Issue: 14 | June 2024
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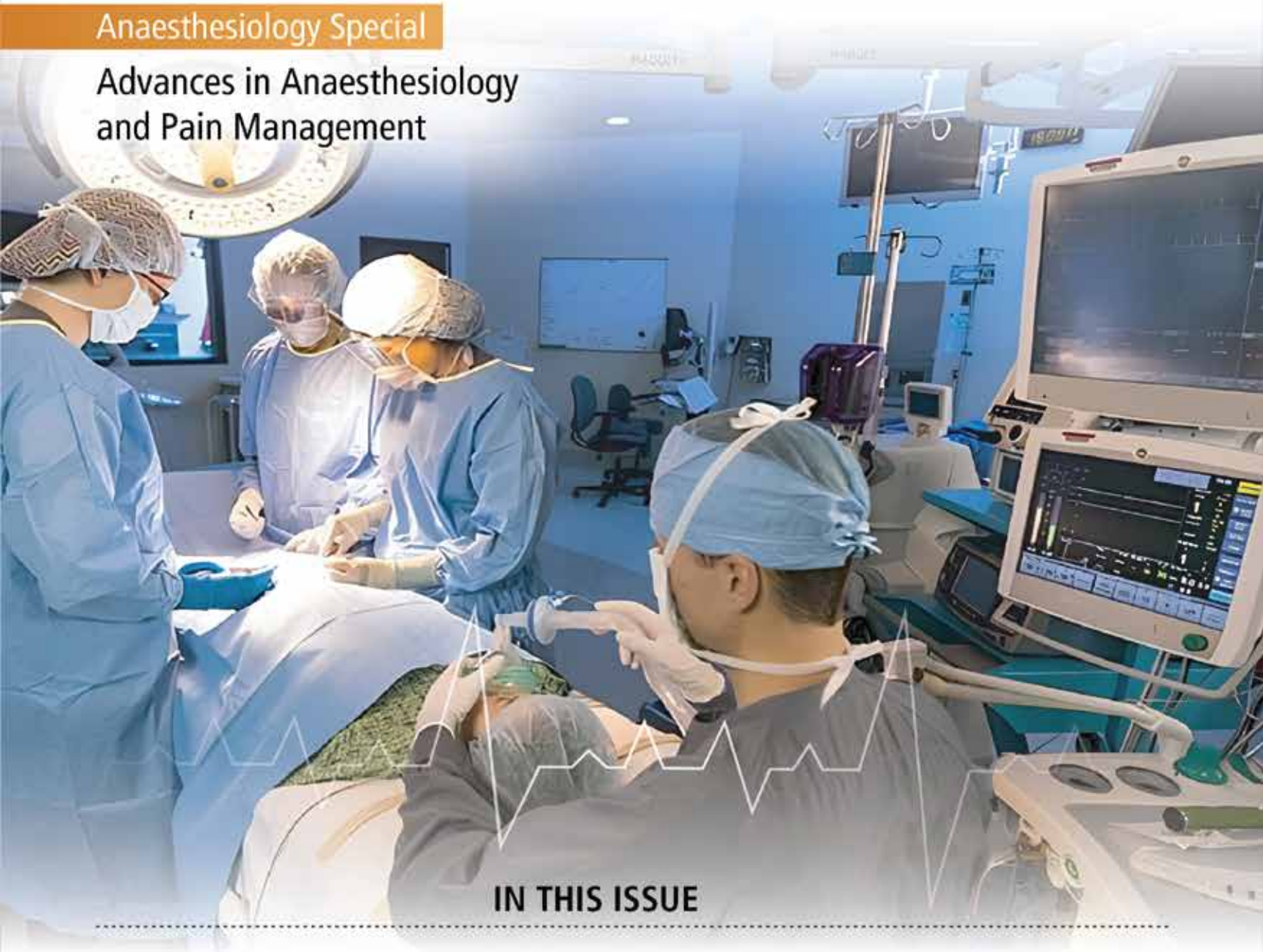
Clinical Connect

Fostering a culture of innovation and excellence

Anaesthesiology Special

Advances in Anaesthesiology and Pain Management



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Leadership Message

Dr Bishnu Panigrahi
Group Head – Medical Strategy and Operations
Fortis Corporate Office

Clinical Connect has been a unique initiative of Fortis Healthcare. This e-newsletter is published quarterly to highlight clinical excellence at Fortis. Each issue of Clinical Connect is dedicated to a Specialty to highlight clinical expertise and commitment of every clinician contributing to clinical connect.

It gives me immense pleasure to write a foreword for this issue dedicated to Anaesthesiology. As an Anaesthesiologist by training, I consider myself fortunate to have been the care giver for first operated patient at Fortis Mohali – a case of Double Outlet Right Ventricle admitted in July 2001 at Fortis' 1st commissioned hospital. Since then, Fortis has grown into a large organization with presence in multiple geographies across India. Our reputed clinicians perform the most complex of procedures including Transplants and it is the Anaesthesiologist who manage these patients during surgery. In fact, they are the largest group of hospital-based specialists who give anaesthetics for surgery; medical and psychiatric procedures. They resuscitate acutely unwell patients and run Intensive Care Services in hospitals.

Pain management has evolved into a distinct discipline in recent years, increasingly recognized for its essential role in patient care in acute as well as chronic condition. The transformative impact of advanced pain management strategies, including enabling pain-free childbirth, not only enhances patient comfort but also defines our expertise in delivering holistic and effective healthcare solutions.

Fortis Healthcare puts a lot of emphasis on enhancing patient experience. A novel concept known as Perioperative Surgical Home is fast emerging where an Anaesthesiologist is the central figure in the multidisciplinary team which follows the surgical patient from admission to discharge. The American Association of Anaesthesiologists has started this concept in few hospitals, something that our Fortis Anaesthesiologists could consider as it enhances operational efficiencies and reduces resource utilization; length of stay; re-admissions and complications resulting in enhanced Patient Experience.

On behalf of entire Fortis fraternity, I congratulate the Editorial Team for this issue of Clinical Connect on Anaesthesiology and wish them great success!

Dr H.H. Dash
Emeritus Director – Neuroanesthesia and Neuro Critical Care
Fortis Memorial Research Institute, Gurugram

Research Institute (FMRI) had pioneered the green operation theatre (OT) way back in 2015 by deferring the use of nitrous oxide during anaesthesia, use of low gas flow technique and abundant utilization of regional anaesthesia (spinal, epidural and ultrasound guided fascial plane blocks) for different surgical procedures. Soon this green OT complex was adopted by all other Anaesthesiology departments of all the other Fortis Institutions.

DNB course in Anaesthesiology is being pursued in umpteen number of Fortis Institutions. Recently, the specialty of Anaesthesiology has undergone ramifications into different Super-specialty like Cardiac,

Neuro, Paediatric, Pain Medicines, Onco anaesthesia, Transplant, Ortho-anaesthesia and Palliative Care. DM courses in these super-specialties are underway in different Government and private institutions. Similarly, super-specialty courses in DNB and fellowship programs in cardiac, neuro, transplant anaesthesia are being offered in different Fortis Hospitals.

Regular publication of **Clinical Connect** by Fortis is highly laudable and a praiseworthy step so as to instill the culture of scientific research amongst the clinicians. I am extremely happy to learn, the forthcoming issue of **Clinical Connect** is dedicated to publications in anesthesiology from pan-Fortis and am sure it will be liked by all the Fortisians. Last but most importantly, it will provide impetus to all our Anaesthesiology colleagues of pan-Fortis to carry out cutting edge clinical research.

The discipline of Anaesthesiology is one of the most important pillars on which the medical institutions are built. The discipline has undergone paradigm shift following the introduction of rapid onset and early offset intravenous and inhalational agents, state of the art anaesthesia work stations, patient monitoring systems, provision of effective pain control by using ultrasound guided techniques and excellent post-operative intensive care. Over and above, anesthesiologists provide meticulous perioperative care so as not to jeopardize patient's safety. This moto is being practiced in all Fortis institutions.

The Department of Anaesthesiology at Fortis Memorial

Dr Murali Chakravarthy
Senior Director - Anaesthesia, Surgical Intensive Care and Pain Relief
Director, Clinical Affairs
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Dear Fortisians!

It is a great feeling to write this message on the occasion of the release of our **Clinical Connect** dedicated to the subspecialty of anaesthesia. Anaesthesia is perhaps one of the few medical specialties that has attained safety standards equivalent to the aircraft industry – Six Sigma! We are expected to encounter an error once in a million anaesthetics. Perhaps we excel even beyond that standard. This is possible because of the process-oriented standardization of the scientific art of anaesthesia. I say scientific art because most procedures, techniques, management of haemodynamic problems, delayed recovery, institution of mechanical ventilation, and weaning from it are mostly scientific and to a lesser extent an art. It is said that "if you can put a formula on a process, you can standardize the outcome predictably." At Fortis hospitals at the national level, the infrastructure, supply of disposables, therapeutic agents, and biomedical support of equipment have been standardized. This has by far enabled our brethren at Fortis Healthcare to standardize the outcome of anaesthetics to a large extent. In lessons on quality, the first step to excellence is standardization, which we have nearly acquired. The only direction we can proceed from here on is northwards - achieving excellence each and every time we intervene. Excellence is never a final destination; it is a point from where bettering it may be visualized.

I congratulate the authors of this huge volume of Clinical Connect! The quality of the articles in this **Clinical Connect** is a testimony to the excellence that we achieve daily!

I wish all the Fortisians a happy time going through the contents of this **Clinical Connect.**

*Reproduced from Historical development of the anesthetic machine: from Morton to the integration of the mechanical ventilator

Ohio DM 5000 Anesthesia Machine

Dr Vijay Shetty
Director, Anaesthesia
Fortis Mulund, Mumbai

Greetings to Anaesthesia Team members across Fortis family & to all our wonderful colleagues in other disciplines!

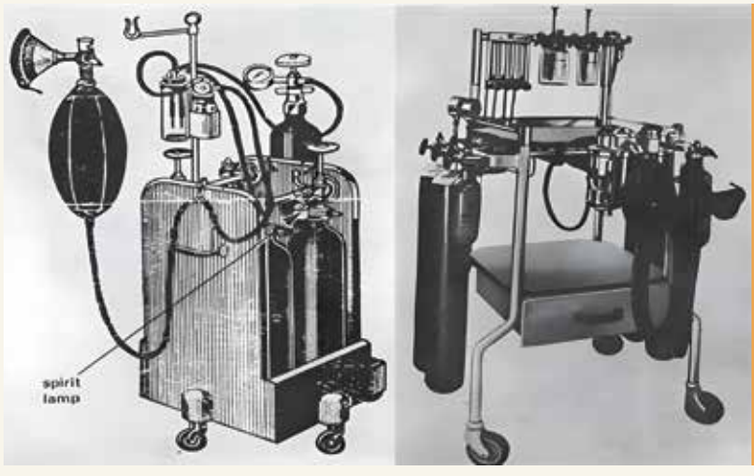
Anaesthesia is critical for ensuring patient safety and optimal outcomes in the operating room and beyond. Complex as anaesthesia may appear, it functions and flourishes on simple tenets of planning, presence, attention, and a commitment to improvement and evolution. A strong foundation in medical knowledge, technical skills, clinical acumen, and crisis response defines your anaesthetist friend. Anaesthesiologists become involved in-patient care well before the procedure and maintain vigilance during and after the intervention. It is widely accepted that most modern surgical marvels, technology-based interventions, and ultra-invasive approaches were made possible due to the rapid strides in anaesthesia. Notably, anaesthesia is recognized as the speciality with the highest safety record, even in a fragile population at extremes of age and risk.

The anaesthesia team is a vital part of the operating room network, and shared leadership in the OR is the best way to ensure a positive and efficient workspace. Every anaesthesiologist function as a leader of the OR, ensuring integrated and enthusiastic involvement of all allied personnel. Developing effective communication skills and safety mechanisms born from a culture of analysing near misses and adverse events is vital. The anaesthesiologist today is part of multiple committees, including Infection Control, Quality, Clinical Privileges, Mortality & Morbidity, and the OR. This demonstrates their versatility and unique ability to take on fresh challenges with the intention of creating a safer environment for patients.

For far too long, Anaesthetists were considered as behind the screen magicians rarely seen but always

there. Today we recognize that the decision-making skills, teamwork skills and ability to get the best out of everyone, situational awareness enabling them to react quickly and decide on the best option in time bound situations make the Anaesthetist indispensable as part of hospital management. We need to wake up to this partnership and ensure that our viewpoints and ideas are heard and implemented.

Exciting times lie ahead for us including advances in brain and awareness monitoring, Ultrasound technology for improved and safer pain relief, advances in managing post op pain, AI in helping predict a better course in the myriad fields like difficult intubation, intraoperative hypotension prediction, regional anaesthesia as well as OR planning, remote patient monitoring ,availability of ultrashort acting and potent opioids like Remifentanyl and reversal agents like Suggammadex- the list is endless. Therefore, the basic tenets aforementioned become more important than ever. Anaesthesia is one of the youngest disciplines of core medicine that came to life officially on 16th October 1846.From that day on, we have helped change the surgical & intervention landscape as the frontrunners in patient safety and comfort. My best wishes to all my colleagues as they help their patients and surgeons navigate the treacherous yet rewarding journey towards recovery. Your resilience is your strength!



Boyle´s Machine. Left: First model, with wooden frame, 1917. Right: 1958 model, with metal structure. Gas cylinders and pressure regulators are fixed to the frame of the table. In the upper part is the block of rotamers and vaporisers. Reproduced from Watt OM. The evolution of the Boyle apparatus, 1917–67. Anaesthesia 1968, with permission of Wiley & Sons.

*Reproduced from Historical development of the anesthetic machine: from Morton to the integration of the mechanical ventilator

Dr Sunil Dhole

Director and Head - Cardiac Anaesthesia
Fortis Escorts Heart Institute, Okhla, New Delhi

Dear Colleagues,

It is a great privilege to write on behalf of the anaesthesia fraternity at Fortis, which includes many stalwarts, legends, and highly competent young colleagues.

From the "ether frolics" of the mid-nineteenth century to the "modern anaesthesia" of the 21st century, the journey for our specialty has been astonishing. Our deeper understanding of physiology and pathophysiology, anatomy, and the development of newer, safer, and shorter-acting anaesthetic agents, coupled with advancements in technology, have driven this evolution. Modern anaesthesia, with a mortality

rate of 0.4 in 100,000, is safer than ever. This has broadened the scope of surgical procedures and interventions. Surgeons can now perform highly complex and major surgeries with excellent results and safety, ultimately benefiting millions of patients.

New surgical specialties have emerged, such as cardiac surgery, neurosurgery, onco-surgery, organ transplantation, and laparoscopic surgery, to name a few. Newer endoscopic and percutaneous interventions can be performed without discomfort. Imaging techniques have improved the success rate and reduced complications of regional anaesthesia, aiding in the alleviation of postoperative and chronic pain. Over the past few decades, subspecialties like cardiac anaesthesia, neuro-anaesthesia, transplant anaesthesia, pain management, and intensive care have developed. The role of anaesthesiologists has expanded beyond the operating theatre to become 'perioperative physicians.' Many anaesthesiologists have dedicated their practice to one of these subspecialties. During the recent COVID-19 pandemic, anaesthesiologists at Fortis and around the world played a crucial role in treating patients and saving many lives.

I congratulate the leadership at MSOG and the Clinical Connect team for providing this platform to clinicians. We are fortunate to have some of the best minds in our specialty within our network hospitals. Many of them are nationally and internationally renowned for their clinical and academic excellence. I thank the Clinical Connect team and MSOG for allowing anaesthesia teams to share their knowledge, achievements, and clinical skills with fellow Fortisians. This will help many clinicians better understand the capabilities of my colleagues from different hospitals and provide opportunities for collaboration with other Fortisians, ultimately improving patient care.

Happy reading!

Dr Manoranjan Sahoo

Director and Head – Cardiac Anaesthesia and Cardiac Critical Care
Fortis Hospital, Mohali

The department of anaesthesia and pain management service across Fortis network provides the best possible patient care by fostering excellence in anaesthesia and pain medicine, in a safe and efficacious manner. The department is committed to excellence in clinical, education, research, faculty development and making the hospital journey most comfortable and pain free for the patient.

Strategically planned to provide superlative quality of services to all patients with state –of-the –art green OT's in many facilities the department provides anaesthesia services to all patients undergoing surgeries in various specialities. We provide anaesthesia for day care as well as short stay procedures and endoscopic procedure in dedicated operation suites. The department also offers services to non-operating areas like CT Scan, MRI, PET scan, Cath lab and Hybrid OT.

Our highly-specialised and well experienced faculty, dedicated to anaesthesia services and peri-operative medicine, are available round the clock to cater to

patient services. The use of the latest equipment Video Laryngoscope, fibre-optic bronchoscope, Glidescope for difficult case helps to ensure utmost safety of the patient. We are equipped with specialised monitor to help us measure the depth of anaesthesia. We also use ultrasound machine in operation rooms for precise placement of nerve blocks and central intravenous cannulations which gives us an edge to manage difficult and complex with ease. We have the latest medicines which give excellent intra operative condition and smooth recovery. All patients are closely monitored after the surgery in a specialised post-operative care under supervision.

We believe that a painless delivery is the "right of every expecting mother" so we provide 24x7 labour analgesia to expectant mothers.

Many facilities provide chronic pain services which is a multidisciplinary team comprising of orthopaedics, neurologists, oncologists, counselling experts and radiologists to provide compassionate and comprehensive services to reduce pain, promote coping strategies, improve function and the quality of life.

We are running DNB programme in various specialities with dedicated and extensive teaching and actively involved with various research programmes.

The **Clinical Connect** on Anaesthesia and Pain Management provides glimpses of such services, knowledge and capabilities in Fortis Hospitals.

I am sure the present issue **Clinical Connect** on Anaesthesia and Pain management services will provide enthusiasm and spirit to further the progress of Anaesthesia and Pain management sciences in all Fortis Hospitals.

*Reproduced from Historical development of the anesthetic machine: from Morton to the integration of the mechanical ventilator

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Neuroanesthesia

Deep Brain Stimulation - A Nexus of Technology, Neuroscience, and Anaesthesia

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Deep Brain Stimulation (DBS) has emerged as a transformative therapeutic approach for various neurological disorders in patients who have failing symptom control with medical therapy. It is commonly used in the treatment for movement disorders such as Parkinsonism. Other indications include essential tremor, dystonia, Tourette's syndrome, chronic pain, psychiatric disorder as obsessive-compulsive disorder and depression.

The disease-specific concerns, such as autonomic dysfunction, orthostatic hypotension, laryngeal dysfunction and risk of aspiration, difficult ventilation secondary to muscle rigidity and dystonia, potential drug interactions, and tremor-related artifacts on BP and ECG monitoring, presence of other comorbidities as hypertension, IHD, diabetes etc warrant meticulous pre-anaesthetic evaluation and preparation of these patients.

Understanding DBS

DBS implantation is performed in a single or two-stage operation. In the latter, the electrode is implanted in the brain on day 1 and the pulse generator on day 2, given concerns for increased infection risk, patient's condition, team preference and hospital protocol.

The surgical procedure consists of two stages:

Stage one: It involves mapping and placement of the intracranial electrodes. The patient undergoes Magnetic resonance imaging (MRI) on the day before surgery; the intention of the MRI is to map the target areas of the brain. The most common targets for movement disorders are the subthalamic nucleus (STN), globus pallidus interna (GPi), and the ventralis intermedius nucleus of the thalamus. For psychiatric disorders, such as obsessive-compulsive disorder, targets include the subcallosal cingulate gyrus, the anterior limb of the internal capsule, and the nucleus accumbent. The Sub thalamic nuclei is currently the primary target for most patients with parkinsonism.

On the day of surgery Leskill stereotactic frame is attached to the patient's head. Then, the patient is transferred to CT for a scan which localizes the anatomy of the deep brain structures relative to the frame. Using these scans and with the frame in place, the surgeon and neurologist and neuroradiologist then plans the route and target positions of the electrodes, during which time the patient is transferred back to the operating room. The patient's frame is then attached to the operating room table and a geometric arc is placed to allow the target to be achieved from any angle given a stable radius. From here, a skin incision is planned, a burr hole drilled, and finally the dura excised. The intraoperative electrode(s) are inserted into the brain and brought to a location 10–25 mm above the target site and advanced in 0.5–1 mm increment along the planned trajectory, with the recordings used to confirm accurate localization of the therapeutic target via microelectrode recording and macroelectrode stimulation. The neurologist also examines the patient clinically to see improvement or worsening of symptoms. The patient then has a repeat CT to confirm position of the electrodes Stage two involves connecting the electrodes to the extension lead which are tunnelled under the skin and connected to the IPG. As tracks are made under the skin, this is done under GA, with the IPG located subcutaneously below the clavicle or in some cases on the abdominal wall.

Figure 1: Leski's stereotactic frame fixed (front)

Figure 2: Leskis'sstereotactic frame fixed (Back)

Figure 3: Geometric arc attached to the operating table. Leads being inserted into the subthalamic area

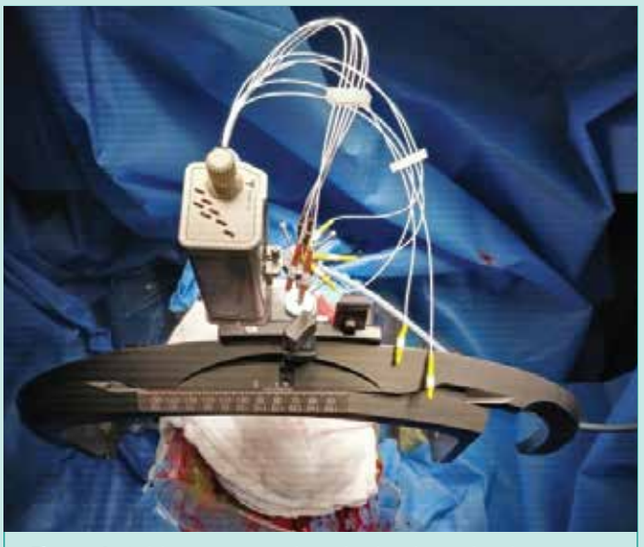

Figure 4: Cables connected to the lead to stimulate

Anesthetic management

The mode of anaesthesia for deep brain stimulus electrode implantation depends on several factors; the patient's presenting condition, the degree of central movement abnormality, and the ability of the patient to tolerate the procedure under local anaesthesia. Presence of coagulopathy, uncontrolled hypertension, extensive cerebral atrophy, MRI evidence of small vessel ischemic disease increases the risk of device malfunction.

Apart from ensuring the patient is medically optimized for the procedure, patients with Parkinsonism commonly suffer from obstructive sleep apnea or have an increased risk for aspiration. Assessment for these are important when considering any sedative technique. If an awake surgical technique is decided on for the surgery, options of securing the airway at any stage of the procedure are important to have prepared in advance.

Patient cooperation during the awake part of the surgery is absolutely required for success. Identification of factors which may complicate this (such as developmental delay, dementia, communication difficulties, claustrophobia, or previous difficulty with sedation) warrants special attention. Preoperative explanation of the intraoperative course can help reassure the patient, alleviate anxiety, identify potential intraoperative challenges, and improve cooperation during the procedure.

Our practise

Is to have the patient sitting in a wheeled chair, fully monitored as per AAGBI recommendations (Fig1&2), then institute a scalp block using long-acting local anaesthetic agents like Bupivacaine (0.5%) orRopivacaine (0.75%) with adrenaline to prolong the

duration of action as the procedure usually lasts for 6-8 hrs. The local anaesthetic Xylocaine (2%) is placed in the pin sites prior to frame placement at the beginning of the procedure. Patient is then taken to CT room and brought back to OT. The frame is attached to the operating table and oxygen is given through nasal canula. Sedation is started using dexmedetomidine infusion 0.2-0.7mcg/kg/hr. Dexmedetomidine is a short-acting selective alpha-2 adrenoreceptor agonist and does not have any established effect on GABA receptors. It has sedative, analgesic, and anxiolytic effects without significantly depressing the respiratory system. It has become widely utilized in neurological ICU settings and several recent reports suggest that it is the ideal anaesthetic for DBS. Propofol, Remifentanil and Ketamine are other agents which can be used as they affect neurocognitive testing the least, are shorter acting, and provide therapeutic comfort levels. Sedation is stopped after burr hole, usually 10-15min before testing is initiated, and can be restarted once testing is done. If needed, the dura can be anaesthetized as well. Re-infiltration at closure can be utilized if there is discomfort reported during the late stages of the surgery.

DBS implantation in dystonia cases and uncooperative patients is carried out under GA, because the involuntary neck movements which are present would result in damage of cervical spine. Using stereotactic positioning the subthalamic leads are placed. The final position is confirmed using MRI. Usually, the programming and the pulse generator are carried out the next day.

Intraoperatively, several key points need to be addressed:

1. Oxygen is often used via a mask or nasal prongs attached to the frame.
2. Temperature and positioning are important to ensure patient comfort.
3. Draping should allow access to the patient's face, arm and legs, maintain sterility, and avoid oxygen/carbon dioxide accumulation.
4. A urinary catheter is not necessary, but conserving fluid administration is essential to avoid bladder over-distension.
5. At all times during the procedure, tools to remove the head frame for emergency airway access must be available.

Risks and complications

Major complications include intracranial bleeding (0.4-3.6%), seizures (0.8-4.5%), strokes, neurological deficit (0.3-0.6%), and post-procedural delirium. Other intraoperative complications include airway obstruction (1.6-5.5%), hypertension, hypotension, or venous air embolism (1.6-3.5%). Complications related to the device itself include infection, equipment failure, and electrode migration.

Safety issues

With the increasing use of DBS, there is a greater chance of the anaesthetist encountering such a patient outside of the neurosurgical environment. These patients may present for routine anaesthesia under a different surgical speciality or may present to other specialities as emergency admissions requiring an anaesthetic input into their care.

No modifications are required for routine GA or regional anaesthesia. However, drugs with extra-pyramidal side-effects should be avoided in this group of patients.

Peripheral nerve stimulators can still be used for neuromuscular block assessment and for peripheral nerve blocks.

MRI scanning

MRI systems generate powerful electromagnetic fields that can produce a number of interactions with the implanted components of the DBS. Some of these interactions are potentially hazardous and can lead to serious injury. These interactions include the following:

- Heating: The MRI RF field induces voltages onto the lead system that can produce significant heating effects at the lead–electrode–tissue interface. This can produce thermal lesions possibly resulting in coma, paralysis, or death.
- Magnetic field interactions: The force and torque effects of the magnetic field may produce movement of the neurostimulator.
- Induced stimulation: Gradient magnetic fields may induce voltages onto the lead system that may cause unintended stimulation.
- DBS function: The static magnetic field may cause the neurostimulator to turn off, may reset the device, or potentially damage it.

The manufacturers detail the strict criteria that allow an MRI scan of the head in a patient with a DBS system in place and this should be carefully consulted before consideration of this procedure. CT scanning, fluoroscopy, and plain X-rays can be performed as normal.

Diathermy

Shortwave diathermy, microwave diathermy, and therapeutic ultrasound diathermy, are contraindicated

in these patients. These modalities induce heating at the tissue–electrode interface leading to potential tissue damage. Surgical diathermy (electrocautery) can damage the DBS leads and can also cause temporary suppression of the neurostimulator, reprogramming of the neurostimulator, or both, but is not contraindicated.

When diathermy is necessary, the following precautions should be followed:

- Use bipolar diathermy where possible;
- If unipolar diathermy is necessary, use only a low-voltage mode; with lowest possible power setting and keep the ground plates far from neurostimulator and leads. After using diathermy, confirm that the neurostimulator is functioning as intended.

External defibrillation

If a patient requires external defibrillation, the first consideration should obviously be the patient's survival. Safety for the use of external defibrillators on patients with a DBS has not been established. External defibrillation may damage a neurostimulator. If external defibrillation is necessary, position defibrillation paddles as far and perpendicular from the neurostimulator as possible, use the lowest clinically appropriate energy output.

Confirm that the DBS is functioning correctly after any external defibrillation.

Device programming

The DBS is programmed externally from a hand-held device which is placed directly over the battery-stimulator unit. Some patients, especially those in whom the DBS was inserted for pain control, will have a hand-held controller that they have in their own possession; this device allows the stimulator parameters to be altered and also allows the device to be turned on and off. For those patients who do not have their own personal control unit, the device will need to be reprogrammed or turned on or off in hospital.

Summary

The novel technique of DBS is here to stay. Excellent team work is necessary between the anaesthesiologist, neurosurgeon and the neurologist. Though anaesthesia is not administrated in a big way, less is more in this situation.

Practice Changing Articles in Neuroanesthesiology and Neurocritical Care in Recent Years: A Literature Review

Source: https://pubmed.ncbi.nlm.nih.gov/34169844/

Dr H.H. Dash
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Neuroanesthesiology and neurocritical care are constantly evolving branches of clinical neuroscience, and patient management is often influenced by literature such as randomized controlled trials, systematic reviews, and meta-analyses. Many controversies still exist in the management of neurologically injured patients, and most research in this field does not translate into significant changes in clinical practice.

This review aims to discuss studies of clinical importance published in preeminent journals over the time period 2017–2020, which may have the potential to influence our current management protocols.

In this review, key articles have been selected to represent neuro-emergencies where recent evidence may prompt changes in practice. In preparing this article, contents of prominent journals between 2017 and 2020 were reviewed, and relevant articles were also identified from abstraction services. Areas chosen for consideration are high-quality trials researching the management of pathologies such as epilepsy, traumatic brain injury and acute ischemic stroke, cortical venous sinus thrombosis, as well as haemorrhagic stroke. For each subject, a brief review of the article is followed by

take home" points. We have attempted to perform a review of some of the highest impact medical journals from 2017 till 2020 and have summarized articles with the potential to change clinical practices for readers so that management protocols for acute neuro-emergencies to ensure good outcomes may be formulated.

Intra-Operative Supplementary Motor Area Aphasia During Awake Craniotomy: A Case Report

Source: https://jaccr.com/wp-content/uploads/2023/10/4-ART_5124_JACCR-Sep-2023.pdf

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Introduction

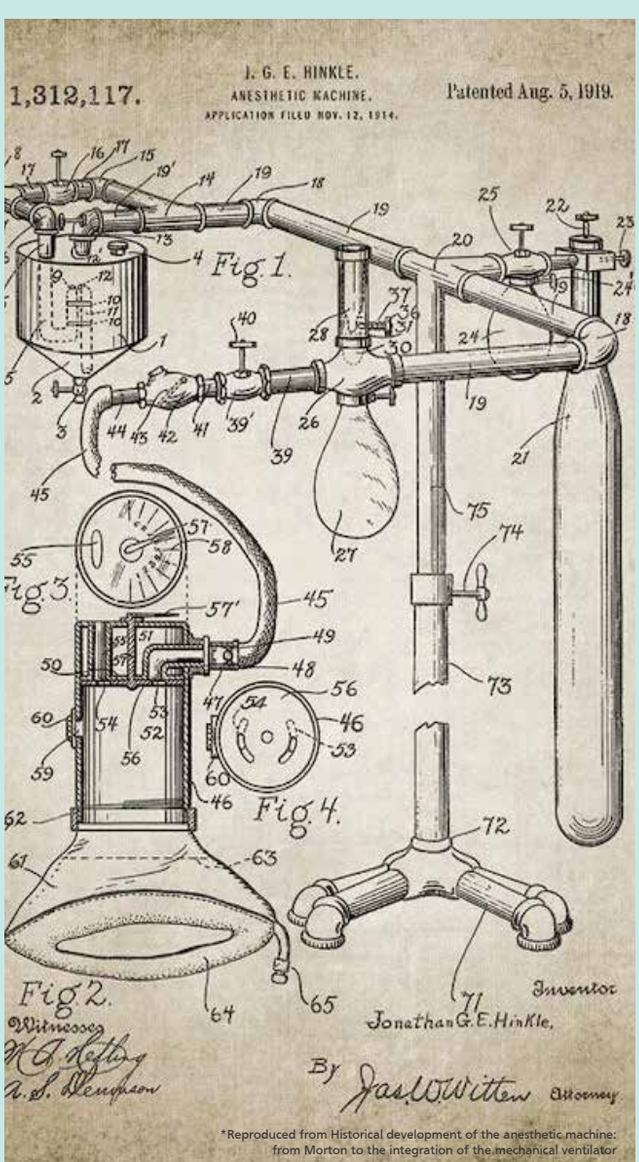
Language function is complex, involving association between Broca's motor speech area, Wernicke's sensory speech area and various interconnected cortical and sub-cortical regions. For lesions in eloquent areas, awake craniotomy with intra-operative neurological monitoring of motor and language function, aids in maximal safe resection of lesion with minimal neurological deficit.

Case presentation

We present a case of 40-year-old patient with left frontal lobe lesion involving motor and speech area who underwent awake craniotomy under scalp block and titrated sedation. Though resection was in safe zone as marked both by neuro-navigation and direct electrical stimulation, patient developed aphasia intra-operatively. The aphasia resolved post-operatively with speech therapy over two weeks. Resection in Supplementary motor area (SMA) in the dominant hemisphere may be the likely cause of aphasia in this patient, resulting in reversible SMA syndrome.

Conclusion

SMA syndrome must be considered as differential diagnosis of deficit during awake craniotomy when resection is in SMA. Keywords: Aphasia, Supplementary Motor Area, Awake Craniotomy, Eloquent Areas.



*Reproduced from Historical development of the anesthetic machine: from Morton to the integration of the mechanical ventilator

Anaesthetic Machine Wall Art

Anaesthesia for a Patient Undergoing Micro Endoscopic Lumbar Decompression in the Prone Position with a Deficient Sternum

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Consultant Anaesthesia
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Dr Vijay Shetty
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Case Report

A 69-year-old male, had undergone coronary artery bypass grafting 17 months ago at another hospital. Post operatively, he developed infection at the surgical site and sternal osteomyelitis. Recurrent debridement and Vacuum Assisted Closure (VAC) procedures were carried out. It finally resulted in the removal of chest wires, part of the sternum. He complained of pain during breathing. He had been offered the option of sternal fixation which he refused, so the use of an adjustable chest brace was advised. The skin over the chest wall had healed, however a sternotomy site defect was seen. He presented to us with lower back-ache and pain radiating to the left leg following a recent fall, therefore was posted for 2 level micro endoscopic lumbar decompressions with unilateral approach. Blood investigations, ECG, 2DECHO were normal. 3D reconstructed CT of chest showed dehiscent manubrium with a gap between the two halves. Left half of the sternal body was deficient post-surgical removal with no support to the ribs medially. Right half of the sternum was fragmented. MRI lumbar spine showed left paracentral extruded disc prolapse at L2L3 and degenerative changes causing lumbar canal stenosis at L4L5 level. Heart rate was 78 per minute, Blood pressure 110/70 mm Hg. Respiratory rate was 14 per minute. He had pain during breathing. Current medications included telmisartan 40 mg, metasartan 50 mg, thyronorm 50 micrograms, prazopress 5 mg, aspirin 75 mg, atorvastatin 20 mg, clopidogrel 75 mg, gabapentin 75 mg.

Post removal of the sternum, the patient had not attempted to lie prone due to anxiety that pressure on the chest could create problems. In the presence of our OT team, a trial of prone position was carried out preoperatively. The patient tolerated the position and remained comfortable with no adverse hemodynamic effect. Informed, high risk consent explaining the possibility of cardio respiratory collapse was obtained. Clopidogrel was withheld for 5 days. Morning dose of telmisartan was omitted on the day of surgery. Other medications were continued. In the operating room the sternal defect was padded and the chest was strapped. Absence of any discomfort to the patient was ensured. 2 wide bore peripheral venous canulae were secured. Routine monitoring included ECG, SpO2, EtCO2, ST segment, pulse pressure variation. Invasive radial arterial pressure was measured (20 G Lederflex-Vygon). Following pre-oxygenation, induction with midazolam 1 mg, fentanyl 100 mcg, propofol 150 mg, atracurium 50 mg was done. Patient was intubated with a size 8.0 flex metallic cuffed endotracheal tube (Portex). Gel bolsters were kept longitudinally parallel to the edge of the operating table. The patient was carefully made prone with the chest resting on the bolsters and the head supported with gel head rest. Anesthesia was maintained using Sevoflurane MAC 0.7-1.0 in air: oxygen 50:50 as carrier gas. Atracurium 5 mg boluses were administered every 30 minutes for muscle relaxation. 2 episodes of hypotension occurred with systolic pressures dropping to 70 mm Hg systolic. Pulse pressure variation was <14%. Hypotension temporarily responded to 3 mg bolus of ephedrine. A low dose norepinephrine (0.05-0.075 mcg/kg/min) infusion was started to maintain mean arterial pressure >70 mm Hg. Thereafter, the blood pressure stabilised. There was not much change in airway pressure (Paw) from the supine (Paw=15-16 cm H2O) Ventilation was carried out using tidal volume 6 ml/kg with volume-controlled mode. The procedure lasted for 3 hours. At skin closure 1 g paracetamol was administered IV. Once the surgery was over, the patient was made supine carefully and extubated in operation theatre after reversal of muscle relaxant with 2.5 mg neostigmine and 0.2 mg glycopyrrolate IV. 100 mcg fentanyl IV was administered in total. Patient received 1000 ml Ringer Lactate peri-operatively. Total blood loss was less than 100 ml. There were no further episodes of hypotension in the supine position, so norepinephrine was

discontinued. Post operatively, hemodynamic stability was maintained. In the recovery area, his pain was controlled adequately with 50 mg diclofenac IV and 50 mg tramadol IV with 4 mg ondansetron. The arterial line was removed. He was shifted to the ward after observation in post anaesthesia care unit. Remaining course was uneventful.

