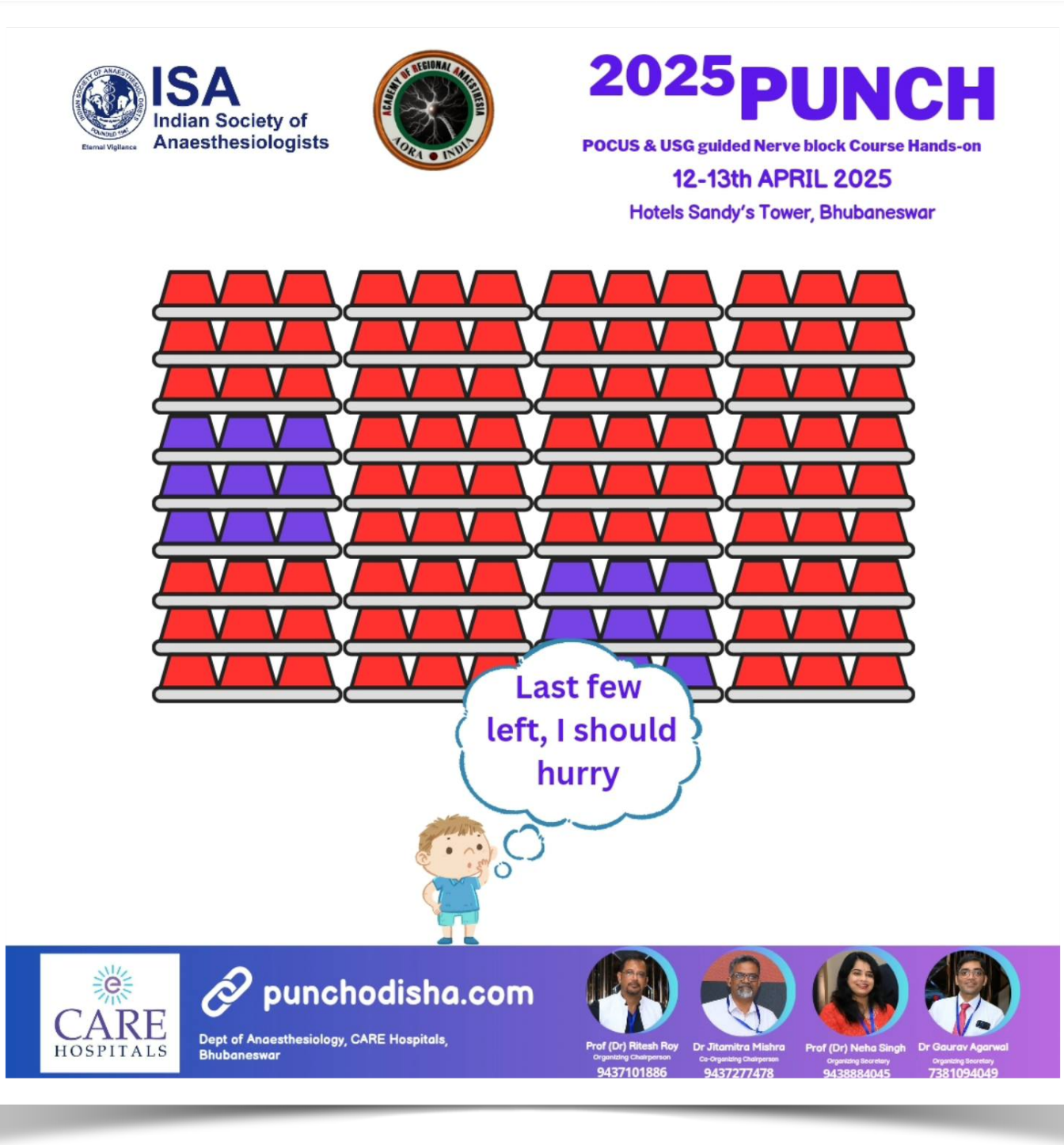
Scan me FOR ONLINE REGISTRATION

AORA 2025 Amritsar

Evolving Trends in Regional Anaesthesia

15th Annual Conference of The Academy of Regional Anaesthesia of India

Date : 18th - 21st September 2025 | Venue : Radisson Blu, Amritsar


ISA
Indian Society of Anaesthesiologists
Eternal Vigilance
ACADEMY OF REGIONAL ANAESTHESIA
AORA INDIA
2025 PUNCH
POCUS & USG guided Nerve block Course Hands-on
12-13th APRIL 2025
Hotels Sandy's Tower, Bhubaneswar
Last few left, I should hurry
CARE HOSPITALS
punchodisha.com
Dept of Anaesthesiology, CARE Hospitals, Bhubaneswar
Prof (Dr) Ritesh Roy
Organizing Chairperson
9437101886
Dr Jitamitra Mishra
Co-Organizing Chairperson
9437277478
Prof (Dr) Neha Singh
Organizing Secretary
9438884045
Dr Gaurav Agarwal
Organizing Secretary
7381094049

AORA 4 U - GSVM RA CME CUM WORKSHOP

FOCUS : PNS GUIDED BLOCKS SPECIALLY FOR RESOURCE LIMITED SETTINGS

Freeze the Pain not the moment

Key note speakers : *Renowned faculties of national and international repute*

Dr J Balavenkat Subramanian
President ISA National
Coimbatore

Dr Javed khan
Indore

Dr Hetal Vadera
Rajkot

Dr Santosh Sharma
Gorakhpur

Venue - Medicine Seminar Room
1st March 2025

Registration Fees - Rs. 4000/-

Limited Seats 100 Registrations only

Early bird Registration till .... 31st Dec. 2024

FOR REGISTRATION CONTACT
Dr Neha Mishra (8874311115), Dr Supreet (6387830539)
Department of Anaesthesia

Organized by
Department of Anaesthesia
GSVM Medical College, Kanpur

PATRON
Dr. Sanjay Kala
Principal & Dean
GSVM Medical College Kanpur

ORGANIZING CHAIRMAN
Dr. Apurva Agarwal
Professor & HOD Anesthesia
GSVM Medical College Kanpur

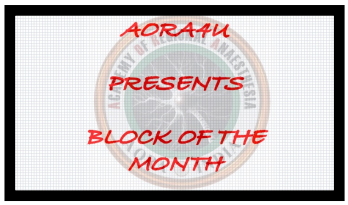
ORGANIZING SECRETARY

Dr. Neha Mishra
Assistant Professor
Department of Anaesthesia
GSVM Medical College Kanpur

Dr. Neetu Singh
Assistant Professor
Department of Anaesthesia
RAMA Medical College, Kanpur

SOCIAL MEDIA LINKS

Click on the images below and follow the social media platforms for regular updates



NOTES BY READERS

ACADEMY OF REGIONAL ANAESTHESIA
AORA INDIA