Discussion

Wound dehiscence post sternotomy following CABG is an unfortunate complication. Sternal osteomyelitis resulting in bone loss causes prolonged distress to the patient. Although a variety of treatment modalities are available, if sternal fragments are not fixed chronic chest pain, breathing difficulty is a possibility.

The normal rib cage can tolerate the pressure exerted on it in the prone position. This patient's rib cage had deficient anterior support. Our concern was to avoid direct compression of the mediastinal structures including the heart and major vessels. Also fracture of the ribs with ensuing pneumothorax was a possibility. A careful observation of airway pressures was maintained throughout the procedure to detect possible occurrence of pneumothorax. An intercostal drain set was kept ready and a surgeon was kept on standby if the need arose. The peak airway pressures remained close to the supine peak airway pressures when the position was changed to prone and no desaturation occurred perioperatively.

A post CABG patient with a deficient sternum can theoretically have herniation of the heart through the defect when made prone. Myocardial or coronary injury is a possibility, as the heart is pushed anteriorly towards the fragmented sternum. The pre-operative trial positioning was carried out with an aim to find the most optimal position, that would prevent compression of mediastinal structures and hence a fall in cardiac output. As the patient was awake, there was an opportunity to get a valuable feedback regarding discomfort. The hemodynamic parameters remained stable. The patient too was reassured about the safety of the position.

Prone position can result in increased pressure in the dependent areas, raised intra thoracic pressure, engorgement of epidural venous plexus which can impact the surgical field [1]. A variety of techniques have been reported to provide optimal prone position including Siemens, Andrews, Jackson's, Wilson's frame and the bolster system [2-4]. Although our patient did not have a compromised cardiac function, the deficient, unstable sternum had to be adjusted for; hence the bolster position placement was crucial. Height and length of the bolsters was selected to ensure adequate room for the abdomen to be accommodated and direct pressure on the sternum was avoided. For patients with significant chest deformity and scoliosis, transoesophageal echocardiography has been used to detect flow abnormalities in the prone position and find optimal supportive padding configuration to minimize the impact on cardiovascular function [3]. We decided to place the bolsters longitudinally based on observations by Dharmavaram et al. who used TEE and suggested, the use of properly positioned longitudinal bolsters produced the least effect on cardiac function, and may be superior to Siemens, Wilson, and Andrews frames for patients with reduced cardiac function undergoing spinal surgery [4]. The position given, resulted in a totally unobstructed abdomen and unimpeded venous return, as legs were supported at heart level [4]. However, the patient did have hypotension requiring the use of norepinephrine. This could be attributed to a combination of factors including, the residual effects of angiotensin receptor blockers, diastolic dysfunction, reduced stroke volume in prone position due to vascular compression in the pelvis, compression of the right ventricle [5]. An adequate volume status was indicated by pulse pressure variation <14%. As PPV was normal, inadequate pre load was excluded and norepinephrine was selected over fluid boluses. ST segment must be monitored. Ischemic changes could be suggestive of coronary or venous graft compression in post CABG patients. Facilities to make patient supine urgently must be available in case of sudden hemodynamic collapse. There is a paucity of information describing CPR in such patients. In event that CPR is required it must be guided by the upstroke of the arterial trace as in this case it could lead to myocardial laceration.

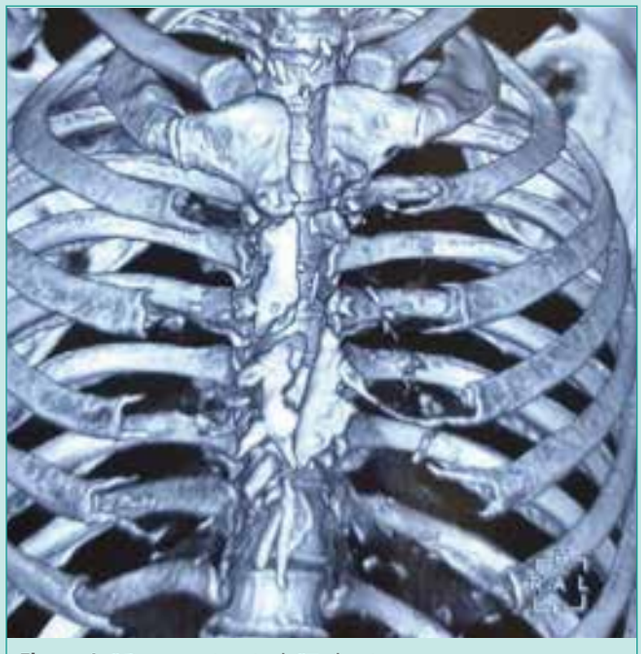

Figure 1: 3D reconstructed CT chest

Apart from hypotension which responded to vasopressors, we did not encounter much difficulty in managing the case.

Conclusion

This is the first such case reported in literature. We emphasize that with careful positioning on longitudinally placed (parallel to the length of the table) gel padded bolsters, gentle surgical technique and pre- operative planning, the case was managed successfully.

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Anaesthetic Management in a Case of Bullous Pemphigoid for Lumbar Spine Surgery

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Abstract

Bullous pemphigoid is a chronic, autoimmune bullous skin disorder. We report the anaesthetic management of a 59-year-old male with bullous pemphigoid lesions undergoing spinal instrumentation. The literature on the anaesthetic implications of a bullous pemphigoid patient is scarce. This case report highlights how to avoid complications that can occur during the anaesthetic management of such cases.

A 59-year-old male weighing 90 kg presented with progressive lower backache and bilateral lower limb paraesthesia for two years. He was diagnosed to have L4-L5, L5-S1 prolapsed intervertebral disc (PIVD) with severe lumbar spinal stenosis (LCS) and was posted for spinal decompression and pedicle-screw rod fixation under general anaesthesia. He was a known case of bullous pemphigoid, type 2 diabetes mellitus and hypertension.

Past history suggested multiple relapses of tense fluid-filled blisters all over the body in the last four years, preceded by highly itchy raised weals. Before the presentation, he had been treated with oral cyclosporine 100mg and wysolone 30mg (tapered off to 15mg last month), which had led to partial resolution, but discontinuation was followed by the rapid reappearance of lesions. Dermatology examination revealed an excoriated erythematous lesion over the whole back, trunk and upper extremities, as well as old eroded and crusted areas over the lower extremities (figure 1). There was no history of recurrent upper or lower respiratory tract infections, significant family history, drug ingestion, or recent viral illness. The airway examination was normal. The patient never complained of difficulty swallowing or developed intraoral bullae in the past.

His pulse rate, blood pressure, and peripheral oxygen saturation in room air were 90 beats/min, 132/78mmHg, and 99%, respectively. The electrocardiogram showed sinus tachycardia with a left-axis deviation pattern. Echocardiogram revealed an ejection fraction of 55-65% and mild left ventricular hypertrophy with no regional wall motion abnormality. Chest X-ray showed clear lung fields and mild cardiomegaly. The remarkable blood parameters were alanine transaminase 153 IU/L, aspartate aminotransferase 70 IU/L, and glycosylated haemoglobin (HbA1c) of 7.1%, and the rest of the

laboratory parameters were normal. Ultrasound of the abdomen revealed grade 1 fatty liver but no hepato-splenomegaly. Dermatology references were sought before surgery.

Inj. hydrocortisone 100mg was administered 1 hour before the procedure. Standard American Society of Anaesthesiologists (ASA) monitors were attached. An anaesthesia technique of propofol, fentanyl, vecuronium (to avoid atracurium-induced anaphylactic reaction), sevoflurane and oxygen-air (1:1) was used. Endotracheal tube was fixed with durapore tape (dynaplast was avoided to prevent skin peeling). Central venous (internal jugular vein) cannulation was done because of poor peripheral venous access. Arterial cannulation was done after induction of anaesthesia and lines were secured with sutures (large dressings were avoided), and the surgery was performed in the prone position on Allen's frame. The patient received a 2300ml balanced crystalloid solution intraoperatively with a blood loss of 300ml; the surgery lasted four hours with stable intraoperative haemodynamic. Postoperatively, the patient had no new bullous and erythematous lesions. There were no lesions at the surgical site, blood pressure cuff placement, and intravenous cannulation). Despite all precautions, he developed skin peeling over the malar area and chest (figure 2); no other pressure injuries were noted. The patient was shifted to neuro-intensive care following tracheal extubation. Post-operative analgesia was provided with intravenous paracetamol 1g 8-hourly and patient controlled analgesia (fentanyl boluses). NSAIDS were not used to provide pain relief. Injection Hydrocortisone 100mg TDS was continued postoperatively. Drugs with the possible association of recurrence or exacerbations with anaesthetic drugs were avoided (Table 1).1 Air mattress bed and every second hourly repositioning was done to prevent bed sores. The arterial line was removed on postoperative day (POD)-1. He had a smooth post-operative course (skin peeling over chin got better) and was subsequently discharged on the POD-4.

Bullous pemphigoid (BP), a chronic, nonhereditary autoimmune bullous skin disorder that can affect all age groups, is predominantly a disease that occurs after the fifth decade of life.2 It had a high mortality rate of approximately 10-40% due to the elderly population being affected. 3 It is characterised by the formation of large, tense bullae arising in either normal-appearing or erythematous skin. It most commonly involves the intertriginous areas of the arms, trunk, thighs, axilla, and lower abdomen, but it can also involve oropharyngeal and oesophageal mucous membranes. The disease follows a chronic course of exacerbations and remissions.4 The treatment of bullous pemphigoid usually includes corticosteroids and immunosuppressive agents. Oral corticosteroids are used to suppress acute exacerbation, whereas a combination of cyclosporine and steroid therapy is used for maintenance. Methotrexate, cyclophosphamide, azathioprine, sulfapyridine, and sulfones (Dapsone) have also been used in treatment. 5

BP patients on combination drug therapy often display an array of associated organ dysfunction that affects the risk of surgery, anaesthesia, and peri-operative course. Literature available on the anaesthetic management of a bullous pemphigoid patient undergoing spinal instrumentation (PSRF) is scarce. Table 2 summarises the different anaesthetic considerations while managing a patient with BP for PSRF.6,7 Invasive monitoring needs to be considered for major surgeries. Hemodynamic status needs to be reassessed upon turning prone, before spinal exposure, and prior to instrumentation. It is prudent to check the pressure point and maintain correct prone positioning to avoid pressure injuries during the surgery.8 It is imperative to maintain spinal cord perfusion and haemodynamic stability during spine surgery. Most marked cardiovascular changes noticed during prone surgery were suitably taken care of.9 Early recognition and prompt management of specific events such as exacerbations of BP lesions, dyselectrolytemia, dysrhythmias, haemodynamic instability, dehydration, pain and thromboembolic events in the post-operative period is desirable.

Its management needs patient-based decision-making, a comprehensive understanding of disease and optimisation of drugs, an intentional search for co-existing systemic abnormalities, anticipating difficult peripheral access, post-operative neurointensive care, and meticulously planned anaesthetic techniques. This case reiterates the importance of a multidisciplinary approach and increased vigilance in the clinical management of this vulnerable group of patients.

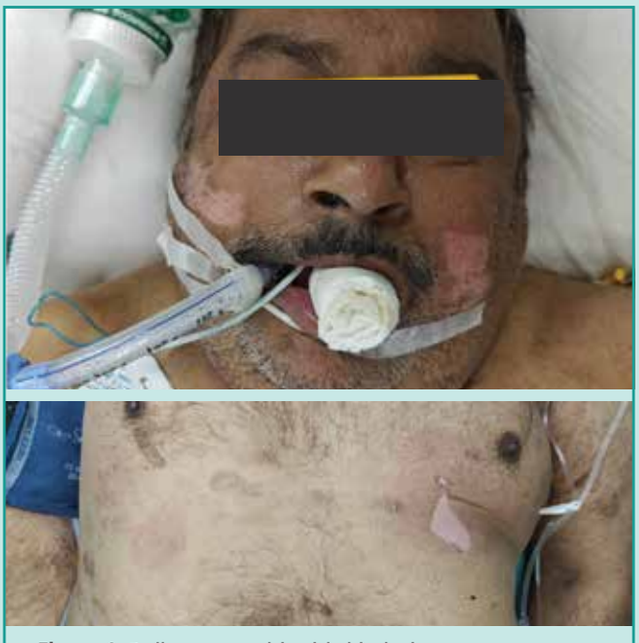

Figure 1: Bullous pemphigoid skin lesion

Figure 2: Pressure injuries over the chest and malar area

Table 1: Drug reported to induce bullous pemphigoid [6,7,10,11]

Likely association[a]	Probable association[b]
Antibiotics (D-Penicillamine, Levofloxacin, Rifampicin)	Antibiotics (D-Penicillamine, Levofloxacin, Rifampicin)
Antihypertensive drug: Enalapril	Antihypertensive drugs (Lisinopril, Losartan, Spironolactone)
OHA (Anagliptin, Alogliptin, Linagliptin, Sitagliptin, Teneligliptin, Vildagliptin)	NSAIDs (Diclofenac, Mefenamic acid)
Vaccine: Tetanus toxoid	Vaccine (Hepatitis B vaccine, Hexavalent combined vaccine)
Ibuprofen, Phenacetin, Aspirin	Antifungal (Griseofulvin, Terbenafine)
Diuretics: Furosemide	Diuretics (Hydrochlorothiazide, Bumetanide)
Others (Etanercept, Erlotinib, Serratiopeptidase, Psoralens with UVA, Sirolimus)	Other (Actinomycin-D, Adalimumab, Arsenic, Celecoxib, Chloroquine, Dorzolamide, Fluoxetine, Gabapentin, Metamizole, Rosuvastatin, Sulfasalazine, Infliximab)

*a: recurrence or exacerbation with re-challenge supports association with drugs.

*b: temporal relationship with initiation of drug.

Table 2: Systemic manifestations and their anaesthetic considerations of Bullous pemphigoid

Organ system	Problems	Anaesthetic considerations
Airway	Acute bullae formation Risk of haemorrhage Airway obstruction and risk of stridor	Thorough preoperative airway assessment Gentle airway instrumentation Assessment of pre-existing oropharyngeal bullae, gingival hyperplasia Gentle oropharyngeal intubation, suction and other instrumentation Suction catheters should be well lubricated and minimise suction pressures Smooth and gentle extubation (without struggling to reduce skin trauma) Observe the patient postoperatively for stridor
Drug therapy	**A). Long-term steroid** Electrolyte abnormalities (may result in sodium and fluid retention) Hypokalemic alkalosis Gastroduodenal ulceration Hyperglycaemia Impaired wound healing Risk of secondary infection **B). Cyclosporine** Gum hyperplasia High blood pressure Hypomagnesemia Hyperkalemia Tremor Renal and hepatic dysfunction	o Potential side effects must be considered. o Drug titration o Assessment of renal and hepatic function test o Correction of dyselectrolytemia o Preop steroid cover
Dermatological	Difficult intraoperative monitoring (BIS, ECG electrodes, IONM, NIRS, NIBP)* Difficult peripheral access Associated with malnutrition, anaemia, electrolyte imbalance Adhesive strapping or diathermy pads, ECG electrodes and precordial stethoscopes may all cause skin lesions Disuse atrophy of the patient's muscles and extensive tissue injury	o Extent of skin lesions and any systemic involvement. Awareness of current drug therapy. o Avoid trauma to skin and mucous membranes o Avoid intramuscular premedication o Theatre and recovery room staff, porters and other personnel must be aware of the dangers of trauma to the patient. o Padding beneath a blood pressure cuff (to reduce the shearing forces on the arm) o Avoid frequent blood pressure cuff monitoring interval o Intra-arterial monitoring (justified for longer procedure) o Non-adhesive ECG plates or intradermal needle electrodes are suitable o Use of bland, sterile ointment instead of tapes to protect the eyes o Crease-free sheets beneath the patient o Foam padding should protect pressure points. o Bleeding from ruptured mucosal bullae may be treated with sponges soaked in 1:200000 adrenaline. o Facemasks covered with soft cotton wadding o Macintosh laryngoscope blade is preferred to the Magill blade (which may traumatise the posterior surface of the epiglottis, resulting in supraglottic oedema and obstruction).

Organ system	Problems	Anaesthetic considerations
		o Avoid frictional trauma during intubation. o The tracheal tube should be tied with a soft flannel bandage (ensure no lateral force is exerted by the tube at the corner of the mouth) o Avoid oropharyngeal or nasopharyngeal airways. o Central access and intra-arterial line must be secured with sutures (local infiltration must be avoided) o Avoid succinylcholine (it can cause a hyperkalemic response; fasciculations may result in skin damage) o Eyes should be lubricated, not taped shut.

*__BIS:__ Bispectral index; __ECG:__ electrocardiogram electrodes, __IONM:__ intraoperative neuromonitoring, __NIRS:__ near-infrared spectroscopy; __NIBP:__ non-invasive blood pressure

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Cardiac Anaesthesia

Emerging Leadership Role of Cardiac Anaesthesiologists/Cardiac Intensivists in the "ECMO World"

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Advances in mechanical circulatory devices in this century has been the most promising development for the cardio pulmonary failure patients. Extracorporeal membrane oxygenation (ECMO) is a life-saving technique that provides temporary support for patients with severe cardiac / respiratory failure irrespective of the cause. It is implemented when all other treatment options have failed in the critical care settings. The main indications of ECMO being Bridge to recovery / heart or lung Transplant / decision. ECMO is a modification of the cardiopulmonary bypass circuit routinely used in cardiac surgery. The modern-day technological modifications of CPB circuit enables us to run ECMO for months without much complications. The basic functions of ECMO circuit is to remove deoxygenated blood from the venous system and return oxygenated blood back to the body. There are two main types of ECMO: Veno-arterial (VA) ECMO and Veno-venous (VV) ECMO support. In veno-arterial (VA) ECMO, the patient receives both cardiac and respiratory support .VA ECMO can be performed via Peripheral cannulation (the ECMO cannulas are inserted via Femoral Artery & Femoral vein as in majority of refractory heart failure patients awaiting transplant, or Central VA ECMO, where the Aorta & RA cannulas are inserted by the surgeons particularly in difficult to wean off CPB patients. In Veno-venous (VV) ECMO, the patient receives only respiratory support as required by Respiratory failure patients awaiting lung transplant /ARDS cases, in such cases Femoral vein cannula is inserted to drain the venous blood and the oxygenated blood is returned to RA via IJV cannula. VV ECMO / Peripheral VA ECMO cannulation is done percutaneously by the anesthesiologists / cardiac intensivists.

More lately, Elective ECMO requirement is rapidly increasing as the number of high-risk patients undergoing complex procedures compromising hemodynamic stability is presenting tremendous challenges to the surgical team. The use of ECMO in patients with high risk PTCA, heart failure patients undergoing major surgeries, lung resection surgeries is enabling us to perform such high-risk procedures (which earlier would have been deemed inoperable) with better hemodynamic stability and gas exchange leading to improved survival rates.

As the technology in ECMO is evolving so rapidly, there appears the need for a separate branch of medical team members "ECMO Specialists", mainly comprising of Cardiac Anesthesiologists / intensivists, cardiac surgeons, perfusionists, ECMO nurses. The roles of ECMO specialists are also evolving on a daily basis.

Earlier days of ECMO, cannulation was done by open technique by the cardiac surgeons and off late by the intensivists / cardiologists by percutaneous, serial dilation technique and thence starting the evolution of anesthesiologists in ECMO.

The Cardiac Anesthesiologists (CA) were intimately involved in taking care of patients on CPB during cardiac surgery in the OR as they had both the knowledge of patient physiology and the CPB systems. When that moved into ECMO, Cardiac Anaesthetists were in an ideal position to take over the responsibilities for that subset of ECMO patients. Though the exact role varies from institution to institution, Anaesthetists are increasingly at the forefront as they offer unique expertise that combines

knowledge of the physiology & pharmacology , and immense skills necessary for cannulation & initiating ECMO and further management .

Anaesthetists prime role is to assess the critically ill patients to determine the need for ECMO, the type of ECMO required depending on the heart & lungs stability, counselling the patient's relatives about the potential risks & benefits of ECMO and obtaining consent. Since most of the patients are hemodynamically unstable with inotropic support, ventilatory support, maintain the stability & anesthetising the patient during ECMO placement & initiation is one of the key responsibilities of Anesthesiologists. Since we are experts in accessing vascular catheters in any kind of situation, percutaneous cannula placement in large vessels under ultrasound guidance has become our utmost test of talent. Our knowledge in Transesophageal ECHO (TEE) / transthoracic ECHO (TTE) enables us to assess the heart condition, rule out any contraindications (Aortic regurgitation) for ECMO, to confirm the cannulas position in the major vessels, identify LV/RV distension, adequacy of ECMO flows. Our knowledge on anticoagulants and coagulation profile monitoring including TEG, enables us to manage the delicate coagulation system of the patient vs the artificial ECMO circuit in order to prevent excessive bleeding of the patient and at the same time avoiding ECMO circuit clotting. Once the ECMO is Initiated, maintenance of ECMO is done in coordination with the perfusion / intensivists team as per the standard ECMO protocols. Maintaining the ECMO flows, hemodynamic stability, reversing the acidosis, maintenance of key organs, ventilator management & sedating the unstable patients or extubating the patients when stable are other key areas where the anesthetists / intensivists are proficient in. Evaluating the patients on daily basis and the need for or termination of ECMO is the daily responsibilities of anesthetists. Providing anaesthesia for decannulation of ECMO is more crucial in order to prevent vascular injury. Management of ECMO complications, Infection prevention & providing anaesthesia for procedures on ECMO like surgical field exploration, tracheostomy are other important challenging avenues of practice for anesthesiologists.

The skills of Anaesthesiology Intensivists have created new avenues for developments in the management of critically ill patients and shock now referred to also as "SHOCK CONSULTANTS ". They are playing an increasingly central role in the management of advanced heart failure, shock, and mechanical circulatory support such as extracorporeal membrane oxygenation (ECMO) alongside cardiologist and cardiac surgeons. At times, insertion of ECMO after resuscitation with ECPR may be lifesaving.

Figure 1 : Showing ECMO in the emergency room following extended CPR

This mechanism also paves way for instituting ECCMO by the road side/ peripheral centre. Even within one's workplace, ECMO may be instituted at out of ICU set ups- in this case at the ER

Figure 2 : Showing institution of ECMO for a cardiac surgical patient in the CT room

With the advent of remote ICUs, telemedicine & remote bedside echo, the shock consultant or the ECMO specialist role is extended to triaging based on patient acuity, offering ideas for monitoring and management strategies, and recognizing when mechanical circulatory support or other specialized intervention is necessary .

and the need to transfer the patients to ECMO centre

Figure 2 : Showing ECMO and scoop from a peripheral Fortis unit

Mobile ECMO has been there for many years in Europe, US, UK and growing rapidly in our country. In situations where a patient is too unstable to be safely transported to ECMO care centre, the use of mobile ECMO to initiate ECMO support at a remote hospital with subsequent transportation to a ECMO centre with appropriate support. Mobile ECMO team consisting of cardiac anesthesiologist & perfusionists at the forefront of many mobile ECMO programs. Mobile ECMO runs are the most stressful situation where many things

could go wrong including equipment malfunction, transportation issues, and patient clinical deterioration. Having a Cardiac anaesthesia intensivists with a unique set of knowledge, procedural skills, and leadership attributes makes them clearly valuable as the leaders of mobile ECMO team, and the future for this role is bright. With the growing infrastructure of telemedicine, future of mobile ECMO is slowly progressing to home care ECMO programs too and our role would be even greater in bringing these new technologies and opportunities to the forefront.

Regardless of the future developments, it's vital to invest in the education and training of the next generation of cardiac anesthesiologists / intensivists as" ECMO specialists". We should look at building ourselves as leaders in the ECMO field in order to improve our overall patient safety & survival rates.

Elective ECMO – A Game Changer for Advanced Airway Procedures Under Anaesthesia: A Case Report

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Keywords

ECMO – Extra Corporeal Membrane Oxygenator, V-A ECMO – Veno Arterial ECMO, V-V ECMO – Veno Venous ECMO, TIVA – Total Intravenous Anaesthesia, HFNC – High Flow Nasal Cannulation, NIV – Non-Invasive Ventilation, IJV – Internal Jugular, VeinBIS – Bispectral Index, CPB – Cardiopulmonary Bypass

Abstract

This case report describes use of Elective ECMO for respiratory and airway management of a patient for anticipated hypoxia and difficult intra operative course with an infiltrating tumor of unknown origin causing near total airway obstruction in the intrathoracic part of the trachea just above the carina.

Rigid bronchoscopy and hot cautery were employed for the debulking process. A deeper plane of anaesthesia limiting the fraction of inspired oxygen to < 40% without intubating the patient was desirable. This posed extreme airway challenge risking complete loss of airway, resultant hypoxia and risk of mortality. The availability of ECMO in our institute was a welcome rescue option which was consensus choice by the anaesthesia and surgery team.

Femoro-Femoral venous cannulation done by two operators under local anaesthesia and awake VV ECMO was initiated. Once gas exchange was established, patient was administered TIVA sans muscle relaxant and the procedure was conducted uneventfully. Plane of anaesthesia was monitored using BIS monitor.

In this case patient tolerated total apnea using peripheral VV ECMO and maintaining the gas exchange for prolonged period to facilitate therapeutic

bronchoscopy and to secure the definitive airway in controlled environment. This case demonstrates that elective EMCO is a desirable first choice for successful peri-operative management of surgeries involving challenging airways caused by near total or complete airway obstruction.

Introduction

Optimum ventilation is essential for gas exchange and maintenance of oxygen saturation. The trachea-bronchial tree is key to the process and any pathology there is a shared area of intervention between surgeon and anesthetists. Hence, conventional methods of ventilation become high-risk and in this case the area of procedure was intrathoracic with lot of potential of procedural complications such as bleeding, migration and obstruction by resected mass and perforation etc. Additionally, hot cautery needed limits the use of higher oxygen concentration of inhaled air to under 40%.

ECMO is an advanced life-support modality traditionally used to provide gas exchange and circulatory support in emergency cases refractory to conventional medical therapy. In recent years it has also been used electively for complex trachea-bronchial and thoracic surgeries.1 They can be broadly divided into two main categories; Veno-Arterial (VA) for both hemodynamic and respiratory support and Veno-Venous (VV) for mainly respiratory support. Here we discuss a case of successful tracheal mass debulking through rigid bronchoscope in a 65-year-old diabetic male conducted under elective VV-ECMO and TIVA.

Case Report

65-years-male weighing 53 kg, a known diabetic presented with cough and breathlessness since a month. He was dysnoec on lying down, and preferred a reclining posture. His vitals in sitting position were – heart rate – 70 beats/minute, blood pressure – 140/80 mmHg, oxygen saturation on room air was 85 % while his respiratory rate was 35-45/ minute. On auscultation, wheeze was present on bilateral upper zone while heart sounds were normal. He was admitted in the ICU and administered high-flow oxygen through HFNC with FIO2 60% at 80 litres/minute which improved SpO2 to 96% and controlled the respiratory rate to less than 30/minute.

Blood investigations were unremarkable. ECG revealed ST segment depression and T wave inversion in leads II, III, V1 and V2 while the 2-D Echocardiography was normal.

ABG revealed pH - 7.414, pCO2 – 53.8, pO2 245 and HCO3 – 33.7 on the above HFNO settings.

HRCT chest showed long segment eccentric polypoid thickening/ soft tissue density lesion involving proximal 1/3rd of thoracic esophagus showing significant luminal compromise, seen extending to mediastinal fat, perivascular space, abutting the origin of great vessels/arch of aorta and infiltrating the left lateral wall of trachea showing intraluminal components and luminal compromise > 50% - imaging features suggestive of neoplastic etiology.

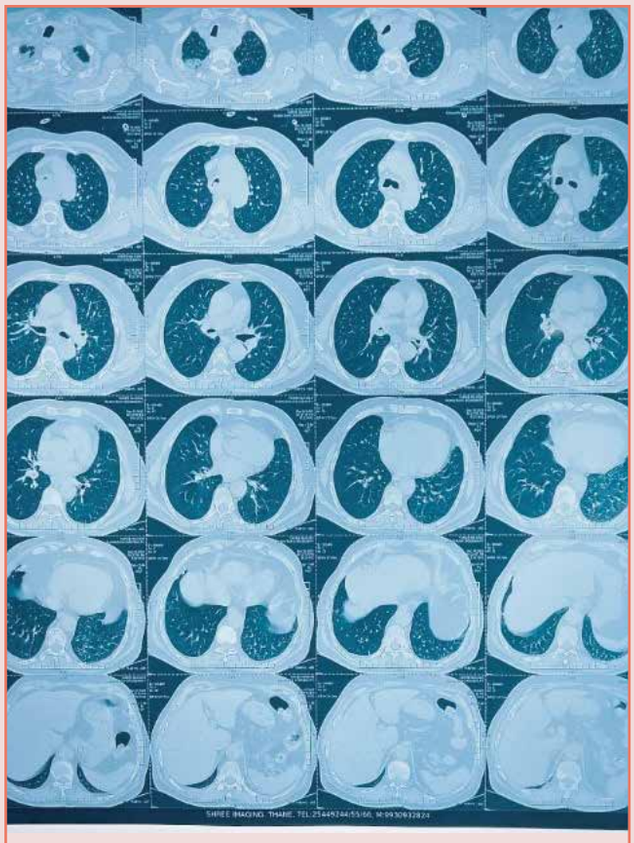

Figure 1 : CT thorax image showing luminal narrowing in intrathoracic tracheal segment

Multidisciplinary conference was held between the anaesthesiologist, pulmonologist, intensivist and ECMO specialist and the course of action was decided.

The pulmonologist decided to do tracheal debulking and tracheal stent placement using rigid bronchoscopy followed by a definitive management after evaluating the histo-pathology of the growth.

A pre-procedure evaluation of the airway was done using awake fibreoptic flexible bronchoscope. It confirmed the CT findings of a narrowing of > 50 % of the trachea in deep intra thoracic part just above the carina. (Figure 2)

Hence the rigid bronchoscopic debulking was planned under elective ECMO for gas exchange sans intubation and muscle relaxation with patient under total intravenous anaesthesia (TIVA). The patient and the caretakers were counselled and a written, informed

Figure 2 : Fibreoptic flexible bronchoscopy showing luminal narrowing of trachea above the carina

consent was taken.

Pre-operatively patient was wheeled to OT on NIV with settings IPAP – 16, EPAP – 6 on 5 litres O2, TV- 340 ml. Patient was maintained at 45 degrees near sitting position to relieve dyspnoea and distress and all preoperative lines including ECMO lines were inserted in this position.

Pre-procedure, right radial artery and left IJV (4 lumen) placed under local anaesthesia and USG guidance.

Femoral Veno-Venous ECMO established under LA and fluoroscopic guidance using 19Fr and 21 Fr femoral cannulae for return and drainage in the right and left femoral vein respectively conducted simultaneously by two ECMO specialists. (Figure 3a) Bio line coated adult ECMO circuit was chosen with minimal dose of heparin for initiation to avoid bleeding secondary to anticoagulation. The ECMO flows checked with transthoracic ECHO (Figure 3b) and cannula position confirmed with C arm (Figure 3c).

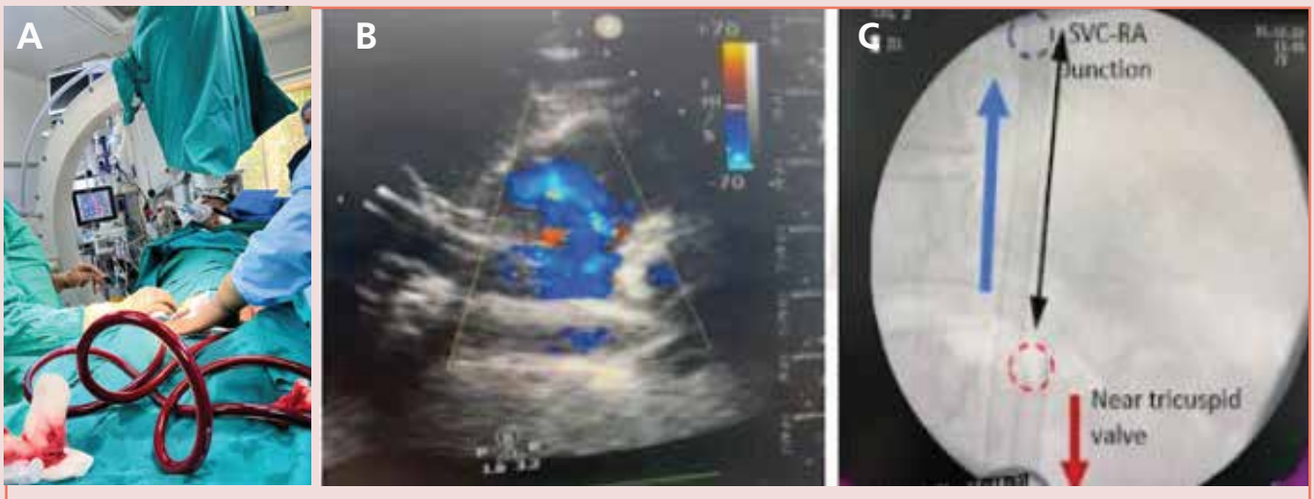

Figure 3a. 3b. 3c. Venovenous ECMO inserted in 45 degree head up position with ultrasound ECHO and C arm guidance

Once gas exchange was established, TIVA was induced using midazolam, 1 mg and fentanyl 100 mcg for anxiolysis and analgesia, followed by propofol 100 mg bolus and 75mcg/kg/min, dexmedetomidine 0.2-0.5 mcg/kg/minute and fentanyl infusion 1-2mcg/kg/hour with intermittent boluses of ketamine at 25-50 mg aliquots.

Plane of anaesthesia was titrated and monitored using BIS which ranged from 40-60. Patient received apnoeic ventilation with high flow nasal oxygenation (HFNO) at 40 – 50 L to maintain SpO2. Blood flow of 2.5 – 3 L was maintained and ECMO sweep gas flow at 2-3 L with FDO2 at 100 % to maintain hemodynamic stability and saturation above 95%. Fig 4a. Besides standard ASA monitoring, CO, SVR, SVV, SV monitoring was also done. Fig 4b Arterial blood gas (ABG) monitoring was done. During procedure patient maintained well on ECMO and HFNC.

Post procedure patient was intubated using 8.5 number ET tube under vision using flexible bronchoscope after haemostasis was achieved. ECMO was weaned off after trial off sweep for 1 hour inside the OT

On post-operative day, during the weaning of phase of spontaneous ventilation, dynamic bronchoscopy was performed through ETT no 8.5. Trachea revealed significant luminal patency and no paradoxical collapse was noted. Endotracheal-tube was gradually withdrawn and patient extubated. He was subsequently shifted on HFNC at 60 litres flow, 40% FiO2 and was off oxygen on post-operative day 2.

RPM: 2400
Blood Flows: 2.5- 3.0 LPM

Hemodynamic Stability
Saturations maintained above 95%

Figure 4a. 4b : Intraoperative ECMO settings and haemodynamic monitoring

The procedure was tolerated well by the patient and he remained vitally stable. There were no adverse events like bleeding, stridor or apnoea.

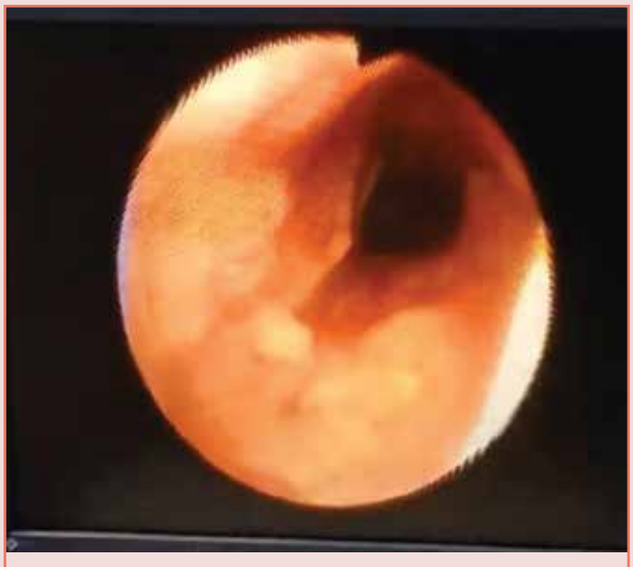

Figure 5 : Post-operative Fibreoptic confirmation of patency of trachea with no bleeding or collapse

Discussion

Esophageal malignancy is common in the elderly age group. The Esophageal mass is notorious for invading surrounding structures because it has no serosal barriers. They can present as stridor in emergency. Surgical resection of the mass is the gold standard treatment to relieve the obstruction. Palliative radiation and placement of tracheal stent may be done in advanced cases to maintain airway patency.

Our patient's presentation was typical of this group. Coughing, wheezing, and dyspnoea were the predominant symptoms. Many patients are initially misdiagnosed with asthma, and treatment delayed from the onset of symptoms. Most patients were treated with endoscopic or surgical removal of the tumour.2

ECMO and CPB are invasive and advanced interventions that can be lifesaving but also come with serious risks and possible complications. Increased risk of surgical bleeding due to the need for systemic anticoagulation is a disadvantage. Newer ECMO oxygenators made of polymethyl pentene have lesser need for anticoagulation compared to the polypropylene oxygenators used in CPB. The choice of peripheral VV-ECMO over cardiopulmonary bypass in this case minimized these risks.3 Advantages of using ECMO include a surgical field free of airway devices with a clear view of the posterior trachea during intervention.

Advance planning is necessary to ensure availability of equipment and perfusionist and personnel to manage ECMO.

Venovenous ECMO configuration used to achieve gas exchange acting as a surrogate lung and can be done with minimal anticoagulation, with percutaneous cannulation, achieving optimal oxygenation and CO2 removal with relatively fewer complications. Veno arterial ECMO configuration returns blood to the arterial side. VA ECMO is good for supporting circulation but may not achieve gas exchange targets in upper body due to differential cyanosis if percutaneous peripheral cannulation done. VA ECMO also has higher complication rate and requires optimal heparinisation. However certain mediastinal tumours needing sternotomy can be done on complete heart lung bypass by using central VA ECMO.4 In our case using an ECMO

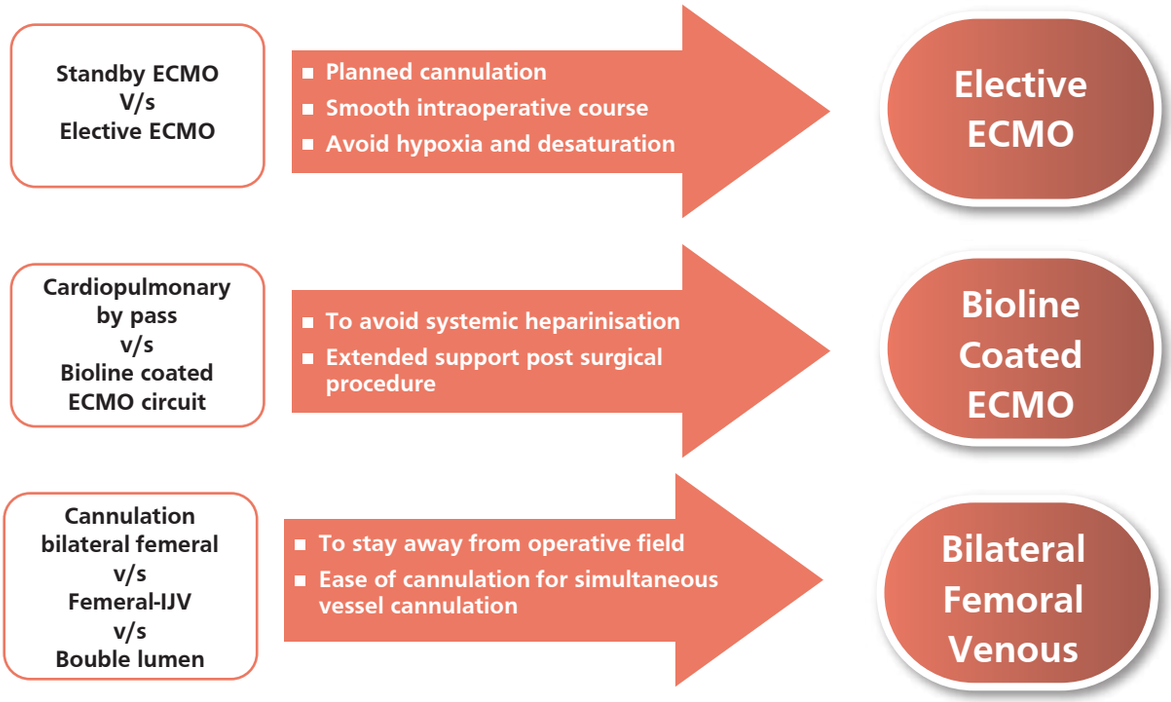

Figure 6 : Decision algorithm for choice of ECMO configuration consumables and cannulation strategy

circuit with access cannulas in the femoral i.e. Femorofemoral Venovenous ECMO with good bioline circuit avoiding heparinisation was considered the safest and best configuration. (Figure 6)

The length of these procedures are unpredictable. We managed to maintain the gas exchange over 4 hours as the stenting plan posed difficulty and led to extended manipulation of the airway.

Conclusion

Elective ECMO is a safe and desirable adjunct to anaesthesia for surgeries involving difficult airways such as near-occluded trachea due to an infiltrating mass. Multidisciplinary team approach is essential for a smooth conduct of such high-risk surgery. Use of ECMO aided in clear surgical field with no competition from the anaesthetist for airway management. In a tertiary care hospital as ours with advanced OT equipped with fluroscopy, TTE, USG, ECMO, flexible and rigid bronchoscopes, BIS and skilled team members including ICU backup any high-risk surgery can be handled safely with optimum outcome.

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Technological Advancement in Anaesthesia

Aviation and Anaesthesia: A Journey Through Time and Technology

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Around 2000 years ago, on the banks of the river Ganges in the city of Kashi, now known as Varanasi, lived Shushruta, renowned as the "Father of Surgery." Remarkably, even in those ancient times, Shushruta understood the critical importance of anesthesia for successful surgical procedures. He employed intoxicants such as wine and henbane (cannabis indica) to induce anaesthesia, ensuring patients could undergo surgery with reduced pain and awareness.

Since then, both anesthesia and surgery have advanced immensely, evolving into their contemporary forms. Achieving success in the most complicated surgeries today is heavily reliant on the unequivocal support provided by anesthesia a field offering the utmost comfort and safety to individuals when needed the most.

Anesthesia provides a magical state of ignorance and sleep to patients undergoing the most complex, intricate and high-risk surgeries, all while maintaining the highest safety standards. The art and science of anaesthesia have evolved over time, alongside surgical practices. This evolution encompasses advancements in equipment, drugs, anesthetic gases, and anaesthesia delivery systems, integrating principles of physics to ensure efficient and safe administration.

In many ways, anesthesia is akin to aviation—a field marked by its intricacies and magnificent advancements. Numerous fundamental laws of physics play a crucial role in designing anaesthesia delivery systems. For example, principles such as Venturi or Bernoulli's principle which in turn is also the basic principle on which the Jet Engines work. Similarly, Hagen–Poiseuille's law, Laplace's law, Boyle's law, and Graham's law are all utilized to facilitate the flow of gases from machines to the human body. It is indeed fascinating how physics is harnessed to keep patients' pain-free and under hypnosis during surgical procedures, protecting them from varying degrees of trauma.

In the early days, anesthesia machines were basic and lacked sophisticated safety systems. However, over time, these machines have evolved into integrated anaesthesia workstations, equipped with numerous safety mechanisms and alarm systems akin to those found in the cockpits of modern jetliners. While to err is human and anesthesiologists are not immune to making mistakes, contemporary anaesthesia machines' alarms and safety systems provide vital alerts, prompting immediate action to ensure patient safety.

Modern workstations integrate comprehensive monitoring systems, including vital signs, depth of anaesthesia, gas delivery and concentration, and drug delivery systems. This integration has significantly reduced anaesthesia-related complications, morbidity, and mortality. With the advanced anaesthesia workstations available today, the possibility of errors has become remote, as these systems offer multiple warnings to prevent mishaps.

The parallels between anesthesia and aviation extend to their commitment to safety and error reduction. Both fields strive for a zero-error policy, recognizing that any mistake can have potentially life-threatening consequences. The modern goal of anesthesia is to achieve zero errors in the interest of patient safety, comparable to the aviation industry's rigorous standards. The journey through general anesthesia can be likened to a trip in an airplane. The pre-flight engineering check-up of an airplane mirrors the pre-anaesthesia check-up, identifying potential risks

beforehand. Taxiing towards the runway is comparable to preoxygenation just before inducing anaesthesia. The induction of anesthesia is as sensitive and vital as the take-off of an airplane. Maintaining anaesthesia is similar to controlling flight operations while cruising at an altitude. Finally, awakening from anaesthesia and the subsequent observation and monitoring phase can be compared to landing and taxiing back to the aerobridge.

In conclusion, the fields of anesthesia and aviation, through their evolution and reliance on scientific principles and advanced technology, highlight the profound commitment to safety, precision, and the well-being of individuals. Both domains demonstrate the remarkable progress humanity has made in ensuring comfort and safety in critical and high-stakes environments.

Anaesthetic Management of Robotic Bilateral Cortical Sparing Adrenalectomy and Paraganglioma Excision in a Pediatric Patient

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Pheochromocytomas are catecholamine-secreting tumors from adrenal medulla chromaffin cells, accounting for 0.5-2% of pediatric hypertension. Paragangliomas arise from extra-adrenal chromaffin cells of sympathetic or parasympathetic ganglia, usually found in children aged 6-14. In children, these tumors are often linked to genetic syndromes or familial diseases like neurofibromatosis, Von Hippel-Lindau disease, and multiple endocrine neoplasia (MEN) types 2A and 2B. Diagnosis involves detecting elevated urinary and plasma metanephrine and normetanephrine levels, confirmed by CT and MIBG scans. Complete surgical resection, preferably laparoscopic or robotic, is the definitive treatment due to early recovery and minimal tissue handling, which avoids intraoperative blood pressure spikes associated with open surgery.

Anesthetic goals include perioperative blood pressure control, blood volume restoration, and arrhythmia management. This case report describes the clinical presentation and anesthetic management of robotic cortical-sparing resection of pheochromocytoma and paraganglioma mass excision, noting the physiological effects of pneumoperitoneum, CO2 absorption, patient positioning, and robotic docking/undocking.

Case Report

A 14-year-old male, 58.8 kg, was scheduled for robotic bilateral adrenalectomy with paraganglioma excision. Incidentally diagnosed during a work-up for circumcision due to blood pressure of 170/120 mmHg, he showed no symptoms like headache, diaphoresis, or palpitations. His mother had undergone adrenalectomy for pheochromocytoma, suggesting a familial condition. MRI revealed bilateral large suprarenal masses and a small presacral mass. The MIBG scan confirmed bilateral pheochromocytomas with elevated normetanephrine and metanephrine levels, normal aldosterone and cortisol levels, and slightly raised parathyroid hormone levels. ECG was normal, but 2D echocardiography showed left ventricular hypertrophy from prolonged hypertension. Antihypertensive drugs normalized his blood pressure to 110/80 mmHg within a month, after which he was scheduled for surgery.

Preoperative planning included general anaesthesia with controlled ventilation, invasive intra-arterial monitoring, and central venous pressure monitoring. Routine monitoring involved ECG, pulse oximetry, capnography, and temperature monitoring. Anxiolytic midazolam was administered preoperatively, followed by fentanyl, propofol, and cisatracurium for anaesthesia induction, with xylocard to suppress the sympathetic response to intubation. Anesthesia maintenance involved air: oxygen 50:50, sevoflurane, atracurium, dexmedetomidine, and nitro-glycerine. Intra-abdominal pressure during pneumoperitoneum was kept at 14 mmHg.

During surgery, the patient was positioned for left adrenalectomy, with the Da Vinci Xi Robot docked. Hemodynamic were stable during docking. Blood pressure spikes during tumor handling were managed with increased NTG, fentanyl, and dexmedetomidine.

Post-tumor ligation hypotension was treated with fluid boluses, albumin, and low-dose noradrenaline. Paraganglioma excision proceeded without major hemodynamic instability. Right adrenalectomy involved similar management strategies.

Surgery lasted 12 hours with 500 ml blood loss, managed with colloid replacement. Postoperative analgesia included an ultrasonography-guided quadratus lumborum fascial plane block. The patient was extubated post-surgery and observed in the ICU, with an unremarkable postoperative stay, and was discharged on day 5.

Blood Biochemistry of Our Patient		
		Normal Range
Free Plasma Normetanephrine	3996	<195
Normetanephrine	2220 ncg /L	
24 hrs Urinary Normetanephrine levels	5772 mcg/24 hr	< 600 mcg/24 hr
Normetanephrine: Creatinine ratio	6937.5 mcg/g creatinine	102- 262 mcg/g creatinine
Vanillylmandelic Acid z	37.28 mg/24 hrs	0- 18 mg/24 hrs
Aldosterone	13.6 ng/dl	1.76- 23.2 ng/dl
PTH	86.4	15- 68.3

Discussion

Pheochromocytoma and paraganglioma in children, often linked to familial diseases, present mainly between 6-14 years, with a male preponderance. Clinical symptoms include headache, sweating, palpitations, and fatigue, with sustained hypertension in 60-90% of Paediatric cases. Diagnosis relies on elevated free plasma and urine metanephrine levels. Imaging studies localize tumors, with MIBG scans confirming their catecholamine-secreting nature.

Surgical resection is the treatment of choice, with blood pressure optimization crucial preoperatively. Alpha blockers are preferred for preoperative hypertension management, followed by beta blockers. Increased water intake helps manage hypertension by increasing blood volume.

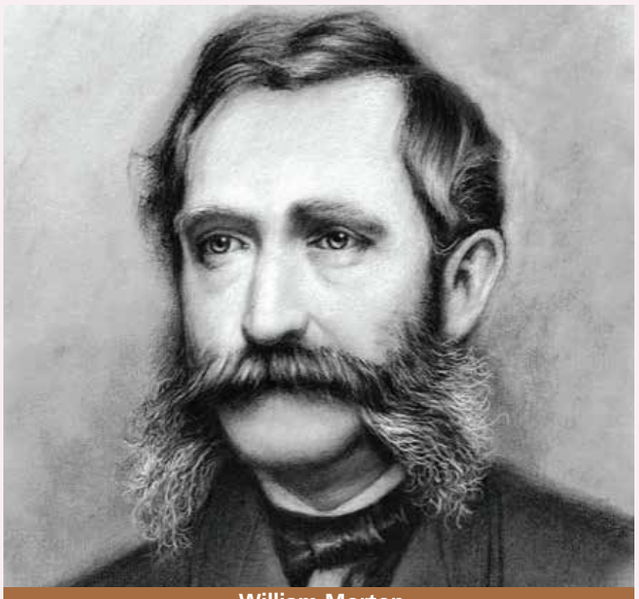
Robotic surgery offers benefits like better dexterity, surgical exposure, reduced tissue dissection, early mobilization, and less postoperative pain. However, it presents unique challenges like patient positioning, limited access, and CO2 insufflation effects.

Anaesthesia management focuses on preventing sudden blood pressure spikes, maintaining deep neuromuscular blockade, and managing intraoperative hypertension and post-tumor resection hypotension. Measures include preoperative anxiolytics, controlled ventilation, intraoperative drugs, and fluid management.

The robotic approach in paediatric patients requires careful planning and a multidisciplinary approach for optimal outcomes, considering physiological changes and anaesthesia management during robotic surgery.

Conclusion

Pheochromocytoma and paraganglioma in children are often familial. Early detection through screening and a multidisciplinary approach yields better outcomes. Robotic surgery, when well-planned, offers excellent results in managing these tumors in paediatric patients.



William Morton
"Father of Modern Anesthesia"
William Morton is famous for his public demonstration of Ether Anesthesia at the Massachusetts General Hospital in 1846, which helped establish its use in surgical procedures.

Sudden and Persistent Bradycardia: An Unexpected Indicator of Pin-Site Extradural Hematoma in a Paediatric Patient

Source: https://www.researchgate.net/publication/326014611_Sudden_and_Persistent_Bradycardia_An_Unexpected_Indicator_of_Pin-Site_Extradural_Hematoma_in_a_Pediatric_Patient

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Depressed skull fracture and extradural hematoma are infrequent complications of skull pin fixation in children undergoing craniotomy. Neurosurgeons are often alerted about these complications by intraoperative brain swelling or postoperative neurological deterioration. We describe the development of pin-site extradural hematoma in a child on whom Mayfield skull clamp was applied during posterior fossa tumor excision. Sudden and persistent bradycardia observed by the anaesthesiologist served as the sole warning sign. Such an on-table indicator of pin-site extradural hematoma has not been described earlier. The anaesthesiologist must maintain vigilance and effective communication with surgical colleagues to ensure early detection and timely management of these pin-site complications.

Keywords

Bradycardia, cranial fixation, depressed skull fracture, extradural hematoma, pediatric, pin-site complications, posterior fossa

Challenges in Anaesthesia for Robotic Assisted Bilateral Pheochromocytoma in a 14-year old Adolescent Patient

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Case Report

A 14-year-old male was scheduled for robotic bilateral adrenalectomy with paraganglioma excision after being incidentally diagnosed with pheochromocytoma during preoperative evaluation for a circumcision. His blood pressure was 170/120 mmHg, with no other symptoms. An MRI confirmed bilateral adrenal masses and a presacral paraganglionic mass. Blood tests showed elevated normetanephrine and plasma metanephrine levels, confirming the diagnosis. Preoperatively, he was managed with antihypertensive medications including nifedipine, prazosin, and metoprolol, normalizing his blood pressure to 110/80 mmHg. The surgery was performed with a robotic approach, involving multiple positional changes and careful intraoperative hemodynamic management. The patient was successfully extubated postoperatively and transferred to the ICU with no inotropic support.

Challenges in Anesthetic Management

This patient was a young **14-year** old adolescent and anxiety was a factor that affects the hemodynamic preoperatively. Upon arrival on operating table **anxiolytic** dose of midazolam was administered to the patient. In adult patients with pheochromocytoma, an arterial line is inserted under local anaesthesia before inducing general anaesthesia. This gives beat to beat variability. But since the patient was young and anxious it was decided to insert arterial line after giving general anaesthesia. **Laryngoscopy** and **intubation** are challenges for the hemodynamic controls. Additional medicines like i.v. lignocaine 2mg/kg were administeredto suppress the sympathetic responses

during laryngoscopy and intubation.

Lateral position is required for surgical approach of both adrenals. Hence, for bilateral adrenalectomy the patient was positioned in both right and left lateral positions for removing right and left adrenals respectively. Since this patient also had a parasympathetic ganglion mass in pelvic cavity, supine position was given for this part of surgery. This means **position** of the patient was changed **three times intraoperatively** i.e. left and right lateral for adrenalectomy and supine for parasympathetic ganglion excision. The change in position of patient requires **Docking** and **Undocking** of the Robot. This entire exercise increases the duration of surgery which in our case was **12 hours** of surgery.

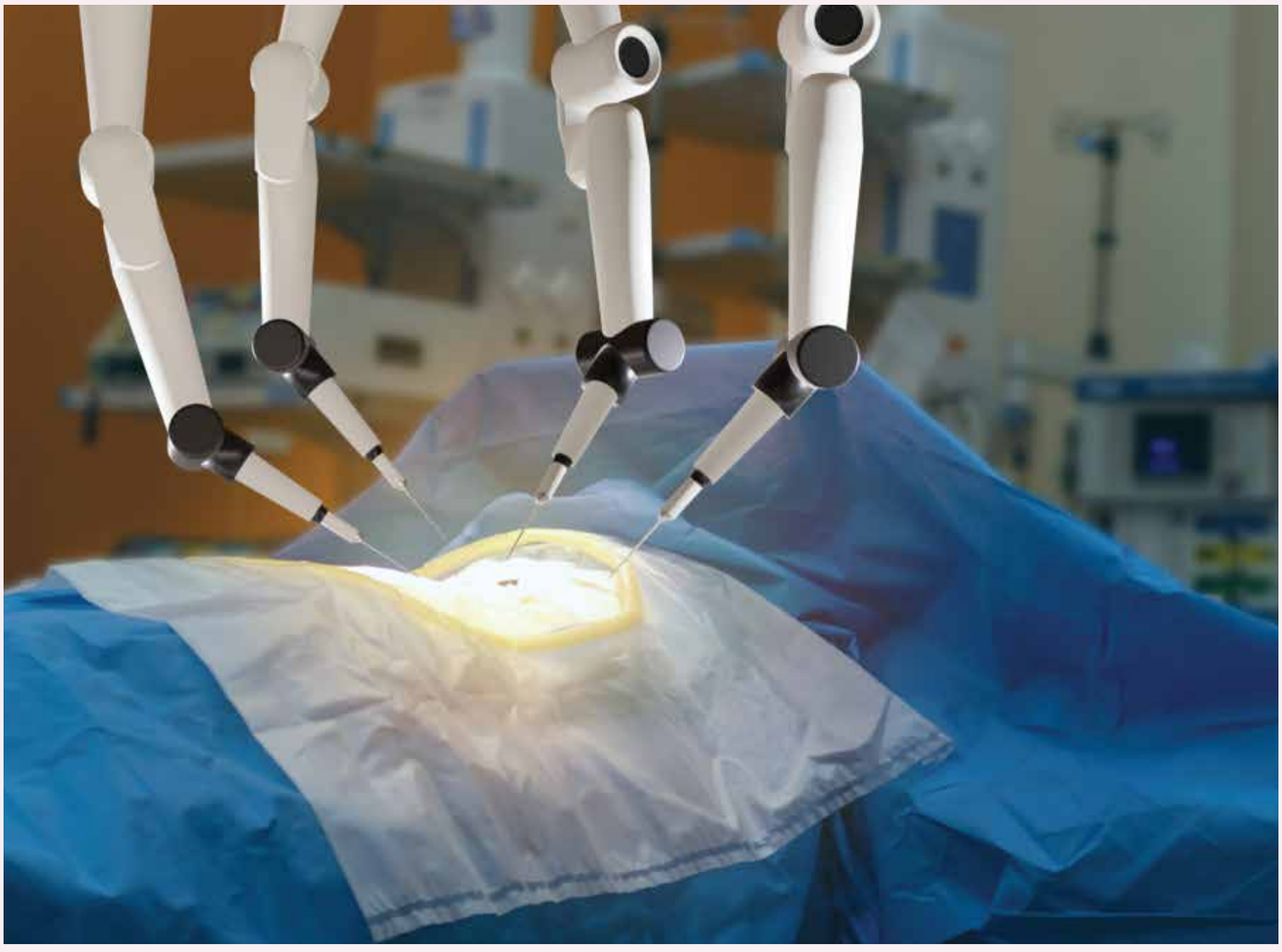
The biggest challenge is intraoperative control of hemodynamic during surgical handling of the tumour. Despite a good depth of anaesthesia, the blood pressure(BP) surges are inevitable. Additional medications like NTG, metoprolol, dexmedetomidine were used to control blood pressure.

The highest surge of BP was seen at the time of ligating the left renal vein. Blood Pressure was **275/140** mmHg and Heart rate was 90-100/ min.

After the removal of left adrenal, the BP dropped and had to be supported by i.v noradrenaline at low dose of 0.1 mcg/kg/min. The BP remained low (systolic 90-100 mmHg) during removal of paraganglionic pelvic mass when the patient was in supine position.

The right adrenalectomy was uneventful with not much hemodynamic changes although noradrenaline was continued in low dose.

The biggest benefit of Robotic approach is less tissue handling so less postoperative pain. Our patient was young and so controlling postoperative pain was very vital. In adults undergoing similar surgery we use epidural analgesia for postoperative pain relief. This epidural needs to be inserted under local anaesthesia with awake patient in sitting or lateral position. Considering the young age of our patient he would have been uncooperative for such a procedure. So, we gave ultrasound guided quadrates lumborum and Erector Spinae Fascial Plane block under anaesthesia at the end of surgery. The patient was absolutely comfortable and pain free after extubation on table. Patient was shifted to ICU with no ionotropic support. As it was a Robotic approach there was minimal blood loss and we did not transfuse any blood to him.



Regional Anaesthesia

Paravertebral Block: A Safe Alternative for Microdiscectomy in a Pregnant Patient

Source: https://sci-hub.se/10.1213/XAA.0000000000000921

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Although most modern anesthetic agents have no teratogenic effects at clinical doses, the greatest risk to the fetus is any process that causes maternal hypoxia or hypotension. General and regional anaesthesia, both have possibility of hypotensive episodes during the procedure, hence regional nerve blocks are being explored as possible alternatives wherever feasible. Here, we present a case of a pregnant woman with precious pregnancy in her first trimester, who presented with Cauda Equina Syndrome which is a surgical emergency. She was planned for an urgent minimally invasive discectomy. After detailed discussion with the patient and surgeon about various anaesthesia techniques (general anaesthesia, spinal or epidural anaesthesia, modified bilateral paravertebral block), we agreed to get the procedure done under ultrasound guided bilateral paravertebral block. The patient remained comfortable throughout the procedure and fetal heart rate before and after the procedure was stable. In the follow up, patient and fetus remained stable till discharge.

We propose lumbar paravertebral block as safe alternative anesthetic for limited lumbar spine surgery in early pregnancy.

Keywords

paravertebral block, cauda equina syndrome, pregnancy, first trimester

Efficacy of Port-Site Infiltration with Ropivacaine Alone versus Ropivacaine with Fentanyl for Postoperative Analgesia in Patients Undergoing Laparoscopic Procedures

Source: https://www.medicainnovatica.org/medicajuly22/5.%20Kaushal.pdf

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Background and Aims

Wound infiltration as a pre - emptive measure to relieve post-operative pain is a common practice following laparoscopic procedures. The addition of adjuvants like opioids to local anaesthetics can facilitate the prolongation of postoperative analgesia. Our primary aim was to compare the analgesic efficacy of peri-portal infiltration of Ropivacaine alone versus Ropivacaine with Fentanyl in patients undergoing laparoscopic operations.

Methods

The study was conducted on 80 ASA physical status I and II patients, aged 18 to 65 years, undergoing surgical procedures under general anaesthesia. Group R was infiltrated with Ropivacaine (0.5%) (18ml+2ml saline) while in Group RF, Ropivacaine(18ml) with Fentanyl 2ml (100µg)] was infiltrated around ports, before wound closure. At the end of the surgery, one of our study drug solutions was infiltrated, to which the patient as well as the assessor were blinded. Postoperative pain was assessed by the VAS (visual analogue scale) score. Injection Tramadol 100mg was given as a rescue analgesic if the VAS score was ≥ 3. Student's t-test and Fischer's exact test were applied for continuous and categorical variables; Kruskal Wallis and Mann Whitney U test for nonparametric data. The entire statistical analysis was done using STATA 13 [STATA CORP. TEXAS, USA] software.

Results

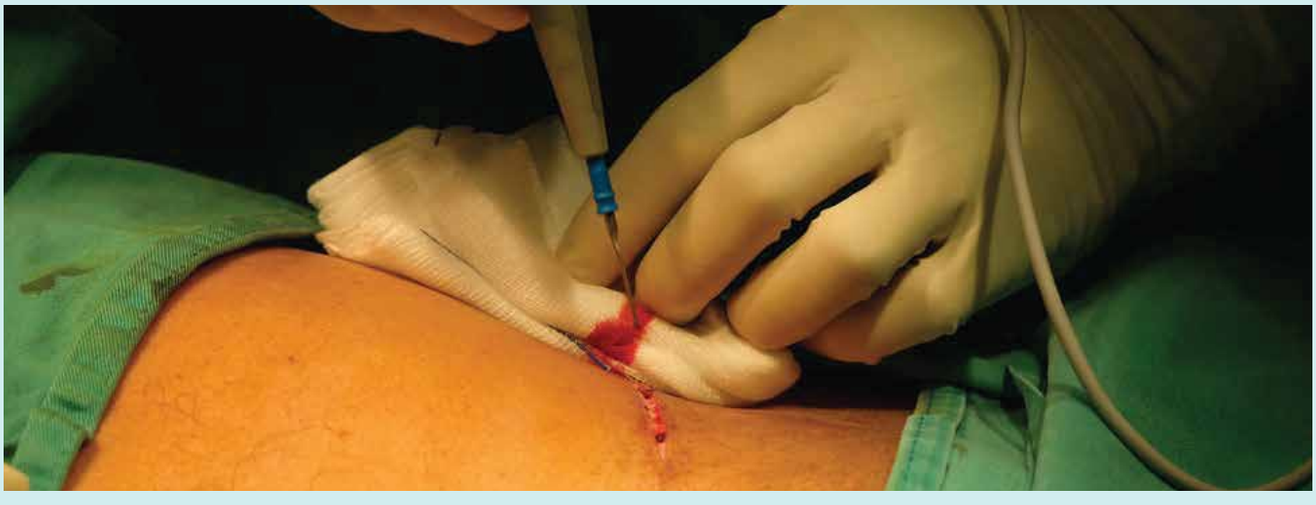
The mean duration of analgesia was significantly longer in group RF, with a requirement of fewer doses of rescue analgesics, compared to group R.

Conclusion

The addition of Fentanyl to Ropivacaine for periportal infiltration was found to be superior to Ropivacaine alone in providing effective postoperative analgesia as well as reducing the requirement of rescue analgesics.

Keywords

Ropivacaine, Fentanyl, Post-operative analgesia, Port site infiltration, VAS (Visual Analogue Scale), Laparoscopic procedures.



Stellate Ganglion Block and Neurolysis for Refractory Ventricular Arrhythmia

Source: https://www.researchgate.net/publication/354921390_Stellate_Ganglion_Block_and_Neurolysis_for_Refractory_Ventricular_Arrhythmia_Case_series?enrichId=rgreq-479bfbae7084bf027db00209bf231221-XXX&enrichSource=Y292ZXJQYWdlOzM1NDkyMTM5MDtBUzoxMDczMzIxMDA5NTA0MjU2QDE2MzI5MTEwNzg2OTg%3D&el=1_x_3

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Introduction

Recurrent and refractory ventricular arrhythmias (VAs) are major hemodynamic events that predict morbidity and mortality in cardiac disease patients.[1] Medical and cardiac-electrophysiological therapies aimed at downscaling these arrhythmias can significantly improve the patient outcomes.[2] The role of the autonomic nervous system (ANS) in the escalation of cardiac arrhythmogenicity must not be overemphasized; however, down-regulatory ANS therapies are not without systemic adverse effects.[3] Novel therapies such as cardiac sympathetic denervation, catheter ablation of arrhythmia trigger zone, thoracic epidural blockade (TEB), spinal cord stimulation (SCS), and stellate ganglion blocks (SGB) assume relevance in this context.[4]

SGB, a widely used diagnostic/treatment modality for vascular insufficiency and sympathetically mediated upper extremity pain, has gained considerable acclaim for managing highly selected cases of refractory VA. [5] We report three patients with refractory VA management due to varied etiology, who were treated with left SGB (LSGB) under ultrasonography and fluoroscopy guidance. Written informed consent was obtained from all the participating patients or their legal representatives.

Case Reports

Case 1

A 54-year- old male patient diagnosed with hypertrophic obstructive cardiomyopathy, with left ventricular ejection fraction (LVEF) 45% presented to us with episodes of recurrent symptomatic ventricular tachycardia (VT). The patient had undergone alcohol septal-ablation and implantable cardioverter -defibrillator (ICD) placement 3 months prior. Subsequently, the patient had undergone radiofrequency ablation of VT trigger zone with 3-dimensional mapping using the CARTO mapping system. Under fluoroscopic and ultrasonographic guidance, we performed an LSGB with bupivacaine 0.5% and subsequently left stellate ganglion chemical neurolysis with phenol. Sinus rhythm with intermittent sinus tachycardia was achieved immediately after the procedure. Thereafter, on 8 months periodic follow-up, the patient remained free of VA, and medical management was de-escalated to single oral anti-arrhythmic.

Case 2

A 62-year-old female patient with acute myocardial infarction (LVEF 25%) underwent percutaneous coronary intervention (PCI). PostPCI, the patient was mechanically ventilated (MV) because of ongoing congestive heart failure. The patient sustained recurrent VT intractable to lignocaine and amiodarone intravenous (IV) infusions in the intensive care unit. Check coronary angiogram revealed no residual or subacute thrombus. We conducted LSGB [Figure 1a and b] using a local anesthetic (LA) after which, anti-arrhythmic infusions were tapered and discontinued and block repeated after 48 h with similar dose of LA [Table 1]. The patient was serially weaned off from MV and anti-arrhythmic infusions.

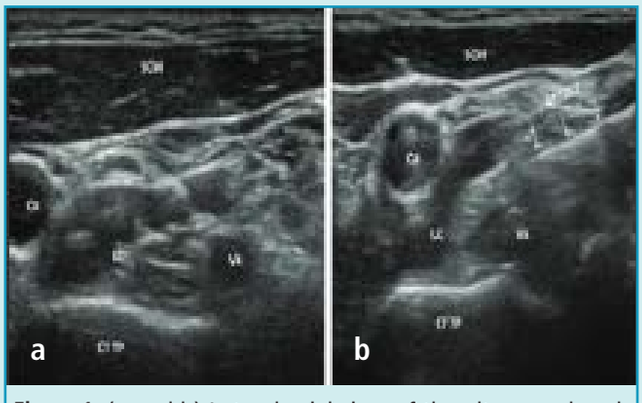

Figure 1: (a and b) Lateral axial view of the ultrasound neck image at the G7 vertebral level. (a) Showing identification of C7 transverse process and surrounding structures for giving stellate ganglion block at an appropriate level. (b) Showing echogenic needle trajectory approaching the target point toward cervical sympathetic chain and stellate ganglion.

Table 1: Demographic and patient characteristics of the cases studied

Variable	Case 1	Case 2	Case 3
Age (years)	54	62	68
Gender	Male	Female	Male
Type and frequency of VA	Recurrent VT, 3-4 episodes per day	Recurrent VT, 4-5 episodes per day	Recalcitrant VT in the postoperative period after CABG
Underlying Pathology	Hypertrophic obstructive cardiomyopathy	Ischemic heart disease after PCTA	Ischemic cardiomyopathy after CABG on IABP
LVEF	45	25	20
Possible Trigger	No triggers	Inadequate sedation	Inadequate sedation
Anti-arrhythmic medications used	Oral-amiodarone and sustained release metoprolol	Intravenous-lignocaine and amiodarone infusion	Intravenous-amiodarone lignocaine, esmolol
Procedure/treatments received before or after SGB	Alcoholic septal ablation with implantable cardioverter defibrillator in situ	Nil	Nil
Interventional Technique	Left SGB with bupivacaine under fluoroscopic guidance followed by left SG chemical neurolysis with 6ml of 8% phenol under ultrasonography and fluoroscopic guidance	Left SGB with bupivacaine 0.25% under ultrasonography guidance, repeated with same dose after 48hrs	Left SGB with bupivacaine under ultrasonography guidance
Type and volume of LA	12mL of 0.5% bupivacaine plain	8mL of 0.25% bupivacaine plain	10mL of 0.25% bupivacaine plain
Immediate follow-up	Arrhythmia-free for 48 h immediately after SGB	Arrhythmia-free for 48 h on Amiodarone infusion	Left SGB ceased VT for 48 h
Reduction of VA and defibrillator shocks	No shockable rhythm post-SGB	No shockable rhythm post-SGB	No shockable rhythm post-SGB
Long term follow-up	Arrhythmia free on periodic follow-up up to 8th postprocedurial month; continued on oral metoprolol only	VA controlled on oral amiodarone and metoprolol	Mortality

CABG: Coronary artery bypass grafting, **IABP:** Intra-aortic balloon pump, **LA:** Local anaesthetic, **LVEF:** Left ventricular ejection fraction.

PTCA: Percutaneous transluminal coronary angioplasty, **SGB:** Stellate ganglion blockade, **VA:** Ventricular arrhythmia, **VT:** Ventricular tachycardia.

Case 3

A 68-year-old patient with triple-vessel coronary artery disease developed recurrent VT with cardiogenic shock immediately following coronary artery bypass graft surgery [Table 1]. Arrhythmia is resistant to medical management (IV amiodarone, lignocaine, and esmolol infusion) and electrical cardioversion. Bedside ultrasound-guided LSGB [Figure 1a and b] terminated VT, however the patient was on mechanical ventilation and haemodynamic was supported with noradrenaline and intra-aortic balloon pump and arrhythmia were controlled on amiodarone infusion. However, on the 5th postoperative day, this patient succumbed to a

resistant cardiogenic shock.

Discussion

Electrical storm (ES) refers to a sustained cardiac electrical instability, with recurrent hemodynamically unstable VA (≥3 episodes in 24 h), which needs intervention with a defibrillator/ICD. [1] Sympatho-excitatory activity is enteropathogenic to ES and VA, often encountered in-patients with acute MI, dyselectrolytemia, arrhythmogenic drug therapy, hyperthyroidism, infection, and/or fever. [6] The therapeutic approaches such as LSGB, SCS, and TEB aim at modulating this accelerated adrenergic tone. [3,4] The LSGB can be used as a rescue therapy following catheter ablation or patients with cardiopulmonary collapse and as a bridge before catheter ablation in drug-resistant VA.

Left stellate ganglion is the site of the majority of efferent sympathetic outflow to the heart. [4] LSGB, devoid of systemic effects of SCS and TEB, and reduces the VA's risk by blocking cardio-accelerator fibres. Mediation of non-noradrenaline synaptic pathways with Neuropeptide Y and Galanin is unique to postganglionic axons of the stellate ganglion. [7] The standard treatment does not address these mechanisms. LSGB offers the upper hand of interrupting noradrenaline signalling and "blocking" additional signalling pathways, irrespective of the VA triggering mechanisms. [8] The longer duration of LSGB relative to the half-life of LA is most likely related to neuroplasticity that allows the ganglion to reset, reducing sympathetic stimulation. We followed the lateral approach for ultrasonography-guided LSGB associated with less risk of injury to vascular and visceral structures. [9]

Nademanee et al. have demonstrated the superiority of LSGB-like sympathetic block-guided therapy over ACLS-guided therapy in recurrent VA with low 1-week mortality and high 1st-year survival ($P < .0001$).[6] Recent research and meta-analysis on the influence of SGB in resistant VA have evidenced its efficacy in terms of mortality and de-escalation of medical therapy.[8-11] Nevertheless, this literature is plagued by a low sample of cases (35 cases from 22 studies/case reports[5] and 38 cases from 23 studies/case reports);[8] selection bias of retrospective data from the positive study result cases; variable outcome parameters and lack of control groups. Our case reports uniquely demonstrate the efficacy of LSGB in VA resistant to ablative interventions and VA refractory to ICD. We also used LSGB as a rescue/ bridging therapy in hemodynamically unstable patients before trigger-zone ablation/ICD placement. LSGB is also feasible in patients on anti-coagulation where TEB and SCS are contraindicated. [12] Further, the bedside performance of LSGB is an added advantage in unstable patients on MV who cannot otherwise be mobilized to catheterization laboratory. Prospective studies with a larger pool of cases in future can further delineate the exact position of LSGB in resistant VA.

Conclusion

LSGB may serve as a rescue option in refractory cases to standard treatment protocols for patients with VA. It can reasonably be recommended as an alternative therapy or as part of combination therapy for the management of ES or recurrent VA.

General Anaesthesia

Comparison of Postoperative Analgesia and Opioid Requirement with Thoracic Epidural vs Continuous Rectus Sheath Infusion in Midline Incision Laparotomies under General Anaesthesia – A Prospective Randomized Controlled Study

Source: https://www.researchgate.net/publication/344007600_Comparison_of_postoperative_analgesia_and_opioid_requirement_with_thoracic_epidural_vs_continuous_rectus_sheath_infusion_in_midline_incision_laparotomies_under_general_anaesthesia_-_A_prospective_rand#full-text

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Background and Aims

To assess and compare the effect of bilateral continuous rectus sheath infusion (CRSB) for postoperative analgesia with continuous thoracic epidural infusion (TEA) in patients undergoing midline incision laparotomies.

Methods

A prospective, randomised study involving sixty patients with Indian Society of Anaesthesiologists (ASA) grade I to III, planned for elective laparotomy were enrolled for the study. Patients were randomly allocated into two groups. In the TEA group, an epidural was sited before induction of general anaesthesia (GA), whereas in the CRSB group, bilateral ultrasound-guided RSB catheters were placed at the end of the surgical procedure, before extubation. Both groups received continuous 0.2% Ropivacaine infusion for postoperative analgesia. They were followed for two post-operative days (POD), for the opioid requirement and post-operative pain at rest, coughing, and moving. Age and body mass index (BMI) were compared using independent t-test and visual analogue scale (VAS) scores were compared by the Mann–Whitney test between the two groups. Opioid consumption, gender, and type of surgery were compared using the Chi-Square test. Statistical analysis was done using Statistical Package for Social Sciences (SPSS 21.0).

Results

Opioid consumption in both groups was comparable, for the first two post-operative days with no statistically significant difference. Pain scores were comparable among the groups at all times except postoperative day (POD) 0 (4 h and 12 h postop) and POD 2 (8 AM and 12 PM), where lower pain scores were observed in CRSB Group.

Conclusions

As a part of the multimodal analgesia technique, CRSB offers a reliable, safe, and effective alternative to TEA.

Key words

Analgesia, epidural analgesia, laparotomy, pain, post-operative, rectus sheath block

Sir James Young Simpson

"Father of Obstetric Anesthesia"
He is recognised for his pioneering use of chloroform in childbirth, which he introduced in 1847. His work significantly advanced pain management during labor.

Artificial Intelligence and its Likely Impact on the Practice of Anaesthesia

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Artificial intelligence (AI)

Its presence seen in every walk of life. Available applications of AI are, image recognition, natural speech processing, language translation, textual analysis, interpretation of factual situations and self-learning. Their value has well been realized in many fields; they are potentially useful in medical field including anaesthesia. The literature is flooded with articles on AI and medicine. Since image analysis is adaptable to AI, radiology, ophthalmology and dermatology have received support from AI. The AI interpreted reports are more accurate than the ones from board certified doctors. The question is whether similar possibility exists for anaesthesia?

AI and anaesthesia

The practice of anaesthesia involves a combination of art and science, not only sound theoretical knowledge but also hand skills. High reliability, quick interpretation, physical action, and response is expected of an anaesthesiologist rather than any single cognitive act that could be automatically carried out by a machine. (1) It is a reasonable expectation that AI is unlikely to invade anaesthesia the way it conquered other image-based specialties. Anaesthesiology is a subspecialty of medicine that operates on a strong foundation of physics, chemistry, fluid dynamics, image interpretation, probability; therefore, predictions based on AI about these should be easily forthcoming. AI is has also made inroad into hemodynamic predictors based on RR interval variation, non-invasive measurement of cardiac output and prediction of hypoxia/ hypotension. Though the thought of anaesthesiologists regarding AI not controlling how anaesthesia is administered, may be wishful, it is only when, not if AI would replace a portion of anaesthesiologist's roles. Automated drug delivery based on the inputs about comorbidities, allergies, genetic predispositions, drug interaction (with the ongoing treatment for concomitant diseases) is a possibility that will render the anesthetic safe in high risk patients.

A landmark publication by Lee and co-workers appears to be one of the first application of AI in anaesthesia indicating the power of AI in predicting the depth of anaesthesia based on big data. (2). They noted "The deep learning approach in anesthetic pharmacology seems promising because of its excellent performance and extensibility. Using deep learning neural network, the prediction of the BIS value was exceptional". It may be prudent to assume that at some point, the decision making of the human mind during an anesthetic may be taken over or overtaken by AI.

The quality and quantity of the AI impact on anaesthesia is likely to be unprecedented. It is crucial for anaesthesiologists to prepare for the interactions of it. AI will automate cognitive work; however, anaesthesia is dexterity-based talent, tasks such as vascular cannulations, endotracheal intubations, interpreting reports and incorporating in therapeutic modality, adjusting doses may not be easily automated – but not impossible. However, image-based analysis is a low hanging fruit for AI to handle. Many innovations in these areas should be forthcoming in the field of anaesthesia too.

It is likely that many integral parts of anaesthesia such as assessment of airway, prediction of hypoxia/ hypotension/ requirement of postoperative ventilation/ critical care stay/ adverse reaction to anesthetic agents/ dose alteration in disease conditions may be supported by AI. Since AI is 'self-learning' the importance of these contributions could only get exponentially greater.

The impact of AI on predictive analytics, customized anaesthesia (planning and delivery), postoperative care, pain management, data driven decision making and self-learning and improvement of existing outcomes is not only exciting but a massive interruption of existing practices. On one hand it is interesting to understand the developments of AI, while on the other, a daunting proposition that AI is likely to outperform humans. It is predicted that it may be a matter of time before

machines replace human doctors. (3). AI is akin to fire – at a safe distance, it provides warmth and at close proximity harm. Medical doctors must put AI to use, it could reduce errors and improve outcomes, anaesthesiologists are no exception. The coming days will be full of surprises for sure.

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Paradigm Shift in Management of High-Risk Robotic Urological Procedure – An Anaesthesiologist's Perspective

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Key Points

- Multi-organ compromised patients cohort seeking minimally invasive robotic surgeries are ever increasing.
- Newer norm is to accept the complicated patient's physiology with guarded risk involvement.
- Extensive preoperative assessment and optimization.
- Advanced hemodynamic monitoring including TOE for all high-risk cases.
- Pivotal goal is to minimise morbidity, complications and exercise safe anaesthesia practices.
- Enhance the patient's recovery in perioperative period.

Introduction

Proven Beyond doubt are the benefits of minimally invasive surgeries among all surgical subspecialties. Cohort with end organ failure/multi organ dysfunction presenting for procedures either therapeutic/salvage, where patients are encountered quite frequent. Apart from routine anaesthetic measure these patients warrant extra precautions in terms of pre-operative optimisation, intra operative monitoring, post-operative critical care management as well as exhort challenges to both anaesthesiologist and surgical skills in order to minimise morbidities, complications enhance recovery and early rehabilitation.

Table 1

Robotic urological procedures commonly done in our centre
1. Robotic Radical Prostatectomy
2. Robotic kidney transplant
3. Robotic ureteroplasty/ ureteric reimplantation
4. Robotic radical/partial/simple nephrectomies
5. Robotic Mitrofanoff procedures
6. Robotic vescico-vaginal fistula

Patient's Perspective

The preoperative single or multiple organ dysfunction challenges that we face:

Renal related: Acute kidney Injury (AKI), chronic kidney disease (CKD), acute on chronic kidney disease (AOCKD), electrolyte imbalances, repeated MDR genito urinary infections, uremic syndromes with sarcopenia are commonly found.

Cardiovascular related: The following cardiovascular comorbidities are associated with renal diseases:

1. Hypertension
2. Ischemic heart disease (IHD) with coronary stents on dual antiplatelets, post- surgical revascularization

status.

3. Valvular pathologies and valve replacement status
4. Moderate to severe ventricular dysfunction status with low LVEF
5. History of rhythm disturbances including malignant arrhythmias on current medical management.
6. Presence of permanent pacemaker/ Cardioverter defibrillator/ cardiac resynchronization device
7. Chronic heart failure and cardiomyopathy

Pulmonary related: Chronic obstructive pulmonary disease, bronchial asthma, chronic bronchitis, basal lung atelectasis, pulmonary arterial hypertension, restrictive lung diseases (ILD).

Central Nervous System: Cognitive dysfunctions, CVA, metabolic encephalopathies, autonomic neuropathies, neuro-degenerative disorders including multiple sclerosis.

Endocrine related: DM with poor glycemic control, hypo/hyperthroidim, Adrenal insufficiencies.

Hepatobiliary/Gastro-Intestinal: GERD, APD, Gastroperesis, h/o pancreatitis, grade 2/3 fatty liver, cirrhosis with portal hypertension.

Peri-Operative Challenges Specific to Robotic Assisted Urological Procedures:

Table 2

Challenges Encountered Anaesthesiologist Perspective
1. Remote access to patient
2. Requirement of absolutely still patient during surgery
3. Lack of access to invasive lines/monitors.
4. Steep trendelenberg postion/ extreme positioning on table (figure 1)
5. Maintaining normal body temperature
6. Pressure ulcers – shoulder and back
7. Nerve / Ocular compressions
8. Pneumo-peritoneum – its side effects
9. Pain management
10. Cautery site burns

Figure 1: Showing the deep anti Trendelenburg position during urological surgery.

Complications Encountered by Anesthesiologist due to Positioning and Pneumoperitoneum

Table 3

1. Endobronchial inubation
2. Pulmonary atelectasis/ increased airway pressure/hypercarbia
3. Cerebral edema/ increased ICP
4. Facial edema/ Upper body edema
5. Peripheral nerve/soft tissue injuries/ compartmental syndromes
6. Subcutaneous emphysema
7. Pneumo-thorax/ pneumo-mediastinum/ pneumo- pericardium
8. Hemodynamic compromise
9. Postoperative visual disturbance/ visual loss
10. Hypothermia
11. Complications associated with increased intra-abdominal pressure
12. Venous air embolism
13. Retroperitoneal hematomas
14. Regurgitation/ Aspiration

Preoperative Measures

Thorough history taking, systemic examination, laboratory investigations, radiological evaluation of interest are mandatory. Patient optimisation involving multidisciplinary approach in case of multiorgan dysfunction to be considered. Electro cardiogram/exercise stress testing/ resting transthoracic echo cardiogram/ pulmonary function tests are mandated in case of cardio pulmonary compromise. Patient and family counselling regarding perioperative risks and its management with informed written consent.

ERAS (Enhanced Recovery After Surgery) protocol to be followed wherever feasible. Incentive spirometry to prevent perioperative atelectasis, Adequate blood and products are cross-matched and available for use. Perioperative medications are evaluated and instructed to either continue or stop as per standard protocol.

Intra-Operative Management

In Addition to Asa Standard Monitoring, Advanced hemodynamic monitoring including invasive arterial, CVP, CCO, PA etc. is applied wherever necessary. TOE based intraoperative cardiac monitoring in patients with severe ventricular dysfunctions. BIS to be routinely used for depth of anaesthesia monitoring. Wide bore peripheral cannulas with extension lines to combat sudden massive blood loss. Hotline to infuse warm IV fluids, hemotherm to maintain normothermia. Antibiotic prophylaxis injected as per institutional protocol/ culture sensitivity. Maintenance of anaesthesia by infusion of muscle relaxants, short acting opioids and inhalational agents. Pertinent fluid infusions as guided by blood loss, urine output (surgeries on bladder or ureters urine output monitoring may not be feasible until end of surgery), CVP, TOE. Serial ABGs as a guide to blood gases, serum electrolytes, Acid base status and blood loss. Ventilator parametres are set to optimize oxygenation and achieve normocarbia. Its vital to prevent barotrauma and volutrauma in cases where extreme head low positions are imperative. Extreme caution is imparted while positioning the patient applying adequate padding and support for all pressure points besides eyes. It is advisable to insert nasogastric tube before insufflation. The goal during surgery is to maintain adequate internal milieu of patients with pre-existing single/ multi-organ dysfunction. Adequate pain management by multimodal analgesic approach sans opioids for enhanced recovery.

Post-Operative Considerations

Based on intra-operative course and events, hemodynamic, ventilator and alimentation objectives to be determined and discussed with surgical and critical care team. ERAS protocol is followed throughout perioperative period.

Surgical Perspective

- Inter–disciplinary coordination and communication.
- Appropriate patient selection.
- Avoiding long lasting procedures.
- Senior most surgeon to perform the procedure to

minimise surgical time, blood loss and other possible RAL complications.

- Use of lower intra-abdominal pressure whenever feasible.

Summary

Preoperative optimisation of patient's existing comorbidities is a prerequisite to robotic surgery. Once the surgery is committed to, there is no safe plan B. To execute plan B, one has to undock the robotic console, which is time and morbidity consuming. Perioperative individualised goals and objectives to be discussed with multi-disciplinary teams. Despite the time consumption that is associated with robotic surgery, the recovery is excellent, perhaps due to minimal tissue injury. ERAS protocol may be followed for perioperative enhanced recovery. Pre-surgery carbohydrate drink (1-2 hrs prior), excellent balanced anesthesia, postoperative superlative pain relief, early mobilization are the ways towards early recovery. Robotic surgery is associated with a learning curve, which would mean longer duration of anesthetic. The surgical community must aim for speeding up the procedure to prevent collateral damage. The robotic surgery may be performed by a senior most surgeon to minimise RAL surgical complications.

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Emergency Management of Pneumo-Mediastinum Post Tracheostomy – Anesthetic Challenges

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Abstract

Pneumo-mediastinum is a rare and dreadful complication after tracheostomy. Generally complications are lesser known with percutaneous dilatational tracheostomy when compared with open tracheostomy. Amongst all complications including bleeding, infection at stoma site, trachea-esophageal fistula, tracheal scarring, tracheomalacia we focus on the most catastrophe complication i.e pneumo-mediastinum requiring prompt treatment.

We discuss a case of decompressive craniectomy who underwent percutaneous dilatational tracheostomy. After the tracheostomy, patient had developed subcutaneous emphysema along with pneumo-mediastinum. Urgent CT neck and chest, showed a rent in tracheal wall which was causing pneumo-mediastinum. The subcutaneous emphysema was increasing with time and put the patient at risk for compromised ventilation. The leak was managed with insertion of a longer bivona tracheostomy tube which bypassed the rent. Emphysema gradually improved.

Any complication post tracheostomy should be timely addressed and treated to avoid any catastrophe results. Timely intervention and quick response of the team could save the patient's life.

Keywords

PDT – Percutaneous dilational tracheostomy, Subcutaneous emphysema, Bivona flexometallic tracheostomy tube.

Case discussion

We present a case of 51 years female, known case of diabetes mellitus, hypertension and post-mitral valve replacement (for rheumatic heart disease , who

presented to the emergency room with headache, left sided weakness along with hematemesis and nasal bleed. She had history of stuck valve (due to irregular self medications of acitrom) and was thrombolysed with injection alteplase at other hospital. Post thrombolysis, CT head showed right fronto-parietal bleed (Figure 1) for which she underwent emergency decompressive craniectomy at our institute. Weaning from ventilator was started on post-op day 2. On day 4, patient was planned for percutaneous tracheostomy under general anaesthesia in operation theatre because of thick neck. Percutaneous tracheostomy was done and 7.0 mm tube was inserted. Two attempts were made to localize the trachea with finder needle and trachea was dilated using the Grigg's technique. The patient tolerated the procedure well and was hemodynamically stable intraoperatively. During mechanical ventilation, peep pressure were kept at 8mmHg in view of poor chest condition to maintain oxygenation. Chest x-ray was done immediate post tracheostomy and it did not show any pneumothorax.

After three hours of tracheostomy, we noticed subcutaneous emphysema on the neck and face, extending over to eyes. Immediately patient was shifted to CT room. During this time subcutaneous emphysema increased over the face and neck region and had become tense on palpation. CT neck and chest showed rent in the posterolateral wall of trachea on the left side (Figure 2) and pneumo-mediastinum (Figure 3). Air leak through this rent during positive pressure ventilation contributed to the subcutaneous emphysema. FiO2 was gradually increased to 100% to maintain the saturation. CTVS reference was done. Immediate intervention was planned to bypass the tracheal rent to improve ventilation. Plan was to replace the regular tracheal tube with a longer Bivona tube 8.0 mm. In this way the leak could be prevented by bypassing the rent and distal airways ventilated. Otolaryngologist and cardiothoracic team were kept on standby in case the rent is large enough and could not be bypassed and patient needs to put on heart lung machine for oxygenation. Patient was shifted to OT again. General anaesthesia was given with injection fentanyl 50 mcg, inj. propofol 60 mg, inj. atra 50 mg along with sevoflurane. Plan was to rail road the normal tracheostomy tube with longer bivona tube. However when neck extension was given to explore the tracheostomy site, due to tense swollen enlarged neck, tracheostomy tube got misplaced and track was lost. Patient started desaturating and we attempted oral intubation with the help of C-MAC laryngoscope. It was difficult airway due to short neck and intraoral edema. Despite three attempts with the help of bougie, oral endotracheal tube could not be negotiated past vocal cords, otolaryngologists were asked to explore the tracheostomy site. Patient desaturated (SpO2 dropped to 50%) and had an episode of bradycardia (H.R 45/min). Atropine (0.6mg) bolus was administered. Ultimately, tracheal opening was visualized from tracheostomy site and a No.7.0 endotracheal tube was inserted through tracheal stoma to ventilate the patient. Patient was ventilated and saturation improved to 92% with HR 88/min and BP 110/70 mmHg. We waited until the saturation and vitals stabilized till another attempt was made to insert the Bivona tube. Later Bivona tube was railroaded over the tube exchanger through the endotracheal tube. Tube tip was kept just above the carina and distal to rent with the help of fiberoptic bronchoscopy. Bivona tube was fixed at 12cm mark at the skin. Patient was shifted to ICU and was kept sedated and paralyzed for the rent to heal. Subcutaneous emphysema started decreasing after the tracheostomy exchange and improved over 24 hours. Sedation was stopped after 1 day and neurological status was checked. Patient was neurologically intact with GCS E4VtM6dull. Family took patient LAMA on day 7.

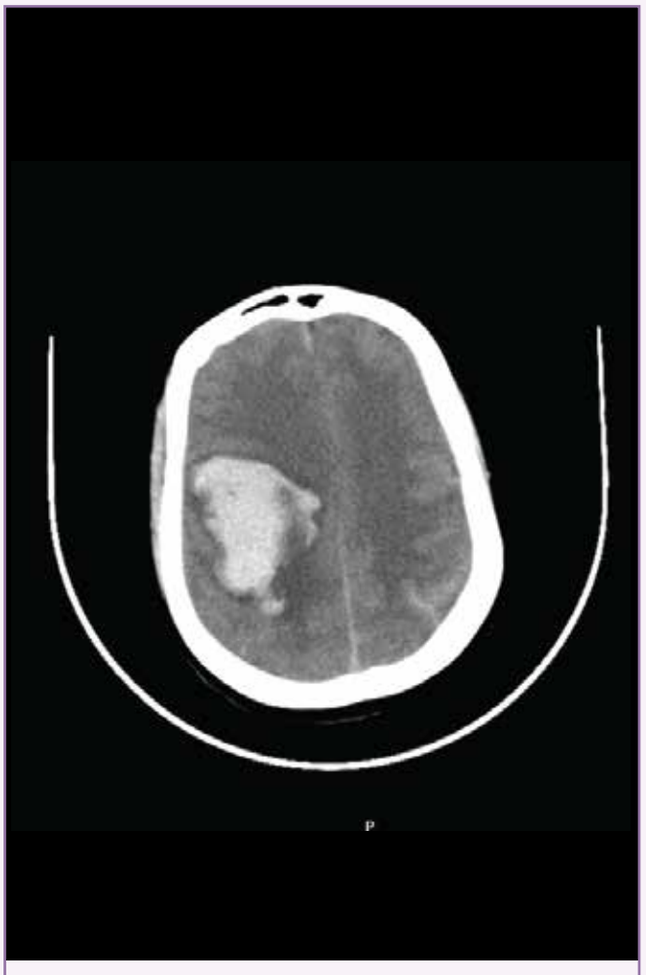

Figure 1 – Pre-operative NCCT head showing large right fronto - parietal bleed.

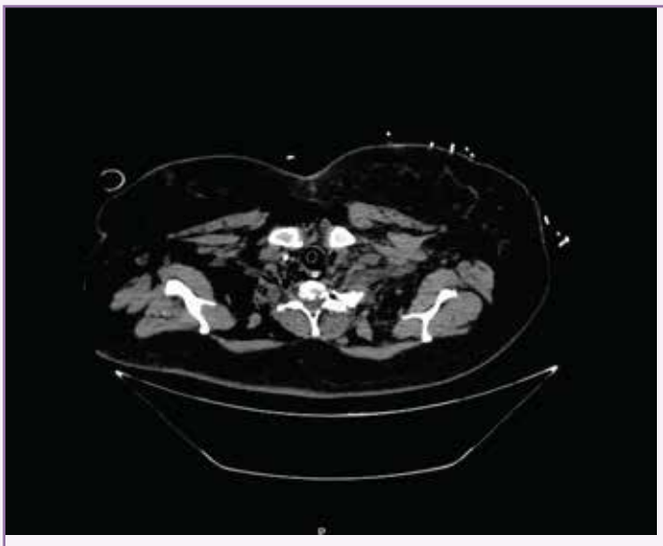

Figure 2 – Axial cut of upper thorax showing the left side tracheal rent leading to mediastinitis

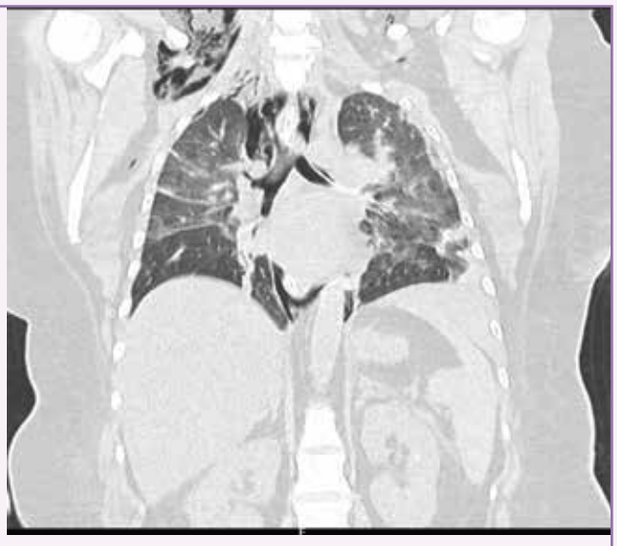

Figure 3 - Coronal Cut of CT Chest showing pneumo - mediastinitis and pneumonitis

Discussion

The complication rate associated with standard operative tracheostomy tube insertion ranges from 6 to 66% and with percutaneous dilatational tracheostomy from 3.9 to 31%.[1] Subcutaneous emphysema is rare but catastrophic complication after tracheostomy especially when it is associated with pneumothorax or pneumo-mediastinum. Subcutaneous emphysema can also occur if tracheostomy tube straps are tied too tightly when using fenestrated tubes.[2] The management aims at first identifying the cause of subcutaneous emphysema which in our case was a rent in posterolateral wall of trachea. The tracheal rent could have occurred while locating trachea with finder needle, with stylet injuries or with tip of the tube when introduced with great force. High concentrations of oxygen is helpful in resolving subcutaneous emphysema and in severe cases can be treated with bilateral infra-clavicular multiple stab incisions.[2] This posterior wall rent can lead to pneumothorax also if the injury occurs to the dome of the pleura.

The complication can be prevented by performing percutaneous tracheostomy under bronchoscopic guidance[3] to prevent posterior tracheal wall injury or real time USG guidance puncture when compared with a blind technique. Also if rent occurs or rent is suspected, high PEEP pressures should be avoided during mechanical ventilation.

Treatment of tracheal tears can be non-surgical in small (length < 2 cm) uncomplicated tears and stable patients, since, under these conditions, healing can be achieved with minimal risks.. Surgery is preferred in large tears and should be performed promptly to avoid feared complications such as descendent mediastinitis4. Expanding pneumo-mediastinum can compress the airway leading to difficult situation of ventilating the patient. In our case the size of the rent was small and it was left to heal on its own.

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Gynaecologic Anaesthesia

A Case of Sickle Cell Trait with Chronic Thromboembolic Pulmonary Hypertension (CTEPH) and Migrated IVC Filter Undergoing Pulmonary Endarterectomy and IVC Filter Retrieval: Special Considerations for Perioperative Management

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Introduction

Chronic Thromboembolic Pulmonary Hypertension (CTEPH) a known complication (Prevalence 10-20%) in patients with Sickle Cell Disease (SCD) & Sickle Cell Trait (SCT) and is often a cause of Mortality .1Pulmonary Endarterectomy (PEA) under cardio pulmonary bypass (CPB) and Total circulatory arrest (TCA), is well established Treatment Modality. Managing CPB in these cases of sickle cell disease and trait is challenging. Hemoglobin S (HBS) Leiden Red Blood cells may sludge under Hypothermia (due to sickling) causing Microinfarcts and lead to morbidity and mortality. Adaptations to the conduct of CPB to optimize outcome is Required.2,3,4

Case Report

A 25-year-old African female a known case of sickle cell trait presented to our hospital with Dyspnoea on Exertion with New York heart Association (NYHA) class II to III symptoms and palpitations. In the Past History two years back, she had massive pulmonary embolism treated with catheter-directed thrombolysis, medical management and the insertion of an inferior vena cava (IVC) filter at another hospital.

Upon evaluation at our hospital, at the time of admission Patient's vital signs were normal during rest. General physical examination showed no pallor, icterus, cyanosis, lymphadenopathy and pedal edema. Systemic examination was essentially unremarkable. To quantify the sickling load Hemoglobin Electrophoresis was performed. She was diagnosed with Sickle Cell Trait {Hemoglobin S (HBS) = 38% on Hemoglobin Electrophoresis}.

Two-dimensional Transthoracic Echocardiography revealed normal sized left Ventricle, with Left ventricular Ejection Fraction of 55 %, D shaped Septum and a normal Mitral Inflow pulsed wave Doppler. Right Ventricular size and systolic Function was Normal. There was Trivial Mitral Regurgitation, Mild Tricuspid regurgitation with Pulmonary artery Systolic Pressures calculated as 60 mm of Hg.

Computed Tomography Pulmonary Angiogram scan was done which revealed Chronic pulmonary Embolism with embolic load more on left side as compared to right (Figure 1). The previously deployed IVC filter had migrated to the Inferior vena cava Right atrial junction.

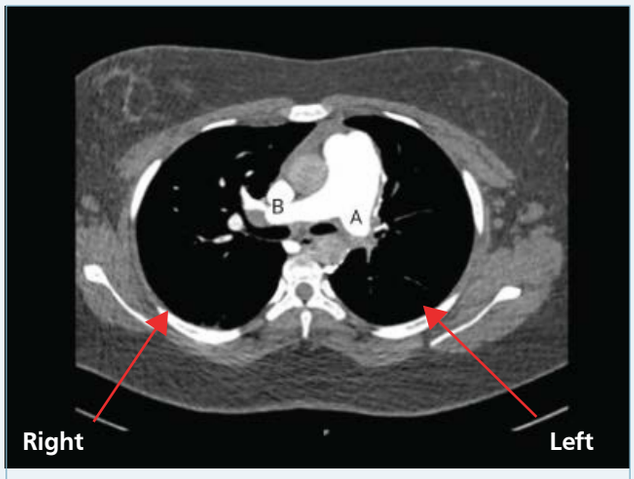

Figure 1 : CT pulmonary angiogram (sagittal section) showing Left pulmonary artery is occluded at the mediastinum with paucity of distal branches(A). Luminal narrowing of right lower lobe pulmonary artery branch is seen(B).

Arterial and venous colour Doppler ultrasound was done on bilateral lower limbs which was essentially normal. Carotid colour doppler ultrasound revealed Bilateral normal Carotid and Vertebral Arteries. Upon evaluation at our hospital, she was diagnosed with Sickle Cell Trait (HBS = 38% on Hemoglobin Electrophoresis) and Chronic Thromboembolic Pulmonary Hypertension (CTEPH), accompanied by IVC filter migration.

After complete physical, laboratory and radiological evaluation Intervention was planned to treat her condition. Pulmonary Endarterectomy under cardiopulmonary bypass with total circulatory arrest with Inferior vena cava (IVC) Filter Retrieval and Pericardial patch repair was planned.

Patient was anaesthetized with standard techniques as per institutional protocols. Sternotomy was performed, the patient was heparinized and cannulated at an Activated Clotting Time of above 480 seconds. The CPB circuit was primed with Kabilyte balanced salt solution, Bicarbonate, Albumin, Mannitol, and Heparin.

Special considerations for conduct of Cardio Pulmonary Bypass (CPB)

1. Pump suckers were not used during cannulation to minimize exposure to blood.
2. Partial exchange Transfusion initiated prior to CPB Total 1800 ml (30 % of blood volume approximately) patient's blood drained out in extra reservoir through venous line Y connector.
3. Initially crystalloid Priming volume used to replace Patient's blood and then subsequently 4 Units of Packed Red Blood Cells transfused. Target Haematocrit was 25 -30% on CPB.
4. Patient was cooled to 20 degree Celsius.
5. Pulmonary Endarterectomy performed with three episodes of Total Circulatory Arrest lasting 28, 27 and 23 minutes each, with intermittent restoration of pump flow.
6. Carbon di oxide insufflation was performed throughout the procedure to minimize the chances of air embolism.
7. Near Infrared Spectrophotometry (NIRS) used during the procedure to monitor brain saturation.

As per the preoperative plan the procedure performed was Pulmonary Endarterectomy under cardiopulmonary bypass with total circulatory arrest with Inferior vena cava (IVC) Filter Retrieval and Pericardial patch repair of the right atrial and the IVC junction from where the migrated mispositioned IVC filter was retrieved.

Outcome and Complications

Post operatively patient was shifted to Recovery intensive care unit on elective ventilation. She was stabilized and Ventilator support weaned off and endotracheal tube was extubated on the 2nd post-operative day. On 3rd post-operative day she started to complain of headache and on evaluation had signs of mild encephalopathy with no focal neurological deficit. Magnetic resonance imaging (MRI) of Brain was done which showed mild diffuse effacement of the cerebral sulci which may be related to diffuse cerebral edema. MRI brain also showed right para sagittal hypodensity along the posterior falx which was diagnosed as a small Sub Dural Hematoma . Incidence of subdural hematomas related to cardiac surgery in Sickle cell disease or trait ranged from 14 -60 % in literature)5. Our patient was managed conservatively for the neurological symptoms and the symptoms and general condition improved subsequently.

Overall patient had gradual Clinical and symptomatic Improvement with 25 -30 % Reduction in Pulmonary Artery Systolic Pressure in repeat Two-dimensional Transthoracic Echocardiography. Patient was discharged on 12th Post-operative day in satisfactory condition.

Discussion

Sickling crisis can occur during cardiopulmonary bypass for cardiac surgical procedures in patients with sickle cell hemoglobin, which could lead to haemolysis with

devastating consequences.

Risk Factors for Sickling Crisis during Cardiac Surgery are hypothermia, hypoxia, acidosis, and low-flow states. Optimization by reducing the HBS concentrations, reducing the haematocrit levels is required to minimize the chances of sickling crisis.

There is no absolute consensus on safe target Hemoglobin S (HbS) Levels. HbS levels of 10% - 20% for patients undergoing cardiac surgery are desired to minimize chances of vaso-occlusive haemolytic crisis as mentioned in the literature.

Management Strategies during CPB have to be tailored to the critical needs of the patient. Its crucial to maintain good flows and normal acid-base status, and limit Total Circulatory Arrest periods. Use of Cell Saver to salvage Red Blood Cells for re transfusion is not recommended as this strategy may lead to more chances of sickling .[6,7]

Conclusion

Sickle Cell Trait with CTEPH potentially is amenable to surgical Treatment. Specialized intraoperative considerations and a tailored approach are crucial in achieving a favourable outcome. This case underscores the successful management of a complex scenario involving Sickle Cell Trait, CTEPH, and migrated IVC filter. Specialized intraoperative considerations were crucial in achieving a favourable outcome, highlighting the importance of tailored approaches in patients with underlying haematological conditions - sickle cell trait in this case.

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Anaesthesia in Procedures of Aesthetic and Regenerative Gynaecology

Source: Kumar, A., Bharti, N., Swami, A.C. (2022). Anaesthesia in Procedures of Aesthetic and Regenerative Gynecology. In: Jindal, P., Malhotra, N., Joshi, S. (eds) Aesthetic and Regenerative Gynecology. Springer, Singapore. https://doi.org/10.1007/978-981-16-1743-0_30

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Abstract

Aesthetic and Regenerative gynaecological procedures are mostly done in office-based or day-care centres by gynaecologists, plastic surgeons, dermatologists or a multidisciplinary team. These are mostly painless and minimally invasive, requiring only local anaesthesia. Recently, some of the more invasive cosmetic gynaecological procedures are being developed, requiring anaesthesia. We present challenges and considerations in providing safe and effective anaesthesia for these aesthetic, cosmetic and regenerative gynaecological procedures.

Keywords

Anaesthesia Aesthetic gynaecology, Regenerative gynaecology, Cosmetic gynaecology, Gender Assignment surgery.

TRIVIA-1

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Pain Awareness Month - Questions for Quiz

Q1. What is total pain?

A. Pain all over the body
B. Psychosomatic pain
C. Physical, psychological, social & spiritual pain
D. Radiating pain

Q2. What is Palliative medicine?

A. Branch of medicine that focuses on quality of life of patients with life threatening illnesses.
B. Branch of medicine that focuses on treatment of cancer patients
C. Branch of medicine that focuses on treatment of patients at the end of life

Q3. What is hospice care?

A. Care in hospital
B. Compassionate care of seriously ill patients
C. Care of very sick patients in ICU

Q4. Can Paracetamol be taken for pain relief?

A. No, it is a fever medicine.
B. Yes, it can be taken for pain relief
C. Not sure.

Q5. Do you think cancer pain is manageable?

A. No, one has to live with it life-long
B. It is manageable up to great extent

Q6. List down few effects of pain on routine life.

A. Feeling tired /fatigued
B. Unable to carry out activities of routine life
C. Poor quality of sleep
D. All of the above

Q7. What is appropriate care for patients at the end of life?

A. Seriously ill patients need to be treated in ICU
B. Can be treated in ward/home/hospice with appropriate palliation of symptoms
C. They must be taken back home

Q8. A pain persisting for 3 months or more and tends not to respond to pharmacological treatment is called.....

A. Acute
B. Malignant
C. Organic
D. Chronic

Q9. Is it okay to self-medicate for prolong period of time for pain?

A. Yes, it is okay to self-medicate because pain is not a serious medical condition
B. No, it can cause serious effects on other body organs like kidney, heart, stomach etc.

Q10. What is interventional pain medicine?

A. Prescribing pain killers
B. Treating pain with physiotherapy
C. Treating pain with minimally invasive interventions targeting specific pain generators

Q11. What are the goals of Palliative care?

A. Symptom management
B. Enhancing patient`s current care by focusing on quality of life
C. Care of caregiver
D. All of the above

Q12. What are the advantages of good pain relief?

A. Adherence to treatment protocol
B. Reduction in anxiety
C. Improved sleep
D. All of the above

Q13. Why is morphine used in cancer pain?

A. To sedate the patient
B. For pain relief
C. To decrease breathlessness
D. Both A & B
E. Both B & C

Case Reports

Role of TEE in a Liver Transplant Recipient with SAM. A Case Report

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A 61-year male patient presented for a living donor liver transplant. He had decompensated end-stage liver disease requiring repeated large-volume paracentesis of ascites and recent admissions for AKI and breathlessness. The highest creatinine was 1.43 mg/dl

Preoperatively 1 PRBC was transfused as the Hb was 6.9 g/dl which improved to 8.4 g/dl. TLC 2180. Following medical management creatinine improved to 0.7 mg/dl. Platelet count 60,000. INR 1.22 Fibrinogen 225 mg/dl. S Na 129. (F) BSL 120 mg/dl. Total bilirubin 0.5 mg/dl. MELD Na score 17.

ECG showed LVH.DSE was negative for inducible ischemia. 2D ECHO showed normal-sized LV with mild concentric LVH. Gr 1 diastolic dysfunction. Degenerative changes of the mitral valve with SAM but no obvious LVOT obstruction. LVEF 55-60%.

He had marked sarcopenia, Liver Frailty Index= 5.67 and was on treatment for diabetes mellitus and hypertension.

Perioperatively, a Transoesophageal ECHO probe was inserted following routine induction given the ECHO findings. Standard invasive lines including femoral and radial arterial pressure monitor (Flowtrac, Vigelio) and large bore sheath (7 Fr) along with 5 lumen (8.5 Fr) central venous catheters were inserted.

Fluid management was guided by SVV, CI, and vasopressors were administered based on the SVR.

2 episodes of SAM along with LVOT obstruction were noted on the TEE scan which corresponded to hypotension, and tachycardia not responding to volume boluses or vasopressors. The initial episode was in the anhepatic phase of the surgery and the second occurred at reperfusion of the newly implanted liver. Both the events responded to fluid boluses along with a small dose of beta-blocker (metoprolol 1 mg) and a small dose of vasopressor.

This patient had higher than usual blood loss as a splenectomy was required, however, the fluid status was well maintained based on the pulse wave-derived parameters along with visual backup of dynamic cardiac function.

The further course of the patient was uneventful.

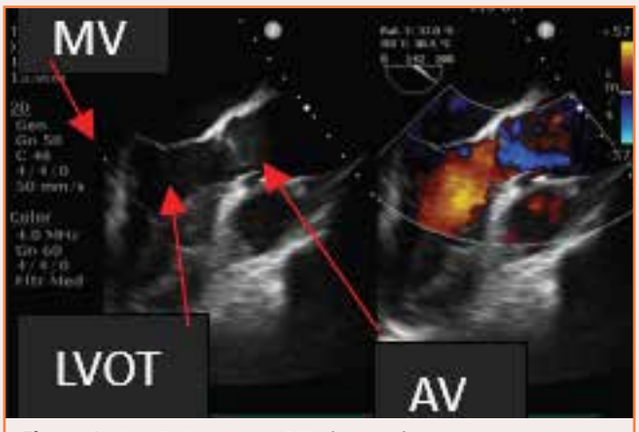

Figure 1: No SAM, No LVOT obstruction

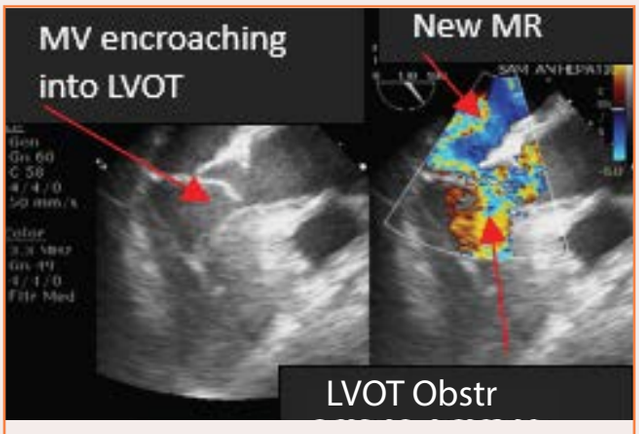

Figure 2: SAM with LVOT turbulence. Note the new MR

Points to Note

Systolic Anterior motion is a dynamic condition where the Mitral valve leaflets move anteriorly in systole causing obstruction to the blood flowing out of the Left ventricle. This causes sudden fall in stroke volume and hypotension. Treating this condition with inotropes would lead to worsening of the clinical state. SAM may occur without warning in young patients with hyperdynamic circulation and underlying SAM susceptibility factors like small and hypertrophied left ventricle and lengthier mitral valve leaflets. Mitral regurgitation accompanies the SAM leading to pulmonary overload. Certain ECHO factors like ratio of the lengths of the Anterior and posterior leaflet, End Systolic volume, C Sep distance and asymmetric basal septal hypertrophy provide warning signs.

Treatment of SAM

- Adequate filling
- B Blockers
- Stop inotropes
- Vasopressors to combat the vasodilation and increase SVR

This case highlights the role of the TEE to provide prompt analysis of LVOTO in the presence of SAM especially in cases like liver transplant which have major hemodynamic shifts and thus guide the management successfully.

Preoperative Ultrasonographic Evaluation of the Airway vis-a-vis the Bedside Airway Assessment to Predict Potentially Difficult Airway on Direct Laryngoscopy in Adult Patients - A Prospective, Observational Study

Source: https://www.researchgate.net/publication/367574095_Preoperative_ultrasonographic_evaluation_of_the_airway_vis-a-vis_the_bedside_airway_assessment_to_predict_potentially_difficult_airway_on_direct_laryngoscopy_in_adult_patients-a_prospective_observatio

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Abstract

Background Unanticipated difficult airway remains a challenge for the anaesthesiologist with no established standard criteria to predict difficulty in intubation. Our aim was to correlate the pre-anesthetic ultrasonographic (USG) airway assessment parameters with Cormack-Lehane (CL) grade at direct laryngoscopy view under general anaesthesia. This was a prospective, observational study on 150 adult patients between 18 and 70 years with the American Society of Anaesthesiologist—Physical Status 1–2 requiring general endotracheal anaesthesia for elective surgery.

Results

The incidence of difficult laryngoscopy was 22.7%. The sonographic distance from anterior neck surface to epiglottis (ANS-E) > 1.67 cm was observed to be a statistically significant USG predictor of difficult laryngoscopic view with sensitivity of 64.71% and specificity of 78.45% (p - 0.000). The sonographic distance from anterior neck surface to hyoid bone (ANS-H) or to anterior commissure (ANS-AC) did not corelate with difficult laryngoscopy. The ultrasound (US) parameters had higher negative than positive predictive value.

Conclusions

We found ANS-E distance to be the most significant predictor of difficult laryngoscopy in our study. USG is a useful tool to identify the "at-risk" patients for difficult airway.

Keywords

Direct laryngoscopy, Endotracheal anaesthesia, Ultrasound

Anaesthetic Management of a Patient with Sub-Valvular Aortic Stenosis for Emergency Lower Segment Caesarean Section: A Case Report

Source: Chhabra AR, Shinde PD, Shetty VL, Ganatra AM. Anaesthetic management of a patient with sub-valvular aortic stenosis for emergency lower segment caesarean section: A case report. J Obstet Anaesth Crit Care 2022;12:74-7.

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Sub-valvular aortic stenosis (SAS) occurs due to a fibrous membrane or a muscular narrowing causing left ventricular outflow tract obstruction. The physiological changes of pregnancy may exacerbate the cardiac condition posing significant challenges for anaesthesia and surgery. A 34 years primigravida, with 32 weeks gestation, a known case of sub-valvular aortic stenosis presented in the emergency room in view of leaking/bleeding per-vagina. Risk factors such as tachycardia, decrease in afterload, preload and increased left ventricle contractility lead to exacerbation of the obstruction and should be avoided. We report a successful anaesthetic management of her lower segment caesarean section while balancing the physiological changes of pregnancy superimposed by pathology of the disease.

Keywords

Caesarean section, general anaesthesia, sub-valvular aortic stenosis

Case History

A 34-years primigravida at 32 weeks gestation presented in the emergency room with preterm labour, bleeding and leaking per-vagina (PV). She was a known case of sub-aortic stenosis and had been operated for cardiac myomectomy at 13 years of age with no past records. Her ante-natal period was unremarkable and safe confinement was planned at 38 weeks. She had received two doses of dexamethasone for baby's lung maturity in the previous week.

She was conscious and oriented, having mild breathlessness (New York Heart Association class 2) associated with dry cough. On examination, it was noted that she was afebrile having heart rate (HR) of 100/min, blood pressure (BP) of 120/70 mmHg, SpO2 of 100% on room air, clear chest and a mild systolic murmur in the aortic area. Her blood reports were within normal limits.

Her electrocardiogram (ECG) revealed wide QRS complex, LVH, left axis deviation with ST elevation in anterior leads. Her 2D- echocardiogram revealed normal LV, left ventricle ejection fraction (LVEF) of 55%, a normal tri-cuspid aortic valve (AV), with mild AR, LV outlet turbulence with a high gradient of 134/77 mm Hg across AV suggesting SAS.

Multidisciplinary teams were involved including the obstetrician, cardiologist, obstetrics and cardiac anaesthesiologists, cardiac surgery team and intensivists. Emergency caesarean delivery was planned in view of her obstetrics complaints. She was starving adequately. The team of obstetric and cardiac anaesthesiologist planned general anaesthesia with invasive monitoring including trans-oesophageal echocardiography (TEE). Cardiologist advised caution with fluids administration and meticulous haemodynamics control perioperatively. An informed high-risk consent was obtained. A peripheral vein was secured using a 20G Jelco with Ringer's lactate infusion on flow. Premedication for aspiration prophylaxis, injection pantopraozole, 40 mg IV and injection ondansetron 4 mg IV was administered in the ward. In the operation theatre standard ASA monitors (Blood pressure, ECG, SPO2) were attached and a wedge was placed under the right buttock to avoid aorto-caval compression. Prior to induction, invasive lines were secured (right radial artery and right internal jugular vein) under local anaesthesia and ultrasound guidance. Emergency drugs (like inotropes) and resuscitation equipment were kept ready. Cardiac surgery team with standby Extra Corporeal Membrane Oxygenator (ECMO) were available throughout the duration of the surgery Baseline arterial blood gases (ABG) revealed a normal pH of 7.437 with a mild respiratory alkalosis.

Modified rapid sequence intubation was done using injection fentanyl 50 mcg IV slowly to attenuate her sympathetic response followed by injection etomidate (14 mg IV) and injection rocuronium (50 mg IV). A 7.0 mm cuffed endotracheal tube was placed under direct laryngoscopic vision. After intubation, her HR and BP

rose briefly to 120/ min and 180/110 mm Hg, respectively but were controlled with injection metoprolol 2 mg IV. Post induction HR and BP came down to 94/min and 124/82 mm Hg respectively. A TEE probe was inserted after endotracheal intubation for continuous echocardiographic monitoring. Hundred percent oxygen was administered until the baby was delivered followed by anaesthesia maintenance with air, sevoflurane and injection fentanyl 100 mcg IV. Muscle relaxant top-ups were not required for the duration of the surgery (50 minutes). A 1.7 kg male baby with good APGAR (9 and 10 at 1 and 5 minutes respectively) was delivered. Injection Oxytocin 20 IU in 500 ml kabilyte was given as slow infusion at the rate of 60 ml/hour after delivery.

Her perioperative TEE findings revealed the presence of turbulent flow in LVOT on colour Doppler along with mild mitral regurgitation [Figure 1]. LVOT peak/mean gradient of 32/20 mm Hg under anaesthesia was lower than the pre-operative 2D-echo. Post-delivery the TEE findings remained unchanged. However, no cardiac intervention was needed.

Her intraoperative haemodynamics were unremarkable.

Blood loss was approximately 500-600 ml.

At the end of surgery, an ultrasound guided transverse abdominis plane (TAP) block using 20 ml of 0.2% Ropivacaine on either side was administered. Her post-operative ABG showed metabolic acidosis (pH – 7.17, pCO2 – 47.5 mm Hg, HCO3- - 16.9 mmol/L, base excess - -11.1 mmol/L, Lactates – 2.5 mmol/L) for which injection sodium-bicarbonate 50 meq IV was administered. As per our hospital anaesthesia protocol regarding high-risk cardiac cases, we decided to electively ventilate her overnight. After confirming normal ABG and hemodynamic parameters, she was weaned off ventilator the following morning and shifted to ward by evening. Multimodal analgesia including paracetamol and tramadol was administered as per protocol. Her subsequent recovery was unremarkable and she was discharged from hospital after 5 days.

Discussion

The primary hemodynamic effect on the left ventricle is one of increased afterload, resulting in increased intracavitary pressure and wall stress.[5] The physiological hyperdynamic changes of pregnancy further exacerbate the compromised cardiac status of the patient.

Hypovolemia, aortocaval compression due to supine position and Valsalva manoeuvre also aggravate obstruction by making the LV cavity smaller.[6] Our patient was operated for cardiac myomectomy at the age of 13 years with satisfactory outcome. Her past echo reports were not available to us. Her current 2D-echocardiogram showed normal LV and AV with high gradient across the LVOT suggesting recurrence. SAS have been reported to recur in 37% cases after surgical resection.[7] There is scant literature detailing SAS in pregnancy, however data extrapolated from valvular aortic stenosis suggest high risk for cardiac complications including heart failure and even mortality.[8]

General anaesthesia with invasive hemodynamic monitoring with continuous TEE was planned. We chose to administer general anaesthesia as the patient had bleeding PV. GA also offers the advantage of better control of haemodynamics and allowed us to insert TEE for continuous echocardiographic monitoring.[9]

Regional anaesthesia has the disadvantage of causing reduction in SVR and precipitate outflow obstruction. Chen et al.[10] have reported aortocaval compression resulting in sudden loss of consciousness associated with bradycardia and hypotension during caesarean section in a patient with subvalvular aortic stenosis who had been given epidural anaesthesia. Modified RSI was done and injection fentanyl, 50 mcg IV was administered as it helps to control the sympathetic The cardiac surgery team was on standby in preparedness for any impending cardiac decompensation.[13] The use of ECMO aids rapid resuscitation in event of cardiac failure.[14] The target while managing these patients is to maintain optimal preload, systemic vascular resistance (SVR) and HR. Systolic anterior motion (SAM) of the anterior mitral valve leaflet causes LVOT obstruction and increases the LV stress along with mitral regurgitation, diastolic dysfunction and dysrhythmias.[15] TEE is significant to demonstrate beat-to-beat intra-cardiac volume filling, LV contractility, detecting SAM and cardiac failure besides guiding the precise hemodynamic management. SAM is known to cause unexplained sudden hypotension perioperatively. [15] Increased LV contractility combined with decreased preload and SVR increases LVOT gradient with resultant increased SAM due to Bernoulli effect. The LVOT diameter and distance from the mitral coaptation point to the septum (C-sept distance) are also measured, both at the onset of systole. A narrow LVOT (<2.0 cm) and a short C-Sept (<2.5 cm) both increase the likelihood of SAM. [16] [Figure 2] Echocardiography can thus help to diagnose the condition that generally responds to fluid loading, beta-blockers and vasopressors. Optimum anaesthetic management with adequate fluid administration helped to maintain cardio-stability of our patient, hence

averting the need for cardiac intervention. Beta-blockers are recommended for managing hemodynamic surges; however, one must watch for neonatal bradycardia, hypoglycaemia, hypotonia and hypotension, [17] which this baby did not suffer.

Oxytocin was administered as a slow infusion to avoid tachycardia and hypotension. Post-surgery pain management was done using multimodal analgesia including bilateral TAP block in the OT and other IV and oral analgesics during her rest of stay in the hospital.

Our patient suffered metabolic acidosis possibly due to neurohumoral stress response to surgery. [18] She was mechanically ventilated overnight postoperatively as per our hospital policy of management of high-risk cardiac cases. The immediate postpartum period is critical as heart failure has been reported even 48 hours postoperatively, hence full therapeutic and monitoring support in a critical care area should be provided. [6]

Prognosis after SAS surgical correction is usually excellent.[3] However, the LVOT gradient still increases slowly over time especially in females and patients over 30 years. Preconception counselling should stratify the risk in pregnancy, inform possible complications and discuss strategies to ensure safe delivery.[19] Mothers with congenital heart defects have an approximately 3% to 12% risk of passing them on to their children compared with a background risk of 0.8% for the general population, hence it's advisable to get timely genetic counselling and screening.

Conclusion

Successful management of a parturient with sub-valvular aortic stenosis for emergency caesarean delivery involves multidisciplinary approach including careful planning, comprehensive understanding of cardiac pathophysiology, judicious titration of anaesthetic agents and fluid management guided by advanced invasive monitoring (TEE) to detect LVOT obstruction.

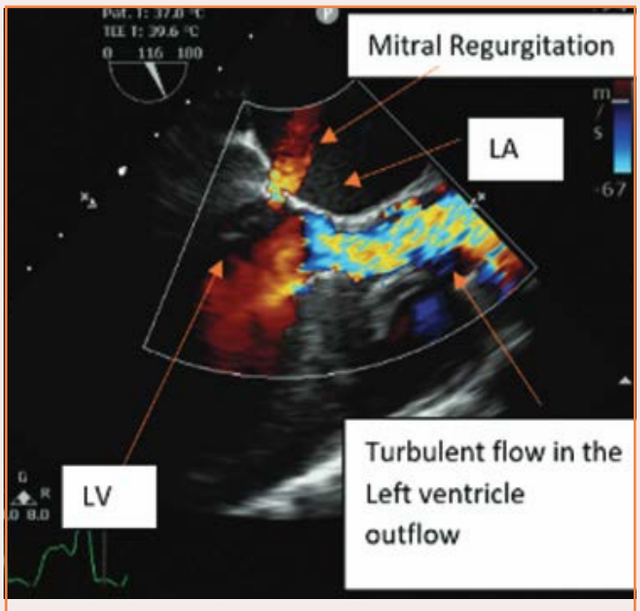

Figure 1: Turbulent flow in LVOT on colour doppler along with mild MR

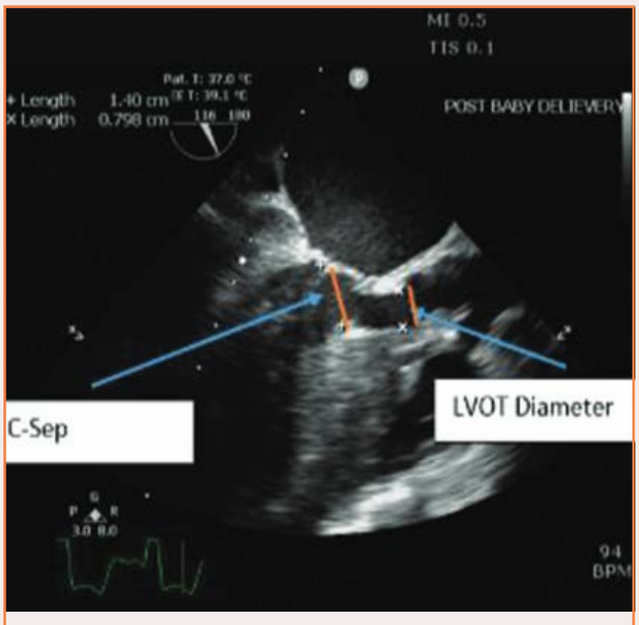

Figure 2: TEE showing marrow LVOT and a short C - Sept

Pain and Palliative Medicine

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"The merest schoolgirl, when she falls in love, has Shakespeare or Keats to speak her mind for her; but let a sufferer try to describe a pain in his head to a doctor, and language at once runs dry," wrote Virginia Woolf. If a writer as accomplished as Virginia Woolf could not find appropriate words to describe her pain, we can all imagine how complex pain can be.

In 1979, the International Association for the Study of Pain (IASP) defined pain as "An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage." It took a 14-member task force, comprising individuals from several nations with broad expertise in clinical and basic science related to pain, ethicists, philosophers, opinions of the public, IASP members, and two years of discussions, emails, web meetings, and face-to-face meetings for IASP to add a phrase "resembling that associated with" in the revised definition of pain given in 2020, making the revised definition as "An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage." However, my favourite definition still remains McCaffery's 1968 definition of pain: "It's whatever the experiencing person says it is, existing whenever and wherever the person says it does."

The concept of "Total pain," i.e., pain is not just physical but also encompasses psychological, social, and spiritual struggles, was introduced by Dame Cicely Saunders way back in 1960. Although the concept was initially given for cancer pain, it holds true for all kinds of chronic pains.

Pain is the most common symptom that a patient presents to clinicians, and as we all treat it, we are all "Pain physicians" in a sense. However, with the ever-evolving and complex pathophysiology of pain, it has undergone a "metamorphosis from a symptom to a disease" in ICD 11. Advances in the understanding of psychological, social, and central nervous system mechanisms account for many inexplicable pain phenomena, avoiding the absolute dichotomy of "Physical" and "Psychological" pain, bringing about a radical change in the philosophy of pain from a "Biomedical" to a "Biopsychosocial" model. In addition to nociceptive and neuropathic mechanisms, the concept of "nociplastic pain" was introduced as a third neurophysiological mechanism in some chronic pain conditions. Terms like "somatoform pain disorder," "nonspecific pains," or "functional pains" are now replaced with "Chronic Primary pain." This led to the emergence of a novel branch of Medicine called "Pain Medicine." Numerous institutes now offer fellowships in pain medicine and interventional pain medicine, with AIIMS Rishikesh becoming the first institute to start DM in Pain Medicine in January 2020.

We established the "Department of Pain and Palliative Medicine" at Fortis Memorial Research Institute (FMRI) in April 2024 with the vision to make Fortis a Pain-free zone for our patients. In many instances, while treating the disease, pain management takes a backseat, significantly affecting patient satisfaction. This is where a specialist pain physician becomes your indispensable ally.

At FMRI, we follow a multidisciplinary approach to treating pain in association with other departments, especially neurology, neurosurgery, orthopedics, physiotherapy, and mental health. We focus on addressing the biological, psychological, social, and nutritional causes of pain. The treatment is carried out by a team of specialists. The Department of Pain and Palliative Medicine at FMRI has performed many minimally invasive, highly effective interventions for pain using advanced techniques including Cooled Radiofrequency Ablation (RFA), regenerative therapy, PRP (platelet-rich plasma) therapy, and Prolotherapy to manage all kinds of pain under image guidance with minimal side effects, same-day discharge, and personalized support.

In addition to Chronic pain medicine, the department offers comprehensive palliative care for patients and their family members across the trajectory of the disease from diagnosis to the end of life and bereavement. All patients with life-limiting illnesses like cancer, Chronic Kidney Disease on dialysis, advanced Chronic Obstructive Pulmonary Disease, chronic heart failure, and liver failure, geriatric patients benefit from holistic symptom management, compassionate care, counselling, prioritizing patient values and comfort, ensuring comfort at the end of life at the place of their choice, and taking care of the grieving family members. We are delighted that FMRI is now a nodal centre for CCEPC (a certificate course in palliative care), an online learning course from the Indian Association of Palliative Care for interested doctors (trainees and specialists) who are eager to learn about primary palliative care. We have also started rotational observation for postgraduate trainees to inculcate primary pain and palliative care into their practice. We participated in the NCG-QI (National Cancer Grid Quality Improvement) project in association with the oncology and administrative team. As a part of the project, we were able to develop an SOP for Goals of care documentation. With ongoing training and awareness, we are hopeful of integrating palliative medicine more closely in our hospital. In the last year, we had three meetings where we had good interactions about difficult pain conditions and advanced medical directives/living will. With small steps like these and your continued support, I am hopeful we will be able to create a pain-free zone at FMRI and subsequently all hubs of Fortis as envisioned. I am really grateful to be part of this journey.

Pain and Palliative Medicine

Chronic Pain- It's Time to Act

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Pain has always taken a back seat when it comes to prioritizing the resources for prevention and management as it never emerged as an important cause of mortality, which has been a major emphasis for policymaking. However, the recent global burden of disease data has provided with a fertile discussion platform on the basis of disability and nonfatal health loss caused due to pain globally and in low-and middle-income countries (LMICs). It is time that chronic pain must be considered as a public health problem and appropriate steps taken to mitigate this health burden.

"For all the happiness mankind can gain, Is not in pleasure, but in rest from pain." –John Dryden.[1] It has been 16 years since in 2004, "Pain management as a fundamental human right" was adopted as a central theme by the International Association for the Study of Pain and global health community stated that "failure to treat pain is viewed worldwide as poor medicine, unethical practice, and an abrogation of a fundamental human right."[2] However, epidemiological studies have only revealed a consistently increasing burden of chronic pain.[3-5]

Till late 19th century, we were still dwelling on "Biomedical model" of pain, starting from Rene Descartes' concept of "pain as an exclusive process" in 17th century to "Specificity theory of pain" by Maximilian Von Frey and "Pattern theory of pain" by Gold Schneider, both in 1894.[6] Even the modern "Bio-psycho-social theory" of pain is not new, its roots date back to Melzack and Wall's "Gate control theory" of pain in the 1960s and "Neuromatrix Model" of pain proposed by Melzack in 1999.[6] Chronic pain is indeed a complex phenomenon. It is time that we stop viewing chronic pain as merely an accompanying symptom. It is a disease entity in its own right and has even received its due taxonomical place in the International Classification of Diseases 11, which has been presented in the World Health Assembly in May 2019 and will come into effect on January 1, 2022.[6]

Chronic pain is multifaceted, dynamic, and difficult to measure; hence, the estimates of chronic pain prevalence globally have always been approximate and yet alarming.[7] As the global burden of disease has shifted focus from mortality alone to years lived with disability (YLDs), low back pain, and migraine have remained as top two causes of disability globally in 1990 and in 2017 as well, in both males and females, which represents poor actions or responses taken to improve these conditions.[4] Globally, percentage increase in counts from 1990 to 2017 for YLDs due to musculoskeletal disorders (rheumatoid arthritis, osteoarthritis hip/knee, low back pain with or without leg pain, neck pain, gout, and others) is 38.4%.[3] Low back pain was the leading cause of YLD in 126 of the 195 countries and territories.[3] YLD counts are highly concentrated in young (20–54 years) economically active population leading to loss of functional status of the workforce.[3] This burden of disease and risk factors is even higher in LMICs.[3] When the economically active members become disabled, the family's livelihood is compromised, further pushing them to poverty and decreasing the opportunities for treatment.[3,8]

In India, headache continues to be the second most important cause of YLD (first being iron deficiency anemia) with an increase by 22% and low back pain with an increase of 25%, moved from fifth to third most common cause for disability in India from 2007 to 2017.[9] There has been an increase in other musculoskeletal conditions too by 20%.[9] About 65% of total health expenditure in India is out of pocket; lack of health insurance further leads the chronic pain patients into misery as they are not able to afford long-term medications, and land up in a vicious circle of social and economic stress.

However, chronic pain is not only limited to low back pain, neck pain, or musculoskeletal pain but also becomes a part of lives of most of the people suffering from other noncommunicable or chronic diseases such as diabetes, peripheral vascular diseases, rheumatic

disorders, cancer, and HIV/AIDS among many others.[7] Therefore, the correct estimates of the overall effect of pain on people would be far more than can ever be estimated.

Pain not only causes physical discomfort but also impairs a person's capacity as a social being. The basic and essential part of being human as eating and sleeping are profoundly affected by pain, and as it becomes more chronic the psychological, spiritual, and social aspects take equal or more weightage as the physical aspect, both in assessment and management.[2] It has a huge social and economic impact on society at large.[7]

It is high time that we consider chronic pain as a serious public health problem. Pain management must be viewed as an ethical issue and a legal right. It is mandatory for countries to provide pain relief as a part of the right to health. Change of focus from the biomedical aspect of pain, i.e., pathophysiology-based management of pain to the biopsychosocial aspect which focusses on the concept of total pain and quality of life. Public health focus should be on preventive measures of chronic pain conditions. Prevention strategies should be implemented at primary (avoid trauma, risk factors, and increase protective factors), secondary (treating acute pain), and tertiary (rehabilitation and psychological management) levels. Focus ought to be on public awareness and education for prevention and treatment of pain with nationwide and worldwide events for the 2020 global year for the prevention of pain. Since many risk factors for low back pain and other musculoskeletal programs are common with those of other chronic conditions, we may utilize opportunities to integrate the preventive programs for chronic pain with mainstream programs such as cardiac diseases, cancer, or diabetes. Conducting research around social and economic dimensions of pain would lead to the enlightenment of health policymakers. Convincing global agencies such as the WHO to include chronic pain as a priority or at least as an optional module would encourage local governments to allocate funds and resources for the research, prevention, and treatment programs. In the long term, we must strive to balance social inequalities and health inequities across the world.

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Erector Spine Plane Block at the T12 Level may not Provide Good Postoperative Pain Relief Following Lumbosacral Spine Surgery

Source: Prakash PS, Jain V, Dash HH. Erector Spine Plane Block at the T12 Level May Not Provide Good Postoperative Pain Relief Following Lumbosacral Spine Surgery. J Neurosurg Anesthesiol. 2021 Jan;33(1):93-94. doi: 10.1097/ANA.0000000000000660. PMID: 31702587.

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In last decade, Bilateral erector spinae block has been introduced for control of acute postoperative pain following lumbar spine surgery and also for providing intraoperative analgesia. Though many studies have shown variable effect with significant to negligible pain relief but we did not find it useful in our routine practice.

In this case series, we demonstrated the spread of contrast dye following Ultrasound guided erector spinae block in two patients following spine surgery. Though dye spread was seen upto L2 level as seen in literature but pain relief was not as expected in these patients. The probable reason for failure is that the erector spinae muscle (spinalis thoracis muscle) takes origin from the spinous processes of T11 (or T10) to L2 (or L3). This anatomic disposition of the erector spinae muscle to the L2 spinous process is probably the major obstacle for the spread of local anesthetic. Therefore, the ESP block may not be an effective method for controlling postoperative pain after spine surgery.

Our fluoroscopic findings suggest that other fascial plane blocks (eg, thoracolumbar interfacial block) may be more suitable for the management of acute pain following spine surgery.

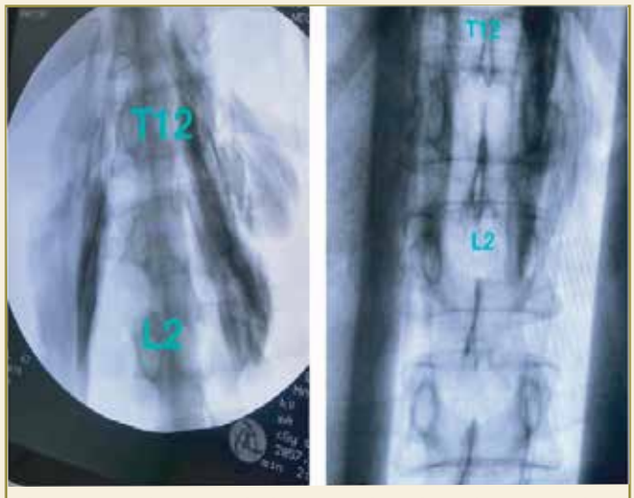

Figure 1 : Fluroscopic images showing the spread of local anesthetic and Omnipaque (to L2) in 2 patients after bilateral erector spinae plane block performed at the T12 Level

Stellate Ganglion Blocks for Refractory Central Poststroke Pain: A Case Series

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Central poststroke pain (CPSP) is neuropathic pain that arises from central lesion of the somatosensory tract. CPSP develops either acutely or in the chronic phase after a cerebrovascular accident. The pooled prevalence of CPSP is estimated to be 11%, and occurrence is common after a thalamic bleed.1 Clinical feature of CPSP includes severe spontaneous or evoked neuropathic pain that affects the entire body or a part of it, usually contralateral to the brain lesion.

CPSP is managed through neuromodulating and psychoactive medications, such as anticonvulsants, antidepressants, and corticosteroids.[3] However, CPSP is challenging to treat despite pharmacotherapy.[4] Various interventional strategies, including deep brain stimulation and repeated transcranial magnetic stimulation, have been applied. These interventions are reserved for refractory CPSP cases and are available in only a few centers.[5,6]

Stellate ganglion blocks have been used in various chronic pain conditions. However, only 2cases of stellate ganglion blocks used for treating refractory CPSP have been reported in the literature to the best of our knowledge.[7,8]

This case series explores the role of stellate ganglion blocks in 5 patients with refractory CPSP. The Institutional Ethical Committee of All India Institute of Medical Sciences, Rishikesh, approved this study. Written and informed consent was obtained from the included patients.

Cases Description

Five patients with CPSP were referred to our tertiary-care pain outpatient department. All of the patients had upper limb or facial pain for >6 months. Patients diagnosed with CPSP were 41 to 67 years of age and were on continuous medications for >3 months. Those not responding to the treatments were considered for stellate ganglion blocks. Patients who refused or had severe comorbidity, coagulopathy, or pain from causes other than cerebrovascular accidents were excluded.

The diagnosis of CPSP was confirmed by clinical history and examination. Post-stroke survivor patients reported newonset neuropathic pain following a stroke in the area of the body opposite to their central nervous system lesions with symptoms confined to the location of the body corresponding to the pain. The central nervous system lesions were confirmed through imaging. Other causes of pain were considered unlikely or ruled out before confirming the diagnosis.[6]

As described by patients, the character of the pain was burning or lancinating and associated with intermittent tingling over the affected side. The pain scores were >6 on the numerical rating scale (NRS) and ≥4 on the Douleur Neuropathique scale, suggesting neuropathic pain. There was hyperalgesia, impaired thermal sensation, and increased muscle tone and reflexes on the affected side. The medication records showed a wide spectrum of analgesic use, including various combinations of neuropathic medications. Despite maximum doses, patients' responses to drugs were inadequate (Table 1). We performed a stellate ganglion block on these patients because other invasive treatments were unavailable at our center.

Procedure

A block was performed in the operating suite for each patient, and patients were monitored as recommended by the American Society of Anesthesiologists. [9] The stellate ganglion blocks were performed on the side of the affected extremity opposite to the side of the brain lesion.[10]

The patients were positioned supine with a pillow to extend the neck, and their heads turned to the opposite side. A preliminary scan was conducted using a high frequency linear ultrasound probe. The transducer was placed in the short axis at the level of the cricoid cartilage and anterior to the sternocleidomastoid muscle. The transducer was then moved laterally to visualize the sixth cervical vertebrae with a prominent anterior tubercle, a short posterior tubercle, and the exiting C6 nerve root. At this level, the longus colli muscle was viewed as an oval structure above the base of the transverse process and vertebral body. The stellate ganglion is situated on the anterior surface of the longus colli muscle. Additional scanning was conducted with Doppler mode to identify nearby vascular structures (Figure 1A).[9]

Table 1. Patients Characteristics

Patients	Age/Sex	Type of stroke	Laterality	Duration of pain (mo)	Symptoms	Treatment (Dosage per day)
1	67/F	Ischemic	Right	9	Burning Pain with tingling in the upper limb	Pregablin 300mg. nortriptyline 50 mg
2	65/M	Ischemic	Left	10	Lacerating pain with tingling sensation in the upper and lower limb	Gabapentin 600 mg and nortriptyline 50 mg
3	41/M	Hemorrhagic	Right	24	Aching pain in the upper and lower limb	Tramadol 100 mg, gabapentin 300 mg, and carbamazepine 900 mg
4	59/M	Ischemic	Left	11	Lancinating pain in the face and hand	Amitriptyline 50 mg, pregabalin 300 mg, and gabapentin 300 mg
5	65/M	Hemorrhagic	Left	9	Tingling and burning pain more in the upper limb than the lower limb	Pregabalin 300 mg, amitriptyline 50 mg, and gabapentin 300 mg

Abbreviations : F, Female ; M, Male

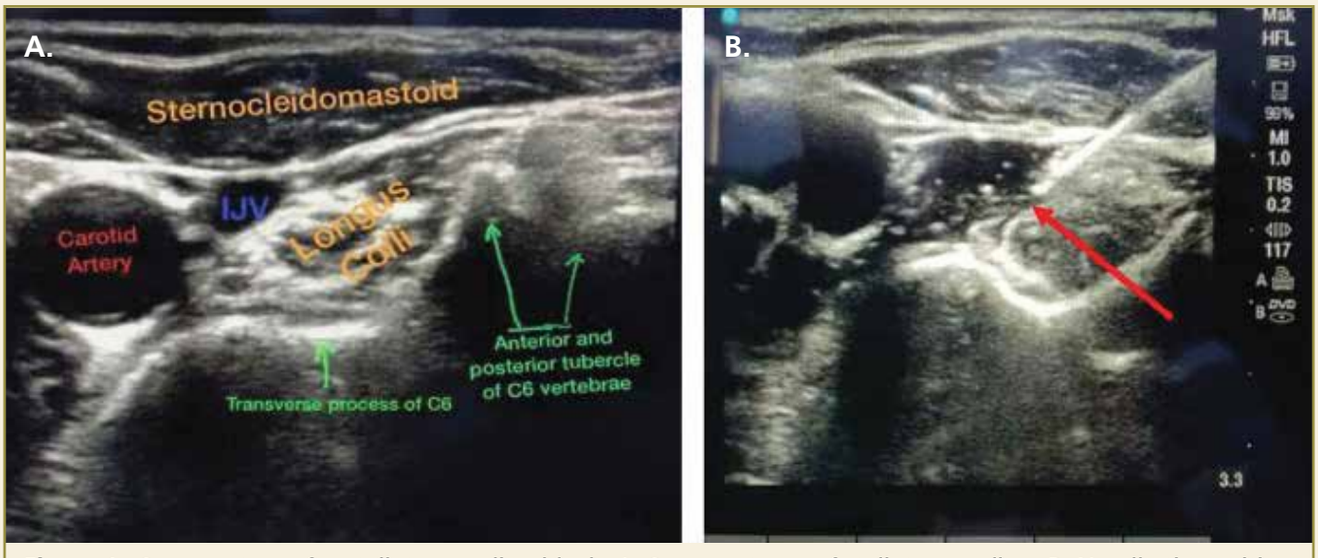

Figure 1 : Sonoanatomy for stellate ganglion block. A, Sonoanatomy of stellate ganglion. B, Needle tip position and drug spread (red arrow). C6 indicates 6th cervical vertebrae; IJV, internal jugular vein

Table 2.	Change in Medication Poststellate Ganglion Block (Doses per Day)		
Patients	**Treatment (preprocedure)**	**Treatment (postprocedure at 1 mo)**	**Treatment (postprocedure at 3 mo)**
1.	Pregabalin 300mg and nortriptyline 50 mg	Pregabalin 75mg and nortriptyline 10 mg	Pregabalin 75mg and nortriptyline 10 mg
2.	Gabapentin 600mg and nortriptyline 50 mg	Gabapentin 300 mg	Gabapentin 300 mg
3.	Tramadol 100mg, gabapentin 300mg, and carbamazepine 900 mg	Gabapentin 300mg and carbamazepine 300 mg	Gabapentin 300 mg
4.	Amitriptyline 50mg, pregabalin 300mg, and gabapentin 300 mg	Gabapentin 300mg and amitriptyline 10 mg	Gabapentin 300 mg
5.	Pregabalin 300mg, amitriptyline 50mg, and gabapentin 300 mg	Gabapentin 300mg and amitriptyline 10 mg	Gabapentin 300mg, amitriptyline 10 mg

Following the initial scan, the patient's skin was prepared using a 2% chlorhexidine solution, and the puncture site was anesthetized adjacent to the transducer. For all patients, we placed the transducer in a short axis to the neck at the level of the cricoid cartilage, and the needle was advanced with an "in-plane" view. The injection was performed using a 25-G, 3.5-in-long spinal needle. Under continuous ultrasound guidance, a needle was inserted and directed to the anterior surface of the longus colli muscle. One mL of normal saline was injected first to confirm the needle placement under the prevertebral fascia and to facilitate clear separation of tissue planes. Multiple studies have demonstrated that injection deep into the prevertebral fascia improves stellate ganglion block efficacy. The needle was carefully repositioned so that the drug was not injected into the muscle. The medications were injected if the spread of saline was adequate (Figure 1B).[9] Each medications were gradually reduced by >50% at 1 month and 3 months (Table 2). Hoarseness was noted in one of the patients, which was self-limiting. No long-term complications were observed.

Discussion

The fusion of the inferior cervical and first thoracic ganglion of the sympathetic trunk forms the stellate ganglion. Stellate ganglion blocks have been used in various chronic pain conditions.[13] Although the exact mechanism of relief of central origin pain is unclear, the following hypotheses are proposed. The pathophysiology of the central lesion is multifactorial. The primary afferent pathways or nuclei are abnormally excitable because of the primary lesion. Thus, the regular activity of peripheral afferent nerves increases an abnormal disinhibited state in central structures. Therefore, blocking the peripheral input reduces the abnormal excitability of the central nervous system. Moreover, the sympathetic system influences afferent nerve fibres and dorsal root ganglions. So, blocking sympathetic outflow is similar to blocking peripheral input to a central lesion.[10]

Based on the above hypothesis, stellate ganglion blocks for CPSP were performed in a series of patients with CPSP who were not responding to pharmacotherapy. After intervention, the patients' pain scores and function improved by >50%. Moreover, neuropathic medications decreased by 50% in patients during follow-up visits. These results were similar to the case reports by Liao et al[7] and Liu et al.[8] In both of their case reports, good pain relief lasting >6 months was obtained in patients with CPSP. However, our case series differs in the drugs used and the number of blocks administered. While previous studies used serial blocks with only local anaesthetics, we used a single injection of local anesthetic and nonparticulate steroid, intending to prolong the block with the steroid.[14,15] Nonparticulate steroids were chosen mainly for safety to prevent the possibility of micro emboli as the block area is highly vascular.

Despite the limitations, this is the first case series in which patients with refractory CPSP were managed using ultrasound-guided stellate ganglion blocks. Significant improvements were recorded in all the patients after the blocks for up to 3 months with no long-term complications. This case series also provides encouraging results for future research on stellate ganglion blocks as a treatment modality for CPSP.

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Serial Stellate Ganglion Block for Upper Limb Neuropathic Pain During Dialysis: A Case Report

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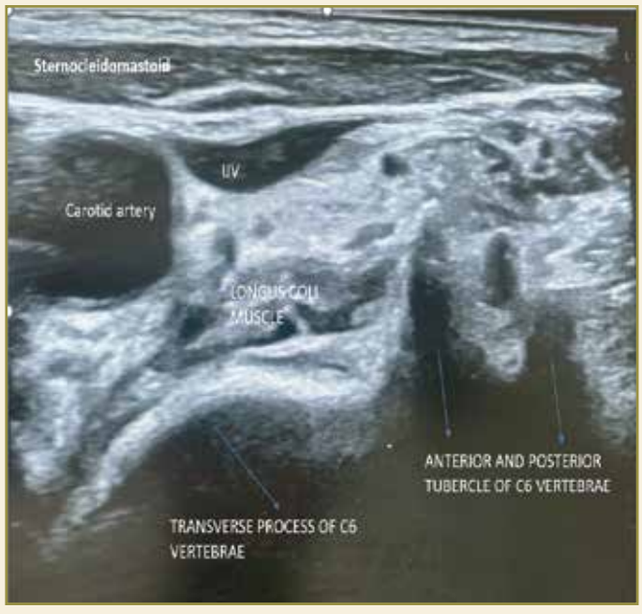
Pain on arteriovenous fistula (AVF) cannulation is a persistent problem in the daily haemodialysis practice. Its prevalence varies from 12% to even 80% depending on the definition and the pain-assessment tools and it affects the quality of life of haemodialysis patients. It is associated with fear of the cannulation process affecting the decision of continuation of the of haemodialysis from the AVF and sometimes the haemodialysis itself.

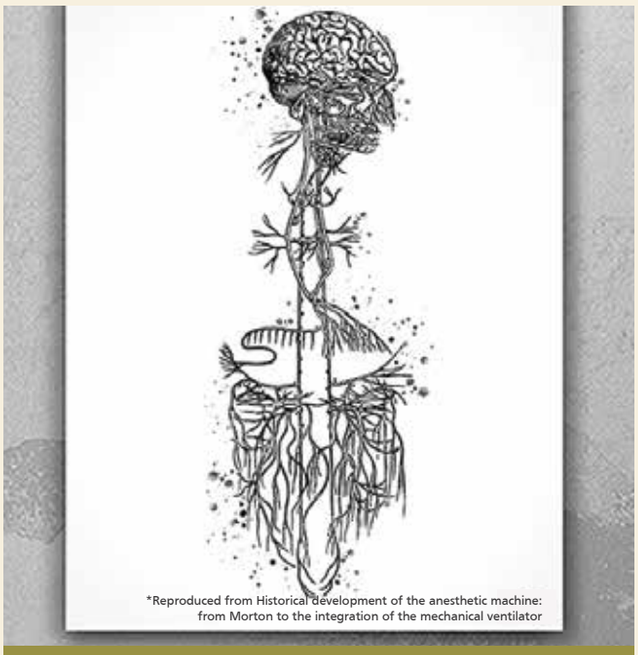
We are presenting a case of a 43-year-old female who presented with left upper limb pain for last 2 months. She is a known case of Chronic Kidney Disease on haemodialysis, twice a week for the last 4 years. For dialysis an AV fistula was created in left arm in January 2024. She complained of pain after needle insertion in AV fistula which persisted throughout the dialysis. Her pain was associated with electric shock like sensation along the left upper limb. The pain was severe in intensity (reported NRS-9/10), hampering her dialysis duration. She received multiple intravenous analgesics including intravenous acetaminophen, diclofenac, tramadol during dialysis providing minimal relief. On examination there was no tenderness, allodynia and hyperalgesia around the fistula and no sensory or motor deficit in left upper limb.

We planned for serial left stellate ganglion block before each session of haemodialysis. Initially left stellate ganglion block was given with 8 ml 0.25 % Bupivacaine biweekly for 2 weeks than weekly for next 3 weeks.

With each stellate ganglion block, the requirement of analgesics went down to present requirement of 1 tablet of low dose combination of acetaminophen and tramadol during dialysis. She reported significant decrease in pain during dialysis with increased in duration of dialysis and decreased in analgesic requirement during dialysis. In addition, the reduction of fear of dialysis has led to a meaningful improvement in her quality of life and has given her a new confidence to go on with her life.

Serial Stellate ganglion block can be an alternative analgesic method for neuropathic and sympathetically mediated pain in upper limbs and head and neck region including Complex regional pain syndromes, vascular insufficiency (e.g. Raynaud's disease), AV fistula cannulation and dialysis among others.





Vagus Nerve Print

Pain Relief After Joint Replacement Surgery - Peripheralization of Nerve Blocks – A Feat by Anaesthesiologists

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Total knee arthroplasty (TKA) remains the standard of care for managing degenerative knee conditions in the aging population. This procedure significantly enhances quality of life and reduces dependency on others. The surgical sector has undergone a revolution, with more precise robotic approaches replacing conventional techniques. Early ambulation, shorter hospital stays, fewer problems, and a general decrease in morbidity and mortality have all been made possible by this procedure. Needless to say, this procedure involving bone cuts causes immense pain. The anesthetic techniques are presumed to provide proper pain relief. Extraordinary pain relief has also contributed to the better peri-operative outcome, early rehabilitation and popularity among patients.

Factors contributing to postoperative pain include surgical trauma, patient pain threshold, duration of tourniquet, preoperative pain level, involved, sex of the patient, postoperative activity level of the patient [1]. Epidural analgesia and opioids were the primary means of postoperative pain management. Despite these variables, joint replacement surgeries are more and more acceptable to the patient population because of good pain postoperative relief.

For good postoperative outcomes preparation begins in the preoperative period. Preoperative assessment, preemptive analgesia and appropriate counselling are crucial for enhancing postoperative recovery. Gabapentin has been utilised as a preemptive analgesic to decrease postoperative opioid consumption. However, the current evidence is not strong enough to support its use, we don't use it at Fortis Hospital Bannerghatta road any more. [2]

Central neuraxial blocks have long been considered the holy grail of intra-operative anesthetic techniques, offering additional excellent postoperative analgesia. Spinal anesthesia, particularly with the addition of adjuvants such as morphine, can extend analgesia duration up to 24 hours; though its use may be associated with pruritus, vomiting, urinary retention and constipation. Therefore, epidural anesthesia with catheter placement has been considered a viable alternative.

Epidural anesthesia enables the maintenance of intraoperative anesthesia and motor blockade regardless of the duration of surgery and the catheter can be used to provide postoperative analgesia with lower concentrations of local anesthetics, with or without adjuvants. However, inadequate analgesia and unilateral sparing have been observed in a few patients undergoing bilateral TKA under epidural anesthesia in the postoperative period. The disadvantages of epidural anesthesia also include its extended action causing unwanted motor blockade; therefore delayed postoperative ambulation. In many cardiac patients who continue anti-platelet therapy, epidural anesthesia is contraindicated. Currently, the epidural technique is reserved for bilateral TKA and for cases where the surgical duration of unilateral TKA is expected to be prolonged.

Additionally, there has been a change in the choice of local anesthetics for patients receiving epidural anesthesia. Ropivacaine and Levobupivacaine have replaced bupivacaine due to their lower cardiotoxicity and better sensory-motor differentiation. Patient -controlled epidural analgesia (PCEA) has been used to improve patientsatisfaction with pain management but may be associated with hypotension and unwanted motor blockade,

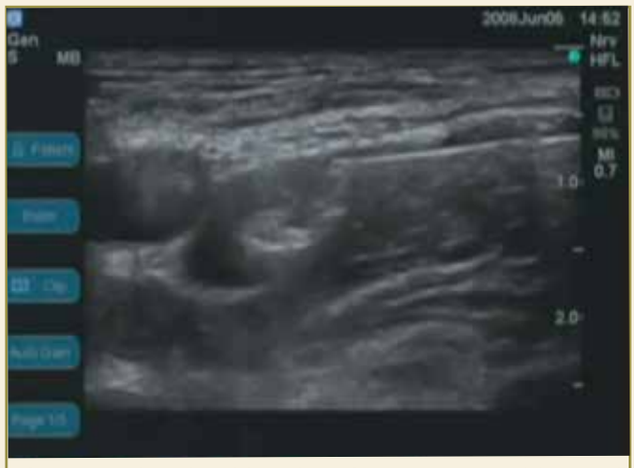

Figure 1 : Showing 'doughnut' appearance of femoral nerve: Femoral nerve bathed in local anesthetic

requiring continuous monitoring to avoid these complications.[3]

With the introduction of ultrasound in anesthesia, focus has shifted from epidural to more and more peripheral nerve blocks. (Fig 1) Knee joint is innervated by tibial, common peroneal and saphenous nerve. Hence selectively blocking these nerves will enhance analgesia and reduce the incidence of unwanted side-effects related to Central Neuraxial Block. It includes femoral nerve block, sciatic nerve block, adductor canal block and iPAC (infiltration between popliteal artery and capsule of the posterior knee).This target centric approach has many advantages.

Femoral nerve block provides effective analgesia for the anterior region of the knee. For complete analgesia, this was initially combined with sciatic nerve block. [4]

However, sciatic nerve block may result in foot drop, and it could be challenging to differentiate this insult from the block itself, tourniquet-related issues, or surgical issues. There could be medico-legal repercussions to this. Although it could be difficult to implement in practice, the proximal approach to block may help to distinguish the etiology of foot drop. A major disadvantage of femoral nerve block is quadriceps weakness and may delay ambulation. Distal approach to selectively block terminal sensory nerve in adductor canal produces effective analgesia without the associated quadriceps weakness of femoral nerve block.

The use of ultrasonography is largely responsible for the high success rate of this easy block. The local anesthetic is observed spreading lateral to the femoral artery below the sartorius muscle with the transducer positioned on the anteromedial thigh at the intersection of the middle and distal thirds of the thigh. When compared to the femoral block, there is ample data to support the effectiveness of this block. As a valuable addition to a multimodal analgesic plan in the postoperative phase, it may not be enough as a stand-alone analgesic treatment. This block promotes early ambulation and recovery while maintaining quadriceps strength.[5]

iPAC enhances the analgesia provided by the adductor canal block. It involves infiltration of local anesthetic into the space between the popliteal artery and the posterior capsule of the knee joint blocking the tibial and peroneal nerves.

Periarticular infiltration by the surgeon is another option to enhance analgesia in the postoperative period.

Anesthesiologists have come a long way in accepting peripheral nerve blocks. Bilateral TKR patients receive general anesthesia (if there is no contraindication) with bilateral femoral nerve blocks or adductor canal blocks

Figure 2 : Showing all the five bilateral TKR patients being ambulated on the same evening

with iPAC. Patients receiving femoral block are receiving Ropivacaine 0.15 to 0.2 % as continuous infusion. The incidence of quadriceps weakness is less with lower concentration of Ropivacaine. Most of our patients are ambulant on the same day. The adductor canal block with iPAC has also made its way through but we have observed a higher rate of catheter fall out. Early mobilization is possible with this combination. (Fig 2)

Very recently we nebulised Dexmedetomidine twice daily and found it reducing the pain of TKR surgery. A prospective study is underway at our department.

Nebulisation of Dexmedetomidine is a new concept. Two patients who underwent bilateral TKR under combined spinal epidural anesthesia were given Dexmedetomidine 1 mcg/ kg in the immediate postoperative period. We noted that their pain scores were less. However this is just our initial trial.

Postoperative pain following TKR is severe. If not handled properly there may be delay in rehabilitation and may lead to chronic pain. It needs to be address and supplementing peripheral nerve blocks with multimodal analgesia plan will enhance mobilisation, improve patient satisfaction and early rehabilitation.

In future we may have long acting local anesthetics with single shot peripheral nerve blocks or single shot spinal prolonging analgesia without the need for catheter placement or continuous infusion of local anesthetic and reducing the need for opioids.

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Expert Strategies for Post-Operative Pain Management: Insights from a Pain Management Nurse

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Introduction

Post-operative pain management remains a critical aspect of patient care, influencing recovery, patient satisfaction and overall outcome. It requires a systematic approach to understand the complex interplay of factors affecting post-operative pain management. The key components include assessment and monitoring, pharmacological and non-pharmacological interventions, multimodal analgesia, complications, individualized treatment, patient education and collaborative care. Each aspect is interconnected, emphasizing the nature of pain management in post-operative setting.

Role of Pain Management Nurses in relieving post-operative pain

Pain management nurses and anaesthetist are trained specialist in pain management who play a special role in assessing patients pain levels accurately and adjust treatment plans accordingly. They work closely with the nurses in providing frontline assessment of pain using pain scales, administration of medication, implementing non-pharmacological intervention, monitoring for side effects, educating patients and families about pain management techniques and advocating for optimal pain relief while minimizing potential side effects and risks. Pain Management nurses review post-operative patients daily and evaluate response to interventions and the effectiveness of current pain management strategies and make adjustments as needed, based on patients evolving needs, treatment goals and feedback.

Benefits from the Pain management services

Pain management services offer several benefits to patients such as

- Improved quality of Life
- Enhanced mobility and functionality
- Reduced delays in pain relief with use of Patient controlled analgesia.
- Personalized treatment plans
- Prevention of chronic pain

Patient – Family Benefits

- Mental health support
- Improved sleep
- Increased participation in rehabilitation
- Support and education
- Holistic approach

Patient Safety Benefits

- Constant monitoring by Pain management team for side effects of analgesia
- Analgesic medications are titrated as per need of th patient.
- Risk of over dosing with opioid analgesics is prevented as pre-set limits are set in the PCA pump by the Pain management team.
- Enhanced patient mobility reducing risk of complications such as Deep vein thrombosis and pulmonary Embolism
- Reduced risk of infection

Key ways in which pain management strategies enhance patient outcomes:

Personalized Care and Attention

- **Detailed assessment** of patient's pain is carried out post operatively, considering its intensity, location, duration and its impact on patient's daily activities. This thorough understanding enables the creation of personalized pain management plans.
- **Continuous monitoring** & reassessment, ensures that pain management strategies remain effective and are adjusted as needed.
- **Enhanced Communication** Nurses act as liaisons between patients and other healthcare providers, particularly anaesthetist. They ensure that the patients pain experiences and concerns are communicated accurately, facilitating timely and appropriate interventions.
- **Patient Education** Patients are educated about

their pain management plans including medication use, potential side effects and non-pharmacological pain relief techniques. This education empowers patients to actively participate in their own care.

Improved Pain Management

- Timely Pain relief - Pain Management Nurses ensures that patients receive timely and appropriate pain relief interventions, minimizing periods of unmanaged pain.
- Multimodal approach – Analgesics are administered via diverse routes such as oral, intravenous, epidural, regional nerve blocks, transdermal patches with careful consideration given to dosage, frequency and potential side effects. Non pharmacological interventions compliment pharmacotherapy, offering alternative modalities for pain relief.
- Patient Controlled Analgesia (PCA) allows patients to self-administer pain medication when they feel it is necessary, leading to better individualized pain management. This results in more consistent pain relief as compared to scheduled dosing.

Emotional and psychological support

- Pain management nurses provide emotional support, helping patient cope with the psychological aspects of chronic pain.

Education and Self-management

- Patients are taught how to score their pain, self-management strategies such as relaxation exercises, proper body mechanics and activity pacing, use of patient controlled analgesia thus empowering them to actively participate in their recovery process & enabling them to manage their pain more effectively.

Empowerment

- By educating patients and involving them in their care plans, patients are empowered to take control of their pain management, leading to improved adherence and outcomes.

Reduction of complications

- Pain management nurses closely monitor patients for side effects of pain medications and other treatments, ensuring any adverse effects are promptly addressed.

Preventing chronic pain

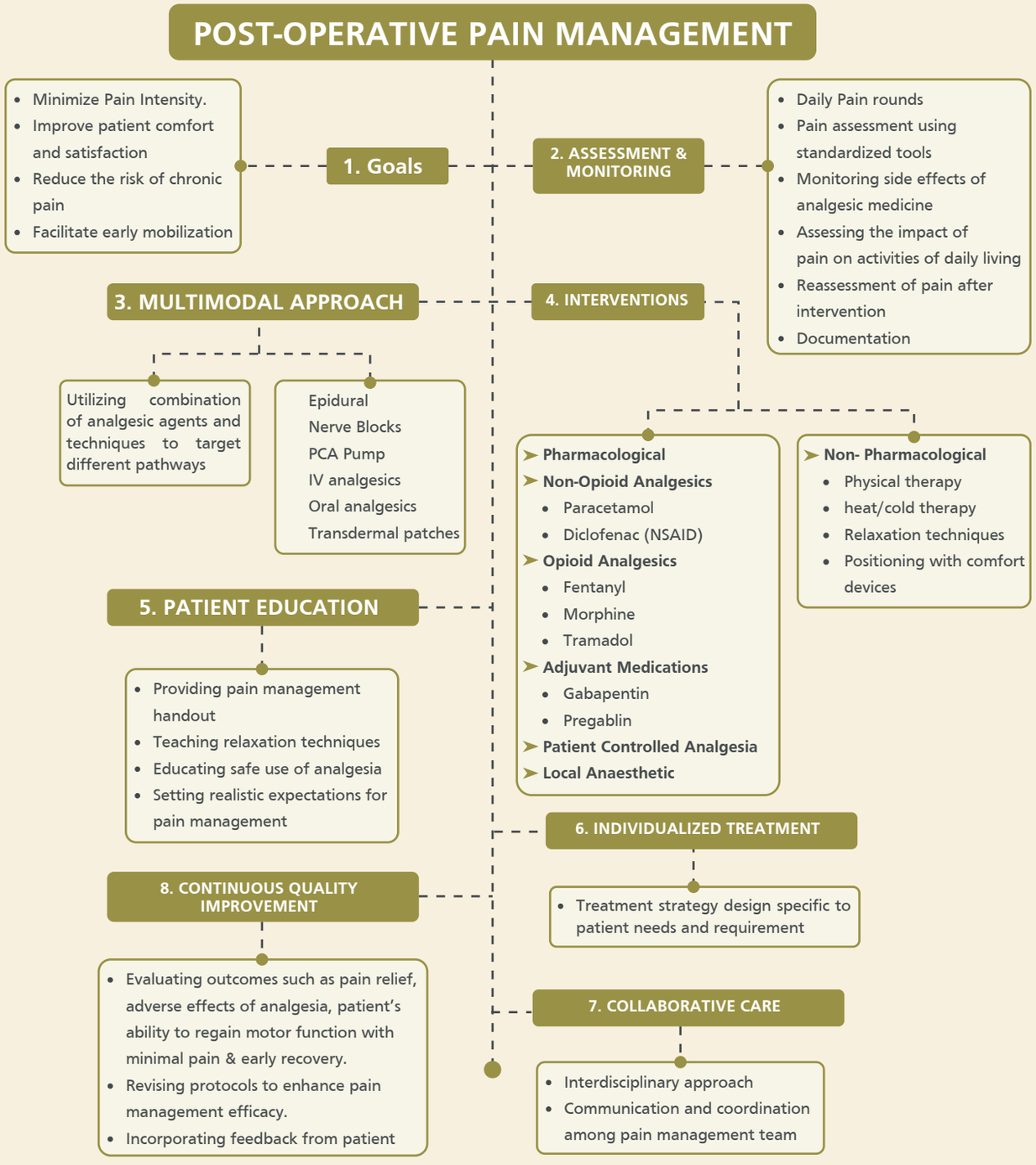
- Early and effective pain management prevents acute pain from becoming chronic, reducing the risk of long-term complications and improving overall quality of life

Overall, pain management services utilize a patient centred approach to treat pain, aiming to improve patient's functional ability and psychological wellbeing.

The given concept map provides a structured overview of the key components and considerations in post-operative pain management. It illustrates the multifaceted nature of pain management and the importance of a comprehensive approach to address the complex needs of patients undergoing surgery. Moreover, this concept map underscores the significance of interdisciplinary collaboration among healthcare professionals, seamless communication and continuous quality improvement initiatives within healthcare systems to enhance effectiveness of post-operative pain management strategies.

Pain management

Concept Map on Post-Operative Pain Management



Post operative pain management for total knee replacement surgeries

Rationale

Patient Reported Experience Measures (PREMs) for total knee replacement patients are essential tools used to assess the quality of care from the patient's perspective. These measures typically focus on the various aspects of the healthcare experience, including communication with healthcare providers, pain management, post-operative, overall satisfaction with the surgical outcome and the recovery experience.

Reference

A continuous PREMs and PROMs Observatory for elective hip and knee arthroplasty

When to use

Post-operative pain management for total knee replacement surgeries PREMs tool is to be used by all patients undergoing knee replacement surgery.

When to serve the tool: Post procedure recovery/before discharge.

Exclusion is not limited to Incapacitated patients, children below 9 years of age & patients under sedation

SR. No.	QUESTION	PATIENT RESPONSE
1.	Did the anaesthetist /pain management nurse explain about post-operative pain management modalities before surgery?	Yes / No
2.	Did you get an opportunity to discuss your preference and concerns regarding pain management and analgesics?	Yes / No
3.	Did the pain management nurse /nursing staff educate you on how to score your pain and how to use PCA (patient controlled analgesia) pump?	Yes / No
4.	Were you informed about the potential risk and benefits of pain medications?	Yes / No
5.	Were you informed about the potential side effects of pain medications?	Yes / No
6.	Were you told to report pain & seek urgent medical attention in case of severe pain, nausea,vomiting,drowsiness, itching over the body, difficulty in breathing ?	Yes / No
7.	Did you feel pain management plan was tailored to your specific needs?	Yes / No
8.	Were your pain levels regularly assessed by the pain management team during your hospital stay ?	Yes / No
9.	Were you reassessed for pain in the recovery room?	Yes / No
10.	Were non medication pain relief methods (e.g. ice packs ,physical therapy)offered to you ?	Yes / No
11.	Did the nurse re-check or ask about your pain after administering analgesics?	Yes / No
12.	Was the patient controlled analgesia (PCA) pump effective in controlling your pain post operatively ?	Yes / No
13.	Did the pain management team & medical staff respond promptly to your pain management needs?	Yes / No
14.	Did you experience any side effects from the pain medications provided?	Yes / No
15.	Did you receive pain relief analgesics after reporting severe pain ?	Yes / No
16.	Did post-operative pain management help in reducing pain during mobilization ?	Yes / No
17.	Were you satisfied with the overall pain management service during your hospital stay ?	Yes / No
18.	Did you receive clear instructions on how to manage pain at home after discharge?	Yes / No

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Surgical Pain- A Myth No More

Left to right- Dr. Minal Bhan Agnihotri , Dr. Palak, Dr. A. K. Tilak, Dr Rekha Gupta and Dr. Meenal

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Introduction

A common misconception is that an anaesthesiologist is the doctor who "puts patients to sleep" before surgery. It's true that this is part of their job, but it's only a small part! An anaesthesiologist is actually a perioperative physician, where "peri" means all-around. So, an anaesthesiologist is responsible for patient care throughout the surgical experience: before, during, and after the surgery itself. An anaesthesiologist also has many responsibilities outside of the surgical suite (operating room). Taking control of peri-operative pain is one of the crucial roles of an anaesthesiologist and requires a multimodal approach in order to ensure satisfactory and safe patient recovery.

Multimodal Analgesia

Multimodal analgesia is defined as the use of more than one pharmacological class of analgesic medication targeting different receptors along the pain pathway with the goal of improving analgesia while reducing individual class- related side effects. Evidence today supports the routine use of multimodal analgesia in the perioperative period to eliminate the over-reliance on opioids for pain control and to reduce opioid-related adverse events.

A multimodal analgesic protocol should be surgery-specific, functioning more like a checklist than a recipe, with options to tailor to the individual patient.

Elements of this protocol may include opioid systemic analgesics, non-steroidal anti- inflammatory drugs like acetaminophen, ketamine, and local anaesthetics administered by infiltration, regional block, or the intravenous route.

In this article we will talk about the regional blocks we use in our set up to control pain. Preoperative Education and Perioperative Pain Management Planning.

We provide patient and family-centred, individually tailored education to the patient (and/or responsible caregiver), including information on treatment options for management of postoperative pain, and document the plan and goals for postoperative pain management.

The benefits of this programme include

1. reduced postoperative opioid consumption
2. less preoperative anxiety
3. fewer requests for sedative medications
4. Reduced length of stay after surgery

This helps to inform patients regarding perioperative treatment options and to engage them in the decision-making process. Educational interventions can range from single episodes of face-to-face instruction or provision of written materials, videos, audiotapes, or Web-based educational information to more intensive, multicomponent pre-operative interventions including individualized and supervised exercise, education, and telephone calls.

Preoperative Considerations

- Assess the patient for physical (neuropathy, coagulopathies, infection) and psychosocial conditions that may influence PNB, baseline VS.
- Assess respiratory status for pathophysiology to rule out COPD and other lung diseases, liver disorders.
- Inability to tolerate the position required for administration of the nerve block.
- Allergies
- Present identified risk factors to the Anesthesia team.

Use of Local and/or Topical Pharmacological Therapies

The use of subcutaneous and/or intraarticular infiltration of long-acting local anesthetics (BUPIVACAINE) at the surgical site has been shown to be effective as a component of multi-modal analgesia in

several surgical procedures, including total knee replacement, arthroscopic knee surgeries, caesarean section, laparotomy, and haemorrhoid surgery.

Use of Peripheral Regional Anesthesia

The use of peripheral regional anesthetic techniques have been shown to be effective as a component of multimodal analgesia for management of postoperative pain associated with a number of surgical procedures, including thoracotomy, lower extremity joint surgery, shoulder surgery, cesarean section, haemorrhoid surgery, and circumcision.

Epidural analgesia with local anesthetics (with or without opioids) or spinal analgesia (intrathecal opioid) in adults and children is associated with lower post-operative pain scores or decreased rescue analgesic use compared with placebo injections or systemic opioid analgesia in patients who underwent a variety of surgeries.Epidural or spinal analgesia might be associated with a decreased risk of postoperative mortality, venous thromboembolism, myocardial infarction, pneumonia, and respiratory depression, and decreased duration of ileus versus systemic analgesia. A potential advantage of epidural analgesia is that it can be performed as a continuous infusion or as PCA with local anesthetics.

Use of Peripheral Nerve Blocks (PNB)

Part of a pre-emptive multimodal analgesic technique providing safe and effective post-operative pain management with minimal side effects. Appropriate for both the in-patient and out-patient setting, PNB's afford both anesthesia and extended analgesia for a variety of surgical procedure. Afferent nociceptive (pain) stimulus from the injured tissue is prevented from reaching the central nervous system by preinjury neural blockade. Pain may be eliminated or minimized.

Advantages of PNB

- Reduced postoperative pain resulting in greater patient satisfaction with their pain management
- Early ambulation and discharge
- Decreased side effects of nausea and vomiting, drowsiness secondary to less opioid use for pain control.
- Less sedation during surgery allows patients to remain conscious (MAC) thus protecting their airway and avoiding airway manipulation and intubation

Disadvantages of PNB

- Requires technical expertise from a variety of medical clinicians.
- Time required preoperatively for block placement. This may be offset by decreased anaesthesia time in the OR and shorter length of stay in the PACU.
- Contraindicated in patients with a history of coagulopathies, preexisting neuropathies, anatomical aberrancy/pathology at injection site, or systemic disease or infection.

Pharmacology

Peripheral nerve blocks (PNB) involve injecting a local anesthetic near or around the nerve or nerve plexus that supplies the surgical area.The duration of action for each anesthetic medication depends on several factors; injection volume, concentration of the medication, and absorption.Single injection commonly 30-40cc. Percutaneous insertion of a catheter directly near the peripheral nerve supplies the surgical site with a continuous infusion.

Ultrasound Guidance

Ultrasound guidance enhances visualization of the neural target and its surrounding structures. Able to differentiate between vascular and non-vascular structures with the use of Doppler flow, as well as other structures i.e. lung.

Unintentional intraneural injection is reduced. Assessment of the proper needle-tip position occurs in real time.

Visualization of LA spread around the neural target ensures a successful block procedure

Allows for use of a smaller volume of LA due to the ability to visualize the administration during injection.

The common PNB used in our set up are :

- Brachial Plexus Blocks
- Cervical Plexus Blocks
- Intercostal Blocks
- Tap Block
- Femoral Nerve, Popliteal, Fascia Iliaca and Adductor Canal Block
- Ankle Block
- Interscalene Block (Isb)

Suitable for shoulder and upper arm procedures involving the lateral 2/3 of the clavicle, proximal humerus, and the shoulder joint i.e. total or hemiarthroplasty, arthroscopy, subacromial decompression, and procedures for the instability of the shoulder joint, rotator cuff repair and frozen shoulder.

Not recommended for patients with impaired pulmonary function. ISB obstructs the phrenic nerve, resulting in ipsilateral diaphragmatic paralysis.

Supraclavicular Block (SCB)

- The indication for a Supraclavicular block is surgery of the upper arm, elbow, forearm, wrist, and hand excluding the shoulder area.
- Pneumothorax is a potential complication due to the proximity to the apex of the lung. anatomy or pathology.

Femoral Block

- Provides motor and sensory innervation to the anterior aspect of the thigh, to the knee and to the medial aspects of the calf, ankle, and foot.
- Used for hip fracture repair and mid to distal femur fracture repair. Analgesia is only partial (usually paired with a spinal)
- Indications for single injections are knee arthroscopy, total knee arthroplasty; sometimes paired with a proximal sciatic block, BKA; sometimes paired with a popliteal sciatic block, AKA; paired with a sciatic block, ACL repair; paired with a single shot sciatic block, other hip or knee surgeries.

Adductor Canal

- Serves as a passageway for the saphenous nerve, the vastus medialis, medial femoral cutaneous, articular branches from the obturator nerve and the medial retinacular nerve as well as the femoral artery and femoral vein.
- Effective alternative to the FNB for patients undergoing TKA or surgery involving the distal thigh and femur, knee and lower leg on the medial side.

Sciatic Block

- The sacral plexus provides motor and sensory innervation to the entire lower extremity including hip, ankle and knee. Important components are the sciatic and posterior cutaneous nerve.

- It provides for complete anaesthesia of the leg except for the medial strip of skin innervated by the saphenous nerve. Combined with a femoral block, complete anaesthesia of the leg may be achieved.

Popliteal Sciatic Block

Anesthetizes the entire leg below the tibial plateau except the skin of the medial aspect of the calf and foot (saphenous nerve distribution).

Used for minor surgeries of the distal lower leg, foot or ankle.

Ankle Block

Indicated for surgery of the foot.

(Tap) Block

Provides analgesia to the skin and muscles of the antero-lateral abdominal wall and parietal peritoneum. Does not block visceral pain.

Used for patients undergoing lower abdominal surgery; appendectomy, c-sect, hernia repair, abdominal hysterectomy and prostatectomy.

Ultrasound-Guided Cervical Plexus Nerve Block

Indications

carotid endarterectomy, superficial neck surgery.

Fascia Iliac Block

Indications

Anterior thigh and knee surgery, analgesia following hip and knee procedures

Alternate Analgesia that has been considered

1. Patient Controlled Pumps
2. Trans- cutaneous Nerve Stimulation
3. Acupuncture, Massage and Cold Therapy
4. Cognitive–Behavioural Modalities

Conclusion

Effective pain management is crucial for enhancing patient recovery and satisfaction. Utilising various regional anaesthesia techniques can significantly reduce opined consumption and improve preoperative outcomes. Future directions should focus on refining techniques, enhancing safety and exploring the long-term benefits of these regional techniques in diverse patient population. By prioritising effective pain management, we contribute to better surgical outcomes. We run pain clinic in our hospital to facilitate the needs of the patients, both pre and post-surgical.

Use of Patient Controlled Analgesia with Continuous Ambulatory Delivery Device for Relief of Pain in Sickle Cell Disease Crisis – A Qualitative Case Study

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Introduction

The vaso-occlusive crisis, or sickle cell crisis, is a common painful complication of sickle cell disease in adolescents and adults. Acute episodes of severe pain (crises) are the primary reason that these patients seek medical care in hospital emergency departments. Frequently, however, the pain is incompletely treated. Despite advances in pain management, physicians are often reluctant to give patients adequate dosages of narcotic analgesics because of concerns about addiction, tolerance and side effects.

The physician and the hematologist must work together to treat acute pain episodes promptly and effectively, manage the long-term sequelae of chronic pain and prevent future vaso-occlusive crises. Optimal treatment of these acute pain episodes requires bolus dosing of intravenous opioids and frequent reassessments of pain, both of which are time-consuming for nurses and often lead to delays in care. Although the American Pain Society guidelines recommend Patient Controlled Analgesia (PCA) for the management of sickle cell pain among hospitalized patients, there is no consensus as to the appropriate timing of PCA initiation.

Pathophysiology of acute sickle cell painful crisis

In the homozygous form of sickle cell disease, inciting triggers (e.g., hypoxia, dehydration, exposure to cold or weather changes, stress) cause hemoglobin polymerization, resulting in the sickling and increased rigidity of erythrocytes. The subsequent deoxygenation of erythrocytes, the sickling, and now damaged red blood cells attach to the endothelial wall, forming a mass comprised of leukocytes and platelets with adhesion molecules P and E selectins.

The formation of these hetero-cellular aggregates physically causes small vessel occlusion and resultant local hypoxia. This process triggers a vicious cycle of increased hemoglobin S formation and releases inflammatory mediators and free radicals, contributing to reperfusion injury. Other pathological events include increased neutrophil adhesiveness, nitric oxide binding, platelet activation, and hypercoagulability. Further microvascular occlusion occurs due to activated neutrophils. Inflammatory mediators (e.g., plasma cytokines) lead to a proinflammatory state, causing further complications of vaso-occlusion.

Objective

- To assess the effectiveness of PCA for the management of sickle cell pain.
- To evaluate if its early use is associated with faster pain control and reduced length of stay.

Methodology

- Qualitative case study approach was used. Case study is based on the author's experience of managing sickle cell vaso-occlusive pain crises.
- Data collection was done using Numerical rating scale, direct observation and interview method.

Case description

Background

A 27-year-old woman with P1L1- 8-month-old male child presented to emergency department with a past history of sickle cell disease diagnosed in the last 3 years.

Management

Day 1

- Patient presented to emergency department with complaints of severe throbbing pain with a score of 10/10 in right knee joint in the last 5-6 hours, along with numbness and cramps of lower limb.
- Inj. Paracetamol 1 gm and Inj. Tramadol 50mg administered stat and continuous intravenous fluids with normal saline at 100ml/hr for hydration started.
- Shifted to medical intensive care unit for further management.

- In the ICU with pain score of 8/10, continuous IV.

Day 2

Initiation of Intravenous Patient Controlled Analgesia (PCA) with Injection Fentanyl Citrate via Continuous Ambulatory Delivery Device (CADD).

- With a breakthrough pain score of 8-9/10, two bolus doses of Inj. Fentanyl 25mcg at an interval of 1 hour was administered.
- In view of constant pain score of 8/10, a reference to acute pain service team was given to initiate IV Patient controlled analgesia with fentanyl in order to maintain a sustained level of analgesia.
- With beginning tenderness of breast, cabbage leaf application (Wong Boh Boi et al, 2017) and hot fomentation was advised to prevent further worsening of breast engorgement.
- Also, Tab Cabergoline 0.25mg was advised twice a day for 2 days to suppress lactation.

Day	Pain Score (Max. 10)	Attempted Dose	Basal Dose	Demand Dose	Lockout Interval
Day 2 (Initiation of PCA)	8	-	20mcg/hr	20mcg/hr	20 mins
Day 3	5	18 given/24 attempted	⬆ 25mcg/hr	20mcg/hr	15 mins
Day 4	4	4 given/6 attempted	⬇ 15mcg/hr	20mcg/hr	15 mins
Day 4 (Mid-day)	2	4 given/6 attempted	⬇ 10mcg/hr	20mcg/hr	15 mins
Day 5 (Weaning of PCA)	1	4 given/6 attempted (No Change)	10mcg/hr	Transdermal Fentanyl Patch 25mcg applied and IV PCA	
				Stopped 2hrs post application	
Day 6	1	Tab Ultracet BD and Fentanyl Patch 25mcg continued			
Day 7 (Patient Discharged)	0	Tab Ultracet BD advised for 3 days during discharge			

Nursing Management

- Assess and reassess the patient's pain using the numerical rating scale.
- Two nurses (assigned nurse and witness) should verify the order in the treatment sheet when initiating PCA or making changes.
- Educate the patient on the proper use of PCA pump.
- The nurse should monitor the patient closely and frequently to assess pain, sedation levels and respiratory rate at 1 hourly for 4 hours after commencement, 2 hourly for 4 hours and 4 hourly thereafter.
- Monitor for any opioid side effects and inform the physician when noticed.
- Document PCA use and pump settings: Basal dose (mcg/hr), Demand dose (mcg/hr), Lockout interval and PCA deliveries and attempted every shift.

Investigations

Day 1

- Complete Blood Count- Hb - 9.6 g/dl, WBC-10.25 thou/µl, RBC-4.37 mil/µl, Platelet Count 120 thou/µl, Hematocrit -28.3 %, Creatinine - 0.67 mg/dl.
- Morphology - RBC predominantly hypochromasia, microcytes, Elliptocytes, Target Cells & Tear Drop Cells Seen. WBC Neutrophilia Noted, Platelets Reduced, Platelet Count on Smear appears to Be 110-130 thou/ul.

Day 2

- Complete Blood Count-Hb - 8.4 g/dl, RBC- 3.84 mil/µl, WBC-7.17 thou/µl, Platelet Count-122 thou/µl, Hematocrit-25.2 %.
- Morphology-RBC Predominantly Hypochromasia, Microcytes & Few Elliptocytes Seen, WBC Normal, Platelets Reduced, Platelet Count on Smear Appears to Be 100-110 thou/ul.

- Serum Electrolytes–Sodium-137 mmol/L, Potassium-3.80 mmol/L, Chloride -109 mmol/L.

Day 3

- Complete Blood Count-Hb- 7.4 g/dl, RBC-3.41 mil/µl, WBC -4.67 thou/µl, Platelet Count 89 thou/µl, Hematocrit-22.5 %.
- Morphology- RBC Predominantly Hypochromasia, Microcytes with Few Tear Drop Cells & Elliptocytes Seen, WBC -Normal Morphology, Platelets - Reduced, Platelet Count on Smear Appears to Be 80-90 thou/ul.

Biochemistry

- Creatinine- 0.58 mg/dl
- Aspartate Aminotransferase (AST/SGOT) – 23 U/L
- Alanine Aminotransferase (ALT/SGPT) – 20 U/L

USG Musculoskeletal s/o High resolution – USG of the right knee joint was performed. No evidence of knee joint effusion or synovial thickening. Quadriceps and patellar tendons are intact. No significant abnormality noted in the medial, lateral and posterior compartment

Fig 1: Day wise pain score

Discussion

- Vaso-occlusive crisis is one of the complications of sickle cell disease. With timely advice on starting Injection Fentanyl infusion through PCA continuous ambulatory device provides a significant reduction in acute pain.
- PCA continuous ambulatory delivery device is a portable machine which can be carried along with the patient when mobilized during physiotherapy. Also, the pump provides additional features where the attempted and given PCA doses can be viewed. The changes in basal and bolus dose can be done as per the patient requirement.
- PCA is to be considered the first-line therapy over continuous infusion in a vaso-occlusive crisis in sickle cell disease patients.

Results

- As seen in figure 1, on Day 2 after commencing IV PCA, the pain score gradually reduced from 8 to 0 on Day 7.
- With reduction in pain, hydration with 100 ml/hr normal saline was slowly tapered to 80 ml/hr with alternate DNS and NS on Day 4. On Day 6, patient's intravenous therapy was stopped and oral hydration of 2.5 l/day was continued and same was advised on discharge.
- The mild tenderness of breast significantly reduced by Day 6.

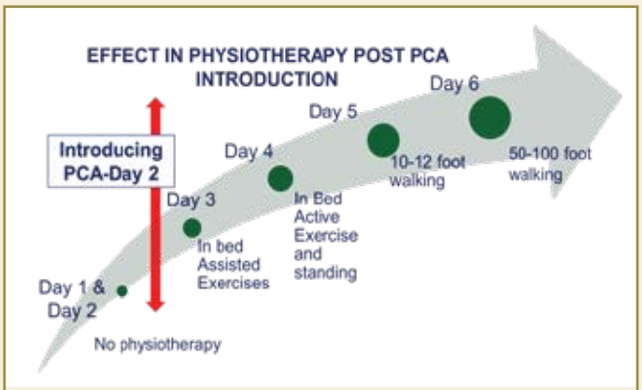

Fig 2: Effect of pain in physiotherapy

- However, each patient's previous history with opioids and individual risks and benefits must be weighed in each case.

Conclusion

- Initiation of IV PCA with Injection Fentanyl empowered the patient suffering with sickle cell painful crisis to control own pain and gave a high level of satisfaction for pain management.
- Patient Controlled Analgesia with Continuous Ambulatory Delivery Device is one of the most essential methods for providing continuous infusion of opioids in an inpatient setting.
- The hospitals receiving people with acute sickle crises should have a written protocol for fast assessment of pain and safe administration of analgesia utilizing PCA management.

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Pulsed Radiofrequency to Stellate Ganglion for Brachial Plexus Injury-Induced Complex Regional Pain Syndrome

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Abstract

Brachial plexus injury (BPI) occurs commonly in young adults following trauma. This may result in the development of complex regional pain syndrome (CRPS) following injury, which is difficult to treat. We present a group of patients with CRPS secondary to BPI. These patients were managed with neuromodulation of the stellate ganglion (SG) with pulsed radiofrequency (PRF) and followed up for a period of 3 months to assess for pain relief and a decrease in the intake of medications after the intervention. PRF to SG was found to have significant pain relief lasting around three months.

Key words: Brachial plexus, causalgia, complex regional pain syndrome (CRPS), hyperalgesia, injury and wounds, neuralgia, stellate ganglion, upper extremity

Introduction

Traumatic brachial plexus injury (BPI) is common in young adults, especially after a motor vehicle accident. [1] Many of these develop neuropathic pain apart from motor and sensory loss. Neuropathic pain in these patients is primarily due to complex regional pain syndrome (CRPS).[2] Sympathetic blocks are part of a multimodal approach, as sympathetically mediated pain plays a significant role.[3] However, the effect of the blocks is short-lasting, and repetition of blocks is often required.[4] Pulsed radiofrequency (PRF) of the stellate ganglion (SG) has shown long-lasting therapeutic benefits in CRPS related to other conditions.[5-7] PRF of SG for management of BPI-induced CRPS has not been reported as per available literature. We present a series of five patients who were successfully managed with PRF of SG with significant pain relief lasting around three months. The study was approved by the Institutional Review Board, and written informed consent was obtained from all subjects whose data are included in this report.

Cases Description

Five patients were referred to our pain department with a diagnosis of CRPS following BPI. Injury to the brachial plexus was following a motor vehicle accident in all the patients and had upper limb neuropathic pain for over 6 months. Limb salvage surgery for BPI was done initially following trauma. No other future surgeries were planned for any of the patients. The diagnosis was based on the International Association of Study of Pain diagnostic criteria. [8] The characteristics of the pain in all the patients are summarized in Table 1. All patients were given diagnostic SG block followed by PRF of the ganglia.

Procedure

A preliminary scan was performed with the patient supine and a pillow under the neck to extend the neck and head turned to the opposite side to have a good view utilizing a high-frequency linear ultrasound probe (6–13 MHz, M Turbo, Sonosite, Gurugram, Haryana, India). We used a short axis view with needling in the "In-plane" view [Figure 1a]. The injection was performed with a spinal needle 25G and 3.5 inches long. Under continuous ultrasound guidance, needle was inserted and directed to the anterior surface of the longus colli muscle. The medications were injected once at the correct position [Figure 1b]. The drug used was a 2 ml mixture of 1% lidocaine. The patient was then observed in the recovery room for immediate complications. Development of Horner's syndrome and temperature difference of 1.5°C in upper limbs were observed in all the patients indicating the successful placement of the block. After confirming the decrease in numerical rating scale by more than 50% following the diagnostic block, patients were scheduled for PRF of SG the next day.

For PRF sympathectomy, a 22-gauge, 10 cm curved, sharp radio-frequency insulated needle with an active tip of 5 mm and a radiofrequency ablation machine (Halyard Health, Inc., 5405 Windward Parkway, Alpharetta, GA 30004 USA) was used. Needle entry was performed, and the final placement of the needle tip was located as per the technique described. Once the correct position was confirmed, a thermocouple was introduced through the radiofrequency needle. Before lesioning, a sensory (at 50 Hz, up to 0.6 V) and motor (at 2 Hz, up to 1.2V) test stimulation was performed to verify the location. If the patient experienced no dermatome-related sensation and had no intercostal muscle contractions, the needle positions were deemed satisfactory. PRF was done at 42°C for 420 s [Figure 2a and b]. The PRF was then repeated in the same manner

as done earlier for 420 s at 42°C. Patients were then observed in the post-op room for any immediate complications. They were then followed-up in the outpatient department.

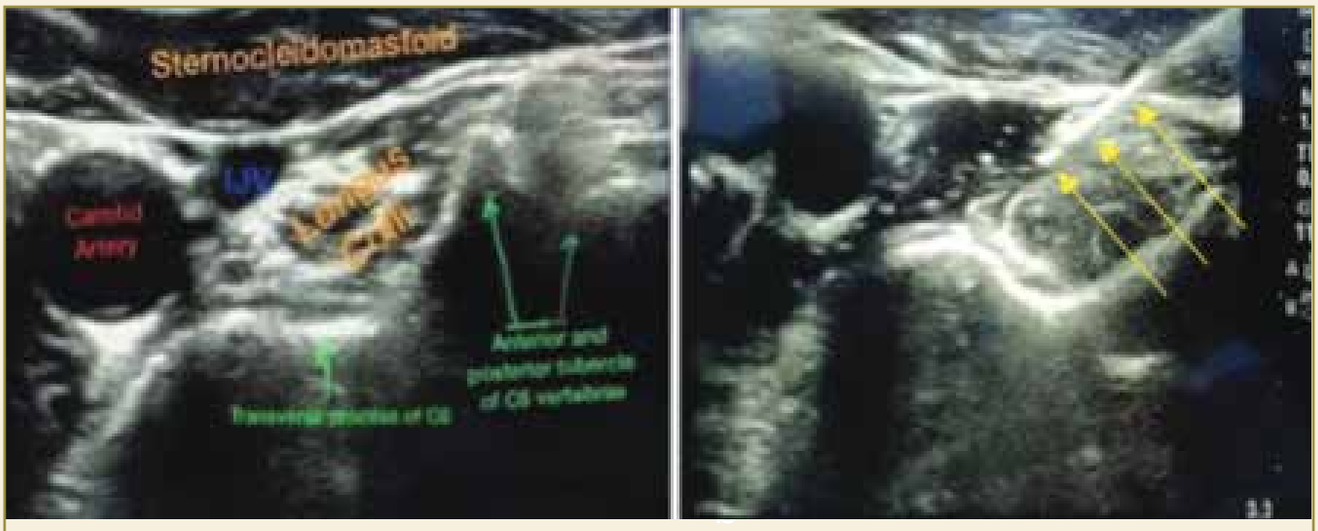


Figure 1: (a and b) (a). Sonoanatomy of stellate ganglion, (b). Needle position (Yellow arrows). IJV, Internal Jugular Vein, C6 Sixth cervical vertebrae

Table 1: Patient charaterisitics and details of the injury

Patients	Age (Years)/ Sex	Dermatological Distribution	Laterality	Characteristics of Pain	Duration (Months)	NRS	Associated Injuries
1	33/M	C5-T1	Left	Running Paroxysmal stabbing pain	8	9	Fracture distal humerus
2	38/M	C5-C8	Right	Dectric Shooting, Needle Pricking sensation	9	8	Fracture clavicle
3	60/M	C5- C8	Right	Burning Shooting, Needle Pricking sensation	/	9	Fracture proximal humerus
4	20/F	C5-C8	Left	Tingling, Lancinating sensation	6	8	Upper limb crush injury, Extensor tendor injury
5	25/M	C5-C8	Right	Burning, Needle prick, Tingline	8	9	Fracture humerus, both bones forearm fracture

M male; F female; C, cervical

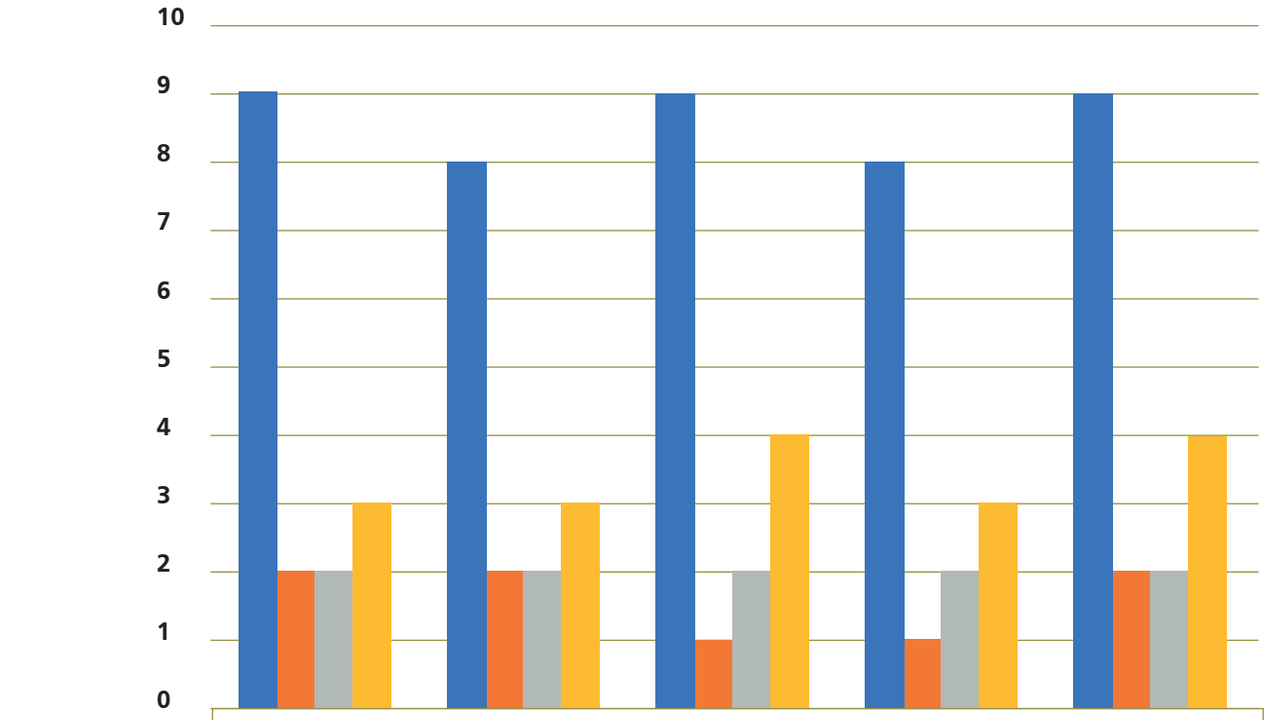
Table 2: Change in medications during the folloe - up

Patients	Gabapentin	(mg/day)	Pregabalin	(mg/day)	Amitriptyline	(mg/day)	Morphine	(mg/day)	Duration of follow-up (Months)
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	
1	600	100	-	-	50	10	60	-	3
2	900	200	-	-	50	10	60	-	3
3	-	-	225	75	50	10	60	-	3
4	600	100	-	-	50	-	60	-	3
5	300	100	-	-	50	-	60	-	3

Pre, Preprocedure; Post, Postprocedure; mg, miligram

Results

Pain scores were recorded by a physician immediately before and after each procedure who was not involved in the study. The patients were then followed-up for three months to observe for pain relief, analgesics use, and complications. All patients reported clinically significant improvement in pain scores by more than 75% at post-procedure and more than 50% at one month and 3 months [Figure 3]. A decrease in analgesic intake for pain by more than 50% over 3-month follow-up period was observed [Table 2]. No long-term complications were observed during the follow-up.



	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5
Pre PRF NRS	9	8	9	8	9
Post PRF NRS	2	2	1	1	2
1 Month	2	2	2	2	2
3 Months	3	3	4	3	4

Figure 3: Pain Scores: Preprocedure and During follow-up. NRS, Numerical rating score

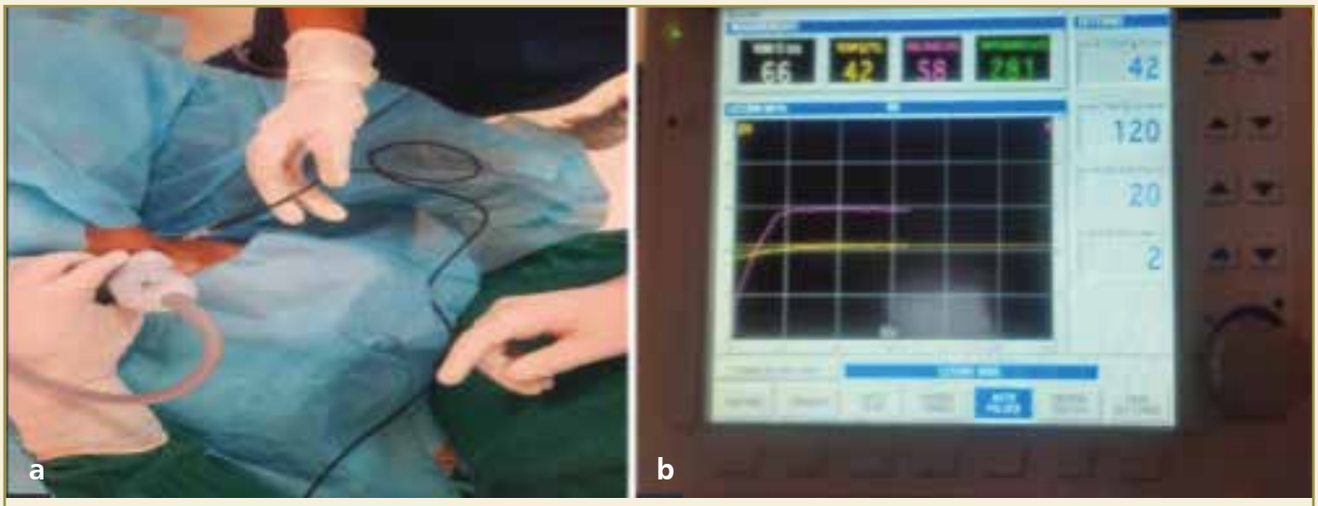


Figure 2: (a and b) Patient position with pulsed radiofrequency frequency under progress

Discussion

The result showed that the PRF of SG was successful in having a clinically significant effect for up to 3 months of follow-up. Moreover, it also resulted in a decrease in daily drug intake by more than 50%. There were no short-term or long-term complications. PRF uses nondestructive radiofrequency by emitting intermittent pulse at high frequency through a pulse generator. High-voltage current is generated around the nerves at short intervals. The temperature around the tissue is dissipated between the shots keeping it typically below 42°C. PRF delivers a low-energy electrical field in rapid pulsations to target nerve tissue and associated microglia. Compared to high-temperature radiofrequency ablation, PRF is not ablative but instead neuromodulating. Hence, it can be used safely where high temperatures of surrounding tissue are not desired and motor function needs to be retained. [9] PRF of SG has been used for a variety of conditions like postherpetic neuralgia, CRPS related to other conditions, and postmastectomy pain with consistent and long-term effect.[5-7]

Park et al[10] compared PRF of cervical sympathetic chain with a thoracic sympathetic ganglion in patients with upper limb CRPS. Results were significantly better in the thoracic sympathetic chain group with a longer duration of pain relief.

The present case series, despite limitations, is the first of its kind where a group of patients with BPI-induced CRPS was managed by PRF of SG. It provides encouraging results for future research to look for treatment modalities in the form of PRF of SG. However, further studies with a large sample size are required to validate this as a treatment modality.

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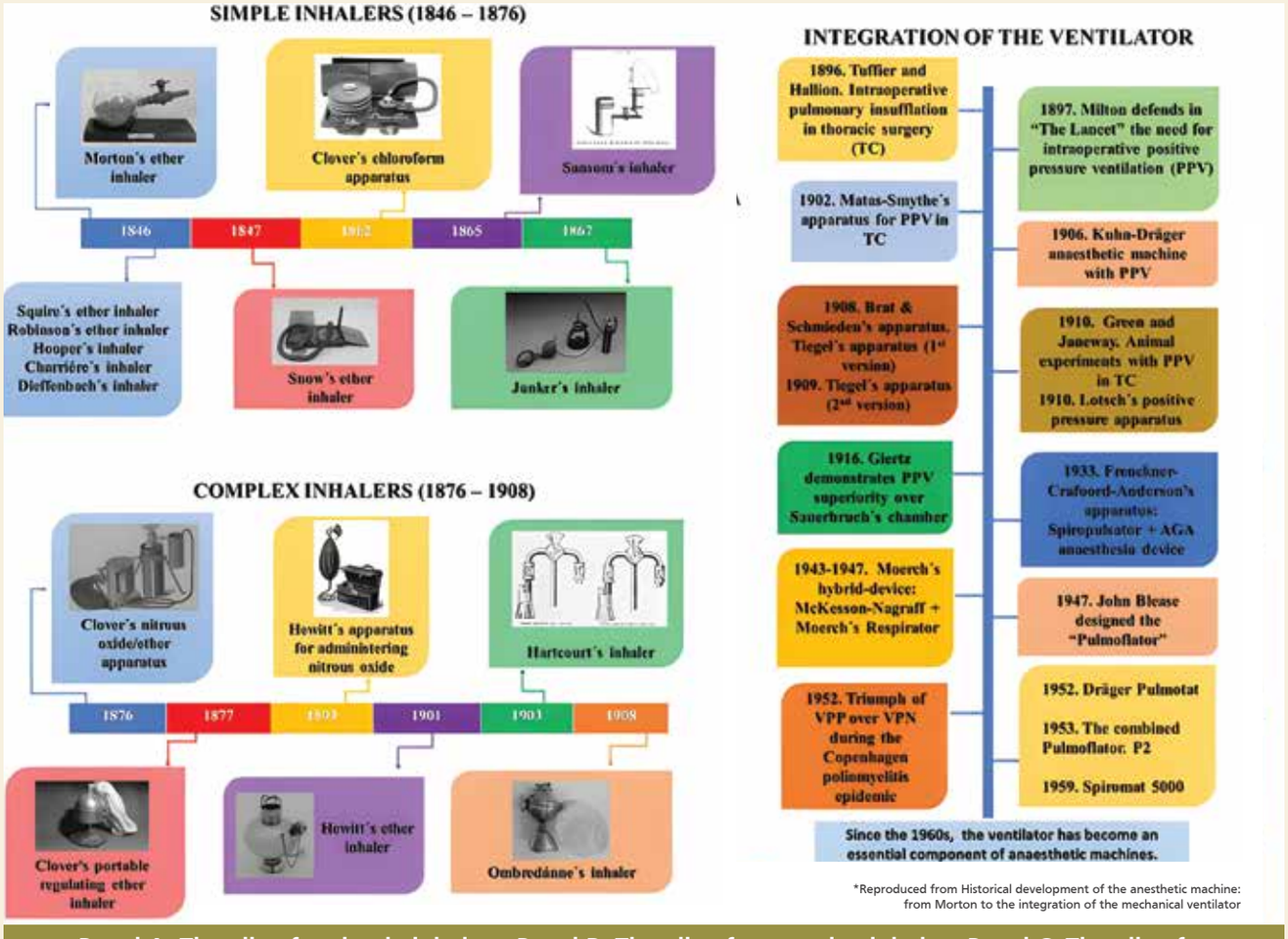

*Reproduced from Historical development of the anesthetic machine: from Morton to the integration of the mechanical ventilator

Panel A, Time line for simple inhalers; Panel B, Time line for complex inhalers Panel C; Time line for "integration of the ventilator"

COVID -19

Point-of-Care Lung Ultrasound: A Useful Diagnostic Tool in the Management of COVID-19

Source : Bharti N, Kumar A, Singla K, Point-of-care lung ultrasound: A useful diagnostic tool in the management of COVID-19. Indian J Clin Anaesth 2022;9(3):370-373

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Introduction

Pulmonary involvement is the primary cause of morbidity and mortality in COVID-19 disease which ranges from destruction of type-2 epithelial cells to diffuse alveolar damage eventually leading to acute respiratory distress syndrome (ARDS) and respiratory failure. Recently, lung ultrasonography has shown its utility in detection of various pathologic conditions including pulmonary edema, pneumothorax and interstitial lung disease (ILD). In experienced hands, pulmonary ultrasonography has been found comparable with CT- chest for identifying various medical conditions. The major advantages of lung ultrasonography are its safety, immediate availability of results and repeatability over time.

Applications of Lung Ultrasonography in COVID-19 Disease

Point-of-care lung ultrasonography allows direct bedside examination of patients; therefore, it can make a substantial contribution in the management of COVID- 19 disease. COVID-19 pneumonia mainly involves the peripheral pulmonary zones which can easily be detected by ultrasonography, using either low-frequency curved transducer or high-frequency linear transducer according to the body habitus.

Lung Ultrasonographic Findings in COVID-19 Disease

1. The initial findings consist of thickened and broken pleural line, presence of comet-tail artifacts or focal B-lines and subpleural consolidations involving peripheral pulmonary zones.
2. During progression of the disease, the multifocal or confluent and melted B-lines, known as "White lung" may be seen depending upon lung involvement.
3. The pleural effusions can be seen in more critically ill patients.
4. The reappearance of A-lines represents recovery phase of the disease.

All areas (anterior, lateral and posterior) of both lungs should be evaluated as bilateral, diffuse multifocal involvement is common. The presence of above sonographic findings in ≥2 zones considered as diagnostic. After initial diagnosis, repeated lung examinations may be helpful in tracking further clinical course and guiding suitable treatment options. The progression of disease, represented by multifocal B-lines and increase in number of affected lung zones, can guide about the escalation of care. The appearance of new consolidation with dynamic air bronchograms shows development of superimposed bacterial pneumonia and suggests for initiation of antibiotic therapy. The presence of "White lung" areas and/or pleural effusions suggest poor prognosis.

Serial lung ultrasonography can also help in taking decisions about the oxygenation and mechanical ventilation strategies. Patients presenting with pleural defects and focal B-lines can be managed with high-flow nasal oxygenation. However, appearance of confluent B-lines and subpleural consolidation suggest the need for pressure-support ventilation. Similarly, presence of posterior consolidations may advocate for prone positioning and, the presence of lung atelectasis suggests the requirement of recruitment maneuvers. Although, resolution of consolidations, reduction in B-lines and, reappearance of A-lines advocates to wean respiratory support.

Lung ultrasonography can also help to differentiate COVID pneumonia from other causes of dyspnea while

waiting for confirmatory testing.

Grading System of Severity

Soldati et al proposed a grading system for the assessment of severity of COVID pneumonia using lung ultrasonography after reviewing 60,000 ultrasound frames from 30 patients. The authors suggested that total 14 areas (3 posterior, 2 lateral, and 2 anterior, on each side) to be scanned and a 0-3 grading should be applied to every lung area scanned.

Score 0 = presence of A-lines with continuous pleural line

Score 1 = a broken pleural line with small-to-large consolidated areas

Score 2 = presence of associated white lung areas below the consolidated area

Score 3 = presence of large dense consolidation area signifying complete loss of aeration

36-point Lung Ultrasound Score (LUS)

Vetrugno et al proposed a 36-point LUS after scanning of 12 lung areas (six on each hemithorax) for assessment of progression of lung involvement and guide eventual respiratory weaning. One point has been assigned to the presence of focal B-lines, while confluent B-lines with the appearance of "white lung" image achieved two points; the presence of consolidation was scored as 3 points. The higher score reflect decrease in lung aeration and the progression of disease severity, suggesting the need for escalation of ventilatory support.

Diagnostic Accuracy of Lung Ultrasonography

Sorlini et al evaluated the sensitivity and specificity of diagnostic accuracy of lung ultrasound for COVID-19 pneumonia as 92.0% (95% CI 88.2–94.9%) and 64.9% (95% CI 54.6–74.4%) respectively and suggested that lung ultrasound can be used as first-line screening tool in suspected COVID-19 patients. In another study, Bianchi et al 12 demonstrated the positive predictive value of 97% and the negative predictive value of 98% of lung ultrasound for predicting COVID-19 disease and suggested that it may help in identifying false-negative RT-PCR cases in emergency department.

Recently, an international multicenter study 13 showed an overall sensitivity of lung ultrasound as 90.2% (95% CI 88.23–91.97%) for diagnosis of COVID-19 pneumonia in positive RT-PCR patients.

Lung Ultrasonography Versus Chest X-Ray and CT-chest

Frequent thoracic imaging is required in COVID-19 patients due to fast progression of disease. Although, x-ray chest is the most commonly used imaging technique due to its easy availability, it plays a limited role in the initial phase of COVID-19. Lung ultrasonography has been found to be more useful in detecting early COVID pneumonia as compared to x-ray chest in symptomatic patients.

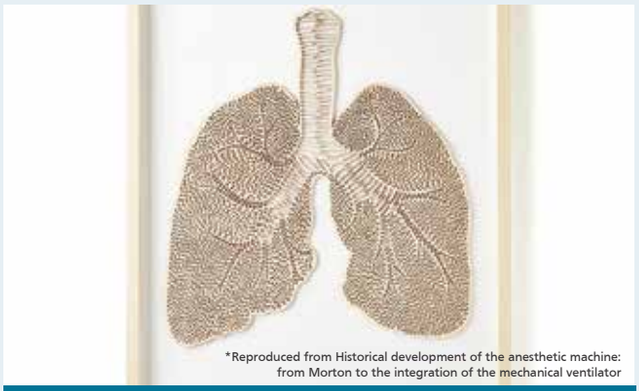
Many emerging studies have proven the efficacy of lung ultrasonography comparable to CT-chest for diagnosis of COVID-19 pneumonia. In a multicenter study comparing lung ultrasound with HRCT-chest to assess the prognosis of COVID-19, a strong positive linear correlation was observed between LUS and CT scores ($r = 0.754$; $p < 0.001$). According to the multivariate regression analysis, LUS was the sole independent predictor of in-hospital mortality among COVID-19 patients presenting with a score ≥20 (p= 0.003; 95% CI: 2.22-43.83).

Limitations

Lung ultrasonographic signs of COVID pneumonia are not specific and can be present in other respiratory diseases also. Therefore, it is important that repeated examinations should be performed and all areas of lungs should be covered.

Conclusion

Point-of-care lung ultrasound may play a potential role in the management of COVID-19 due to its high sensitivity and dynamic nature of observation. Lung ultrasonography can be useful for early diagnosis of COVID pneumonia, to assess the severity of lung involvement, to monitor the appropriateness of oxygen therapy and ventilatory support, to guide for escalation of care, and to track the evolution of disease during follow-up. The associated hazards of transportation for CT-scan in high-risk patients can be minimized by the increasing use of bedside lung ultrasonography. Moreover, this radiation-free imaging technique may also play an important role in pregnant patients.



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Anatomical Lungs Artwork

Happenings @ Fortis

IHH Service Week Celebrations

IHH Service Week - 22nd to 26th April 2024.

Service Week is a time when we celebrate our commitment to exceptional service, dedication, and patient-centric care. It is a celebration of the indomitable spirit that inspires and energizes each one of our staff members to excel and outperform themselves. Service Week serves as a reminder of our ongoing commitment to excellence in healthcare. It's a time to reaffirm our dedication to delivering uncompromising care to all our patients, every day, with enhanced teamwork and stronger bonds. This not only strengthens our resolve to keep patients at the core of our focus but also fosters an environment where healing is paramount. The empathetic care provided by our staff, coupled with exceptional clinical care, continues to set us apart. As soon as a patient enters our facilities, they should feel surrounded by a compassionate and healing environment.

This year we celebrated Service Week from 22nd to 26th April with theme, "Touching Lives with Caring Hearts," which captured the essence of our mission to provide compassionate, quality care that nurtures holistic healing. It was particularly special as we dedicated days to celebrate our Clinicians, Staff and Patients alike, ensuring everyone's participation in the festivities. The activities were designed to energize and inspire, leaving a lasting impression to motivate our team throughout the year and builds excitement for future celebrations.

Service Week at Fortis started off with enthusiastic cheers. It was a grand inauguration of the Service Week on 22nd April across the Country with Facility Director townhall along with lamp lighting and cake cutting. With an enlightening webinar by author Jin Kang Moller, live from IHH Singapore, the event was a success.

Day 2 of Service Week was Clinician focused. Lots of wonderful activities were conducted for our doctors across all units including dancing and singing talent shows. Our patient experience and admin staff gave 'Thank You' cards & gifts to doctors. A webinar on '7 C's of Care' was conducted by Dr Samir Parikh, Chairman Fortis Mental Health Program. Many Clinicians very enthusiastically participated in the Service Week and really appreciated the initiative.

Day 3 of Service Week was Patient focused during which various health talks, quizzes, BLS trainings by experts were conducted for the patients. The highlight of the day was voice of patients sessions where we invited our patients to share their experience of care and services received at our hospitals. It was great learning sessions for our staff to further focus on service excellence and enhance patient experience.

Day 4 & 5 was specifically focused on our Staff. Amazing fun activities, games, competitions, talent shows were organized at all units. There were cheers and joyful atmosphere all around. A special lunch meal was also organised for the staff.

Closing ceremony on 26th April concluded the Service Week with Rewards & Recognition for the Staff. It was a week of unity, inspiration and dedication. Everyone thoroughly enjoyed the Service Week and geared up for the year with more enthusiasm and renewed focus.

A Celebration of Compassion and Care on International Nurses Day

Fortis dedicated the month of May 2024 to celebrating the spirit of selflessness, courage, and professionalism of our nurses, acknowledging the wonderful work they do every day. Numerous events were organized across Fortis units throughout the month, including engagement activities, talks, and learning initiatives.

Fortis Corporate Nursing celebrated this special event by organizing Fortis Nurses' Townhall with the MD & CEO and senior leadership team for all nurses across Fortis Hospitals. 28 locations, approximately 8 hours (5 sessions), 100+ questions from 1000+ Nurses who were directly/indirectly logged in for an interaction with the leadership. In this distinctive Townhall, bedside nurses had the unique and unprecedented opportunity to engage directly with the MD & CEO, CHRO, Head of MSOG, and Corporate Chief of Nursing. This first-of-its-kind forum fostered open communication and support, allowing nurses to voice their concerns and queries. The leadership team responded with immediate resolutions, demonstrating a strong commitment to addressing frontline challenges and enhancing the working environment for our dedicated nursing team.

On 10th May 2024, an event was organized, virtually attended by 3000+ nurses, CNOs, unit leaderships, HR, Medical Admin and significant others across the Fortis Network. Held at FMRI, this event was physically attended by Fortis senior leadership, further demonstrating the organization's commitment to acknowledging and valuing the contributions of its Nurses. They were joined by the Delhi NCR Unit CNOs.

An exclusive booklet titled 'The Guardian Angels at Work – Tales of Care and Compassion- Vol II' was created to showcase the exemplary stories of Fortis nurses at work against all odds, moving unfeared, uninterrupted, and with courage. What stood out was the selected teams of nurses along with their doctors were present to share their side of story, loud enough about their critical thinking, courage and teamwork.

The Corporate Nursing Team, led by Capt. Sandhya Shankar, Chief of Nursing–Fortis Healthcare, MSOG, along with marketing and corporate communication, meticulously planned every aspect of the event. An overwhelming response was received from all across the units. The positivity and great energy emanating from this connect has a lasting impact on the nurses at Fortis.

We rise by holding & lifting each other.

Celebrating Progress and Collaboration: International Clinical Trial Day 2024

Introduction

On May 20th, 2024, the Fortis CSR Foundation orchestrated the International Clinical Trial Day at FEHI, Okhla New Delhi in collaboration with Sanofi India. This Day serves as a reminder of the critical role that clinical trials play in advancing healthcare and improving patients' outcomes worldwide.

The event was graced by esteemed dignitaries, among them were Dr Bishnu Panigrahi-**MSOG Head,** Dr. Narottam Puri- **Advisor Fortis Medical Council,** Dr Kameshwar Prasad -**Dean Fortis Clinical Research,** Mr. Jerin Jose Cherian-**ICMR,** Ms. Gunjan Kumar-**ICMR,** Preeti Shukla-**Cliantha Research** and Mr. Prakash Sahu -**Sanofi India** whose presence added prestige and significance. Notable figures of FEHI such as Dr. Vikram Aggarwal-**Facility Director,** Dr Anil Saxena-**HOD Clinical Research,** Dr Z.S Meharwal-**Member Secretary-Ethics Committee** and Dr Amrita Gupta -**Medical Director** also attended, enhancing the occasion with their influence and expertise. Their participation underscored the event's importance and impact.

Students from various universities attended the event, showcasing a diverse representation of academic institutions. Participants hailed from multiple educational establishments, converging to engage in the enriching experience.

Esteemed dignitaries were honoured with thoughtful mementos, symbolizing gratitude for their esteemed presence and invaluable contributions. The Clinical Research team, alongside participating students, were acknowledged for their invaluable contributions and active engagement during the event.

Celebrating Progress

International Clinical Trial Day provides an opportunity to celebrate the remarkable progress made in medical research and healthcare delivery. Furthermore, the collaborative nature of clinical trials deserves recognition. Researchers, clinicians, patients, advocacy groups, pharmaceutical companies, and regulatory

agencies all play crucial roles in the success of clinical research.

The event commenced with a welcome speech by Dr. Kuldeep Kumar, followed by a lamp-lighting session. The dignitaries in attendance added a special touch to the celebration by sharing their thoughts and experiences in the field of research. A panel discussion was then organized to address questions from the attendees, followed by a poster presentation from the 16 research sites and ended with quiz session and prize distribution.

Looking Towards the Future

As we celebrated International Clinical Trial Day, it is crucial to recognize that our work is far from over. There are still many diseases for which effective treatments have not yet been found and significant health disparities persist around the world.

Conclusion

International Clinical Trial Day serves as a moment of reflection, celebration, and recommitment to the principles of evidence-based medicine and patient-centred care. As we honor the achievements of the past and present, let us look towards the future with optimism and determination. By working together and supporting clinical research, we can build a healthier, more resilient world for generations to come.

Lamp Lighting by (left to right) Dr. Narottam Puri (Medical Advisor- MSOG) & Dr Vikram Aggarwal (Facility Director- FEHI

Dr Kameshwar Prasad (Director Neurology-Fortis Vasant Kunj and Dean of Clinical Research)

Lamp Lighting by (Right to left) Dr Bishnu Panigrahi (Head- MSOG) and Dr Kuldeep Kumar (AGM- Clinical Research)

International Clinical Trials Day 2024 celebration at Fortis Escorts Heart Institute, Delhi

Clinical Research Team and attendees of ICTD 2024 event

Clinical Trials

Comparison between QCA (Quantitative Coronary Analysis) and IVUS (Intravascular Ultrasound) Derived Normal / Non-Obstructive LMCA (Left Main Coronary Artery) Dimensions – An Observational Study

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Background

Intravascular ultrasound (IVUS) is one of the most widely applied intracoronary imaging method for the quantitative assessment of coronary artery disease, yielding more accurate evaluations of vessel geometry along with lesion severity than traditional quantitative coronary angiography (QCA).

Aim and Objectives

To estimate and derive the dimensions of normal/non-obstructive left main coronary artery (LMCA), to compare the values of dimensions of LMCA obtained through QCA versus IVUS, and to determine the relation between patient habitus and age on coronary artery size.

Methods

In 55 patients who were undergoing IVUS-guided PCI for critical left anterior descending artery (LAD) and/or left circumflex artery (LCX), the normal/non-obstructive LMCA dimensions were recorded during pull back and analyzed offline. The IVUS derived parameters were then compared with QCA derived parameters (obtained during offline assessment of coronary angiogram) of the normal/non-obstructive LMCA. Any correlation between age and patient habitus with that of IVUS derived LMCA dimensions were looked for.

Study design

Single center, observational study.

Study setting

Department of Cardiology, Fortis Hospital, Cunningham Road, Bengaluru

Study population

In-patients of the Department of Cardiology undergoing intravascular ultrasound-guided PCI for LAD or LCX disease who had proximal (LMCA) disease-free coronary artery segments or minimal atheroma.

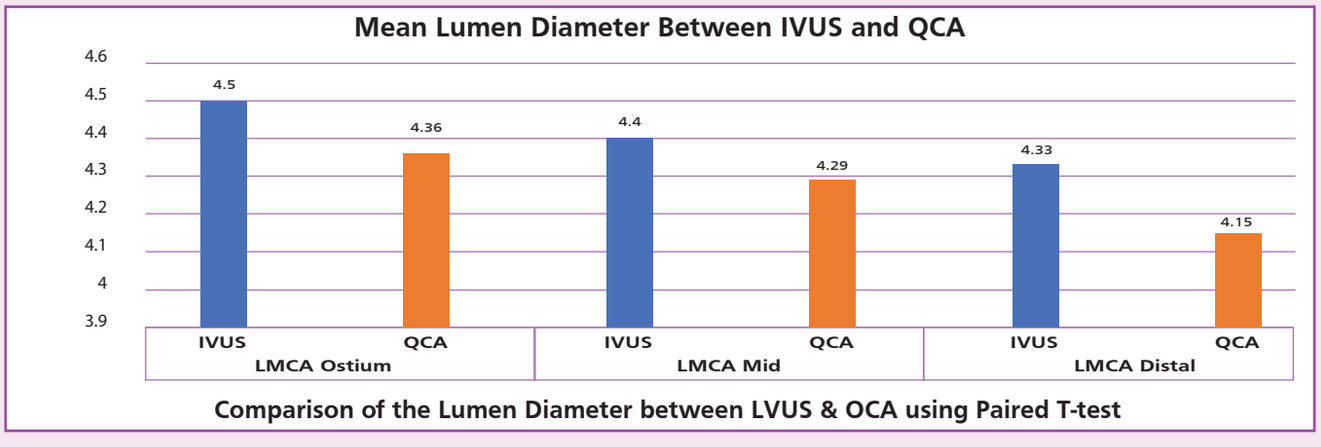
Results

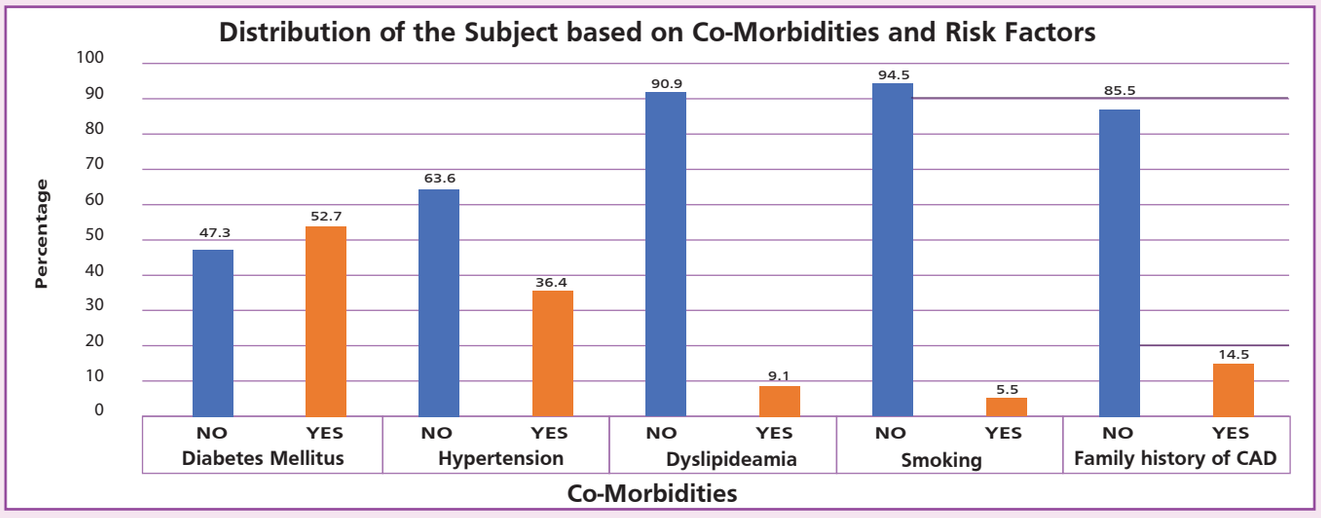
The average age of subjects was 58.69 ± 12.07 years. Out of 55 subjects, 22 were aged between 61 to 75 years followed by 21 subjects aged between 46 to 60

years, 8 aged in the range of 30 to 45 years and 4 subjects were aged > 75 years. 47 subjects were males, which could have been the probable reason for the above average height (cm) of 171.69 ± 8.61. The average BMI was 25.710 ± 3.36. Majority (i.e, 29 out of 55) of the subjects had diabetes mellitus, 20 subjects had hypertension. In the IVUS-derived parameters, the mean lumen area (mm2) was 16.22 ± 3.35 in the LMCA ostium, 15.49 ± 2.98 in LMCA mid and 15.24 ± 2.91 in LMCA distal. The mean lumen diameter was found to be higher in the IVUS group for LMCA ostium, LMCA mid and LMCA distal- 4.50 ± 0.45, 4.40 ± 0.43 and 4.33 ± 0.43 respectively when in comparison to QCA- derived LMCA ostium, LMCA mid and LMCA distal of 4.36 ± 0.68, 4.29 ± 0.54 and 4.15 ± 0.62, respectively. The mean vessel area (mm2) by IVUS was 21.26 ± 3.88 in LMCA ostium, 20.49 ± 3.72 in LMCA mid and 20.37 ± 3.78 in LMCA distal. The mean vessel diameter (mm) by IVUS was 5.21 ± 0.46 in LMCA ostium, 5.09 ± 0.46 in LMCA mid and 5.05 ± 0.45 in LMCA distal. Mean plaque burden (%) was higher in the IVUS group- 24.39 ± 4.01 compared to the QCA group-10.15 ± 6.44. The mean length of LMCA was higher in the IVUS group- 7.01 ± 3.02 mm as compared to the QCA group- 6.20 ± 2.84 mm. Age showed a very weak, positive but non-significant correlation with the IVUS-derived averages of the ostium, mid and distal LMCA lumen area (mm2), lumen diameter (mm), vessel area (mm2) and vessel diameter (mm). BSA showed weak, positive and significant correlation with the IVUS-derived averages of the ostium, mid and distal LMCA lumen area (mm2), lumendiameter (mm), vessel area (mm2) and vessel diameter (mm).

Conclusions

All parameters derived through IVUS were larger when in comparison to QCA- derived parameters with values being of statistical significance in LMCA lumen diameter, length of LMCA and plaque burden. In majority of the patients, the IVUS-derived lumen area, lumen diameter, vessel area and vessel diameter were larger in the LMCA ostium followed by LMCA mid and then LMCA distal. Greater than 80 % of patients had an IVUS-derived lumen diameter of > 4 mm. Only 2 patients had an IVUS-derived vessel diameter of > 6 mm. IVUS-derived plaque burden was highest in LMCA distal followed by LMCA mid and then in LMCA ostium. Age had a very weak, positive but non-significant correlation with the IVUS-derived lumen area, lumen diameter, vessel area and vessel diameter. Body surface area had a weak, positive and significant correlation with IVUS-derived lumen area, lumen diameter, vessel area and vessel diameter.





1. Receiving, Verifying & Registering the Investigational products

The Investigational Product (IP) is delivered to the clinical research department, the PI's office, or the research pharmacy after the ethics committee approves the study protocol. Only the study investigator /co-investigator/clinical research coordinator/clinical research nurse/designated personnel will receive the consignment at the research site. The shipment is verified by the study team, and ideally, the following information mentioned in figure-2 should be cross-checked.

After verification, the receiver of the shipment must provide an acknowledgment receipt, stating the condition of the shipment upon receipt at the site. This acknowledgment should be sent to the sponsor/CRO via email, fax, IVRS, or IWRS (as applicable). The acknowledged consignment form, checklists, and all documents related to transportation and receipt of the IP/IWRS confirmation should be filed in the study master file.

Figure 2

2. Storage of Investigational products

The Investigator or designated personnel are responsible for storing and managing the Investigational Products (IPs). They will issue and record the storage location in the Research Pharmacy, identified by project, and located at a specified site. A master accountability logbook with labeled access is maintained for authorized personnel.

IPs must be stored under controlled temperature and humidity conditions as per the protocol. Continuous temperature monitoring is required and should be recorded in real-time, with data archived for records and references.

The Principal Investigator (PI), Co-Investigator (Co-I), Clinical Research Coordinator (CRC), Clinical Research Nurse (CRN), or designated personnel are responsible for completing the IP access, use, return, dispensing, and destruction processes. This involves maintaining a tracking form provided by the sponsor or using the pharmacy's access and storage logbook.

The IP Tracking form and the calibration certificate of the temperature monitor should be filed in the Trial Master File.

3. Dispensing of Investigational Products

The Investigator or designated personnel, after reviewing the subject's report, contacts the IVRS/IWRS (where applicable) to schedule the supply of IP. The IVRS/IWRS worksheet (where applicable) is completed by the designated study staff. The Investigator or designated personnel dispenses the allotted IP as per the IVRS/IWRS instructions. This involves accessing the stored medication and identifying the correct IP by matching it with the IVRS/IWRS or other randomization methods used for the subject. The Investigator or designated personnel then records the subject's initials or ID and dispensing date on the IP package. They also instruct the subject on administration details such as dosage, frequency, storage requirements, precautions, and any prohibited medications. Each time the IP is dispensed, the Investigator or designated personnel completes the IP tracking form.

4. Accountability of Investigational Products

The PI, Co-I, CRC, or designated personnel collect the unused IP and empty IP boxes from the subject and calculate compliance. They record the IP return date on the IP package. Unused IP is stored separately in a secure, controlled-access area, with its location identified in the pharmacy's master logbook as per sponsor or protocol requirements. After each use, the PI/Co-I/CRC/designated personnel complete the IP tracking form with details of the used IP and file it in the Investigator Site File (ISF).

5. Destruction of IPs or Return to the Sponsor

The PI, Co-I, CRC, or designated personnel ensure all documentation regarding IP management is complete. They receive written approval from the sponsor for either destruction or return of the IP. If IP destruction is

required at the site, they follow the SOP on destruction and generate a destruction certificate accordingly. The process of destruction or return of IP is documented, and a copy of the return/destruction document and certificate is sent to the sponsor. These documents are filed in the ISF.

6. Quarantine of IPs

The Research Pharmacist in-charge/Study CRC/designated personnel receive confirmation from the Sponsor/CRO regarding the storage of used IPs, retention samples, or expired products at recommended storage conditions, where applicable. They ensure that used IPs, retention samples, or expired products are labeled and quarantined separately in designated equipment or cabinets. Confirmation is obtained from the Sponsor/CRO regarding the storage conditions of these items. The Sponsor and Principal Investigator are informed of these actions.

Handling Damaged IP Shipments: Essential Procedures and Best Practices

If the Investigator or designee receives an Investigational Product (IP) shipment that is damaged, partial, or deviates from storage conditions, they must note the condition on the acknowledgment receipt sheet or in the IXRS entry. Specifically, they should use terms like 'Damaged', 'Partial/Incomplete Consignment', or 'Temperature Excursion' accordingly. Details of the damaged or missing IP should be included if applicable. Immediately after, inform the Sponsor or Sponsor Representative about the shipment's condition and send them a copy of the Acknowledgement Receipt sheet and/or the IXRS confirmation via email or fax. The shipment should not be used, and a return request should be initiated only after formal written communication from the Sponsor or Sponsor Representative.

Indispensable Shipment Records

If any documents in the shipment are incomplete, ensure that the following are included:

IP Delivery Form with details includes,

- Consignment/Shipment number
- Protocol number
- Site number
- Principal Investigator Name
- Material Description (dosage form/type of IP),
- Batch/Lot number
- Kit/Serial number
- Expiry Date

Additionally, an Acknowledgment Receipt Form must be included.

- Signature page (Signed by the receiver)
- Remark (Stating the condition of the IP upon receipt)

Preferably, a Certificate of Analysis (COA) should also be included, unless it's a double-blind clinical trial. If any required information or documents are missing, inform the sponsor or sponsor representative. The Investigator or designee should request the missing documents/information or seek a clarification/Note to File where applicable.

IP Storage Deviation Management Procedure

In case there is a deviation in the storage conditions of the IP at the study site, inform the Sponsor or Sponsor Representative immediately via email about the temperature excursion. Provide a detailed list of the Consignment No., Batch/Lot No., and Kit/Serial No. for reference. The IP should not be used and must be stored separately in a clearly marked box labeled 'NOT TO BE USED', under the required storage conditions as specified in the protocol.

IMP Expiry Date Extension Process

If there is an extension of the use date of the Investigational Medicinal Product (IMP), affix an additional label to the IMP. This label should clearly display the new use date and repeat the batch number. Preferably, this labeling should be done by the sponsor's clinical trial associate. Ensure that documented evidence of this additional labeling is available in the trial documentation and batch records for quality control purposes.

TRIVIA-1

Answer to the Quiz

1.	C	7.	B
2.	A	8.	D
3.	B	9.	B
4.	B	10.	C
5.	B	11.	D
6.	D	12.	D
		13.	E

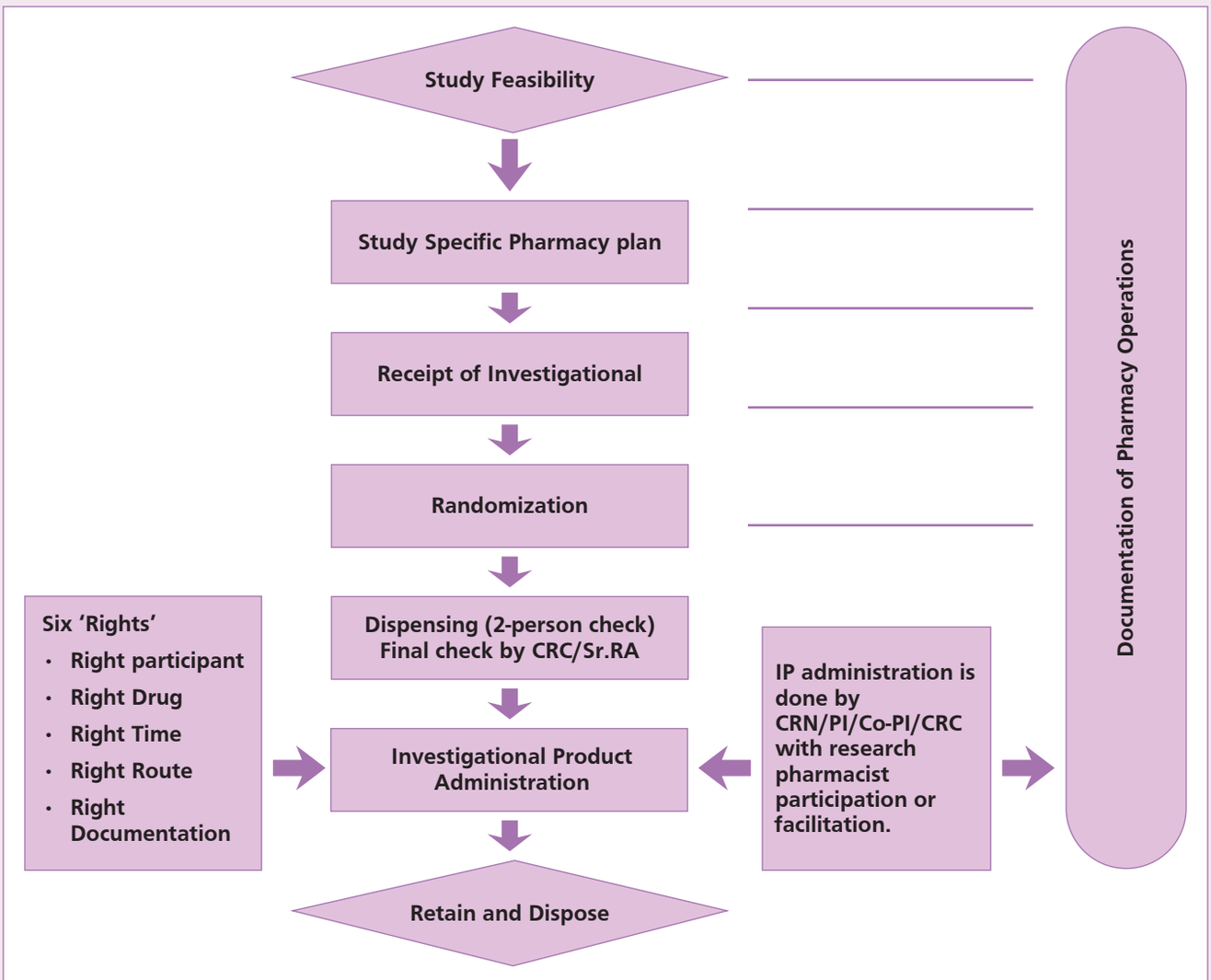


Figure 3: Pharmacy Operations Flow Chart

Conclusion

Effective management of investigational products (IPs) is essential for the success and integrity of clinical research studies. This review paper outlines a comprehensive framework for the key procedures involved in the lifecycle management of IPs, from receipt to final disposition. Proper handling and storage of IPs according to Good Manufacturing Practices (GMP) and study protocols are crucial. Detailed documentation of IP accountability, including dispensing, return, and destruction, ensures compliance with regulatory requirements and sponsor expectations. Timely communication with sponsors regarding IP status, including any deviations or extensions, enhances transparency and study integrity. These practices not only safeguard participant safety but also support the scientific validity and reliability of clinical trial outcomes. Implementing standardized protocols and maintaining thorough documentation facilitates smooth operations at research sites, fostering efficient and ethical conduct of clinical trials. Pharmacists and other delegated research team members play a crucial role in ensuring appropriate handling and dispensing of IPs. Continuous training and oversight by the Principal Investigator further enhance the quality and consistency of IP management practices.

In conclusion, this review highlights the importance of a comprehensive framework for IP management in clinical research. By adhering to standardized protocols and maintaining detailed documentation, research teams can ensure participant safety, data integrity, and regulatory compliance throughout the study lifecycle.

References

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Investigational Product Management: A Critical Review of Practices and Procedures

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Abstract

Effective management of investigational products (IPs) is crucial for the success and integrity of clinical trials. This study provides a comprehensive review of the key processes involved in IP management, including delivery, storage, dispensing, accountability, and destruction. The findings indicate that IPs are typically delivered to the clinical research department, PI's office, or research pharmacy after ethics committee approval and only authorized study personnel are permitted to receive and verify the shipment contents. Strict storage requirements, including controlled temperature and humidity, as well as continuous monitoring and documentation, are essential to maintain the integrity of the IPs. The study also examines the challenges faced by investigators and research teams in managing IPs, such as addressing deviations in shipment conditions or storage, incomplete documentation, and the proper handling of used, expired, or damaged IPs. By understanding the best practices and potential this study aims to contribute to the development of procedures and guidelines that can enhance the integrity and efficiency of clinical trials, ultimately benefiting patients and advancing medical research.

Keywords

Investigational Product (IP), Sponsor, Clinical Research Organization, Interactive Voice/Web Response System (IXRS), Trail Master File (TMF).

Definition

Investigational Product - A pharmaceutical form of an active ingredient or placebo being tested or used as a reference in a clinical trial, including a product with a marketing authorization when used or assembled (formulated or packaged) in a way different from the approved form, or when used for an unapproved indication, or when used to gain further information about an approved use[1].

Introduction

In clinical trials, it's crucial to follow strict rules about how investigational products (IPs) are handled. Guidelines from ICH-GCP and Good Manufacturing Practice require detailed records at every step from making the IP to giving it to patients or disposing of it. Both the sponsors funding the trials and the sites where they are conducted must keep thorough records. They need to document everything from receiving the IP to how it's stored, prepared, given out to patients, and returned or destroyed.[6] [4] [14]

When sponsors work with other organizations to manage trials, these responsibilities extend to those third parties. Making sure IPs and their delivery systems are traceable, monitoring each step from when they arrive to when patients get them, and keeping them stored correctly (like at the right temperature) are all big challenges. Everyone involved in clinical trials, from the early stages to the final phases, must follow these guidelines closely. [2] [13]

This article provides a comprehensive overview of essential rules and best practices for managing investigational products (IP) at clinical research sites. Drawing on insights from industry experts, it outlines effective strategies for handling the receipt, storage, dispensing, and accountability of IPs within studies.

Emphasizing the criticality of each stage in the IP lifecycle—from receipt through authorized return or destruction—the article underscores their interconnected roles in maintaining trial integrity. Targeted at study teams including Investi gators, Co-Investigators, Clinical Research Coordinators, Clinical Research Nurses, and Pharmacists, its primary goal is to establish standardized IP management practices across all study phases. This standardization aims to ensure rigorous adherence to protocols and regulatory requirements, thereby enhancing the reliability and compliance of clinical research efforts.

Managing Investigational Products from Arrival to Archive

The process is divided into five stages: The Study Investigator/Pharmacist/designee will be communicated by the sponsor/Contract Research Organization or designated drug depot for confirmation, readiness, and availability to receive and store the investigational products at the site. Once the Study Investigator/Pharmacist/Designee confirms availability, the storage facility sponsor will notify/confirm the site of the investigational products released to the site by the concerned party.

Figure 1

Antimicrobial Stewardship

Treatment Challenges in the Management of Difficult-to-Treat Gram-Positive Infections: A Consensus View Apropos Therapeutic Role of Novel Anti-MRSA Antibiotics, Levonadifloxacin (IV) and Levonadifloxacin (oral)

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Purpose

Treatment of antibiotic-resistant Gram-positive infections (GPIs), including methicillin-resistant Staphylococcus aureus (MRSA) is becoming increasingly difficult, particularly in patients with multiple co-morbidities who require antibiotics with greater safety and a consistent pharmacokinetic / pharmacodynamic (PK/PD) pro- file. Such difficult-to-treat GPIs are often associated with poor outcomes, extended hospital stay and increased expenditure. This can be partly attributed to the limited safety and aberrant PK/PD profile of existing anti-MRSA antibiotics. In this context, intravenous Levonadifloxacin and its oral prodrug Levonadifloxacin are novel anti- MRSA antibiotics that have significant advantages over conventional anti-Gram-positive antibiotics. The purpose of this paper was to generate a consensus on the optimal use of Levonadifloxacin and Levonadifloxacin for tackling resistant Gram-positive infections in patients with multiple co-morbidities.

Method

Using a modified Delphi approach that combines critical appraisal of evidence and expert opinion, therapeutic use of Levonadifloxacin and Levonadifloxacin in various clinical scenarios and specific unmet conditions was deliberated. Fifteen expert members from medicine, critical-care, emergency, microbiology, and intensive-care disciplines participated and voted on 11 pre-conceived statements. When there was at least 70 % agreement, a consensus was reached.

Results

Following the voting, agreements were reached on 10 out of the 11 statements. Broadly, a consensus was reached in defining the therapeutic role of Levonadifloxacin and Levonadifloxacin in the treatment of various clinical indications involving resistant Gram-positive pathogens, including MRSA, in patients with co- morbidities, such as co-existing or increased risk for kidney dysfunction or hepatic disease and/or immuno- suppression; also, in therapeutically challenging conditions caused by Gram-positive bacteria such as bacteremia, bone and joint infection, diabetic foot infection, febrile neutropenia, and hospital-acquired pneumonia. Conclusions: This consensus supports the therapeutic use of Levonadifloxacin and Levonadifloxacin in the treatment of antibiotic-resistant GPIs, including those caused by MRSA and certain polymicrobial infections, in patients with multiple co-morbidities requiring drug with adequate safety and consistent efficacy.

Effectiveness of Ceftazidime-Avibactam in Gram-Negative Nosocomial Pneumonia: A Real-World Study in India

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Background and Objective

The incidences of nosocomial pneumonia in intensive care unit (ICU) in India has been reported to range from 9% to 58% and are associated with a mortality rate of 30%-70%. Ceftazidime- avibactam has activity against OXA-48-like Carbapenem-resistant Enterobacter ales (CRE) and has a safer adverse effect profile as compared to the nephrotoxic colistin. The current study aimed to assess the effectiveness and usage pattern of ceftazidime-avibactam in gram-negative Hospital Acquired Pneumonia (HAP)-Ventilator Acquired Pneumonia (VAP) in real-world settings in India.

Methods

Electronic medical records of hospitalized patients with nosocomial pneumonia and having documented gram-negative Klebsiella Pneumoniae confirmed infection were collected. This study assessed the effectiveness, usage pattern of ceftazidime-avibactam, clinical and microbiological cure rate.

Results

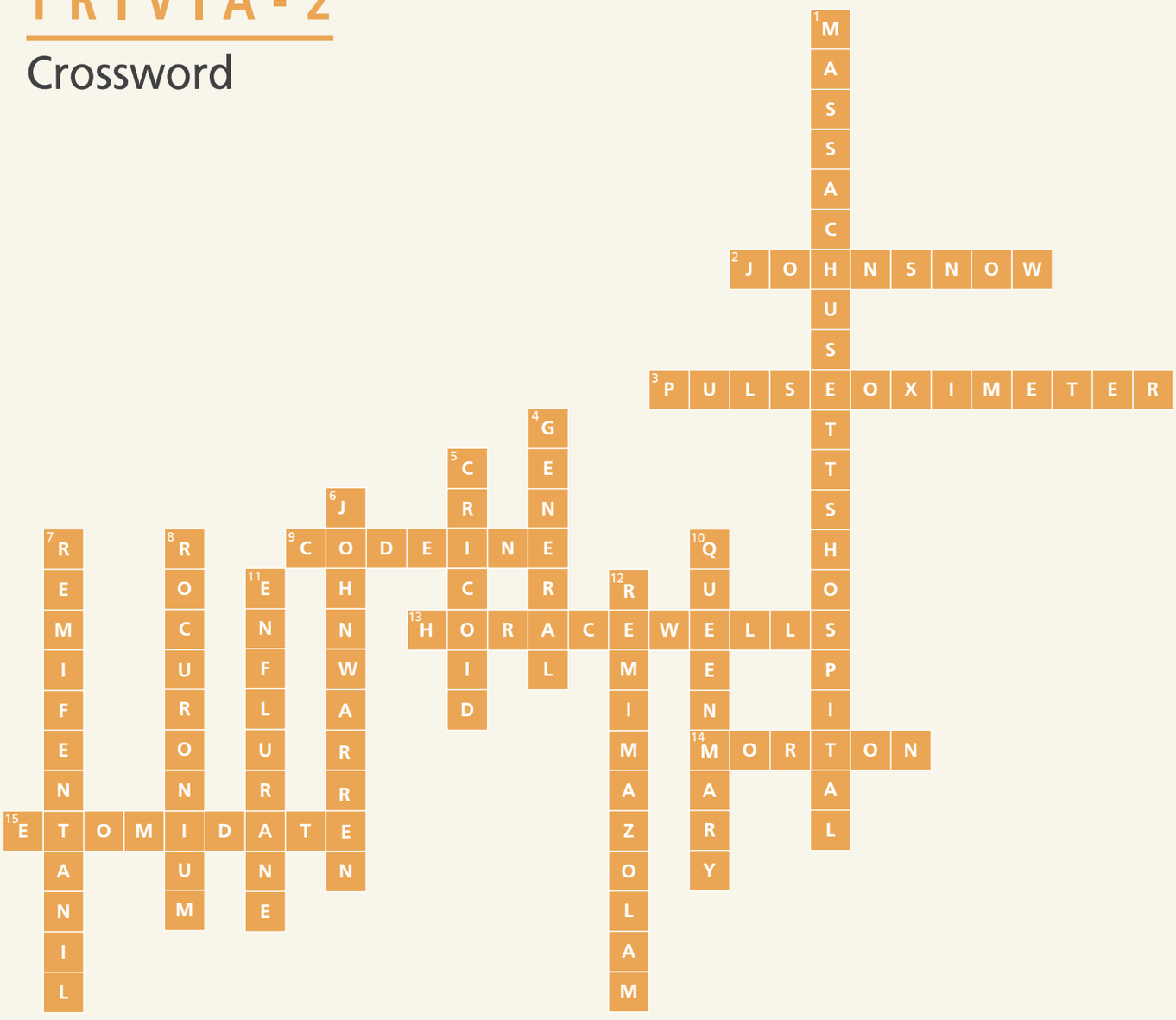
Among the 116 patients included, 78.45% (91/116) showed clinical cure. Microbiological cure was observed in 9 out of 13 (69.23%) patients. In the subset analysis, a clinical cure rate of 84.85% (28/33) and microbiological recovery rate of 62.50% (5/8) were observed when ceftazidime-avibactam was initiated within 72 hours of diagnosis. Ceftazidime-avibactam was administered for a mean (±SD) duration of 7.79 ± 4.43 days, with improvement in signs and symptoms reported among 91.38% (106/116). Ceftazidime-avibactam showed a susceptibility of 56% (28/56) in the study.

Conclusion

The current study showed a better clinical and microbiological cure rate with a safer tolerability profile of ceftazidime-avibactam in carbapenem resistant Klebsiella Pneumoniae nosocomial pneumonia and ventilator acquired pneumonia. This study has further demonstrated that ceftazidime-avibactam may be used as one of the viable treatment choices in carbapenem resistant Klebsiella Pneumoniae with favorable clinical outcomes.

TRIVIA-2

Crossword



ACROSS

2. Dentist credited with demonstrating the first successful use of ether anesthesia in 1846 (John Snow)
3. Non-invasive device measuring oxygen saturation in the blood during anesthesia (Pulse Oximeter)
9. Opioid analgesic used for mild to moderate pain and as a cough suppressant (Codeine)
13. Pioneer of nitrous oxide Anesthesia in dentistry, mid-19th century (Horace Wells)
14. Dentist credited with demonstrating the first successful use of ether anesthesia in 1846 (Morton)
15. Intravenous anesthetic agent favoured for its hemodynamic stability (Etomidate)

DOWN

1. Historic site of the first public demonstration of ether anesthesia in 1846 (Massachusetts Hospital)
4. Type of anesthesia that induces unconsciousness and lack of sensation throughout the body (General)
5. Type of pressure applied during anesthesia induction to prevent aspiration (Cricoid)
6. Surgeon who performed the first public demonstration of ether anesthesia (John Warren)
7. Ultra-short-acting synthetic opioid analgesic with rapid onset and offset (Remifentanil)
8. Non-depolarizing neuromuscular blocking agent used for rapid sequence induction (Rocuronium)
10. World War I hospital known for pioneering plastic surgery and anesthesia advances (Queen Mary)
11. Inhalational anesthetic agent with a sweet odour, used less frequently due to side effects (Enflurane)
12. Ultra-short-acting benzodiazepine used for procedural sedation and induction (Remimazolam)

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