

### PRESIDENT'S MESSAGE!

We've come a long way since our humble beginnings with a few doctors who saw the need for an organization and banded together for the successful diffusion of knowledge, which was supposed to provide safety to our small tots. We recognized the importance of delegation of responsibilities and a systematic approach to our growth and difficulties encountered at various points in time and across India. The formation of a new executive committee heralded a new beginning, with new challenges waiting for new solutions.



**Dr Neerja Bhardwaj**  
*President*

The focus of the new executive was to bring IAPA to the forefront in terms of academics and international visibility. Various committees were formulated to bring the above aim into practice. It was envisaged that the lead of these committees will spearhead the defined work. The team leads were chosen based on their willingness to contribute, their aptitude and interest in a particular area.

1. **Education Committee** : (IAPA fellowship and Accreditation Committee, Guidelines Committee):  
Fellowship program of IAPA is being run in 10 hospitals and this number may increase in the near future. This committee will be responsible for coordinating the accreditation and re-accreditation of hospitals running this course. The committee will also be responsible for modification of the curriculum if required. An individual with a strong academic background who has a deep understanding and who can meticulously plan the implementation of the course is essential. Based on these requirements, Prof Sandhya was chosen to lead the education committee.
  - a. **Lead – Sandhya Yaddanapudi;**
  - b. **Members** – HM Krishna, Aruna Parameshwari, Anila Malde, Indu M Sen, Debashish Saha.
2. **Examination Committee:** Dr. Murthy during his tenure as General Secretary IAPA, planned and executed the exit examinations (held twice a year) meticulously and seamlessly and therefore the right choice to lead this committee.
  - a. **Lead –MSRC Murthy**
  - b. **Members** – R Jayanthi, Anju Gupta, Ravi Nagaprasad.
3. **Research Committee:** To spearhead research, this committee led by Dr. Rakhee Goyal aimed to conduct multicentric trials amongst leading paediatric anaesthesia departments of the country. It also aimed to increase its visibility in the international forum by building research collaborations with other international societies.
  - a. **Lead – Rakhee Goyal**
  - b. **Members** – Preethy J Mathew, Priyanka Karnik, Ruchi Gupta.
4. **Newsletter Committee:** It was felt that there should be a dedicated editor for the newsletter who can improve the presentation as well as content. Dr. Ekta Rai was given this responsibility owing to her interest as well as dedication. This will enable easy transition of newsletter to a journal in near future.
  - a. **Lead – Ekta Rai**
  - b. **Members** –Vibhavari Naik, Anisha De, Gayatri Sasikumar and Meera Gandhi
5. **Website Management Committee:**
  - a. **Lead – MSRC Murthy**
  - b. **Members** – Vibhavari Naik, Dinesh Kumar, Harick Shah.
6. **Wake up Safe India (WUSI):**
  - a. **Lead –Elsa Varghese**
  - b. **Associates:**President IAPA, Secretary IAPA
  - c. **Members** – Geeta Nath (Rainbow Hospital, Hyderabad), Ekta Rai (CMC Vellore), Sandhya (PGI Chandigarh), Renu Sinha (AIIMS, New Delhi).
7. **PPLS Coordinator – Vibhavari Naik**
8. **State Branches Coordinator – Aavula Muralidhar**
9. **Advisory Committee:** Drs. Elsa Varghese/Rebecca Jacob/Snehalata Dahaygude /Pradnya Sawant/ Bharati Kulkarni

All the committees have resolved to make steady progress towards their projected target of 2024. We are thrilled to propose multi-centric studies and other innovative projects, with the immediate goal of making IAPA visible at international platform. It is the goal of the IAPA to foster more active connections among its members.

**Long Live IAPA!**

### IAPA OFFICE BEARERS

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Dr. Nandini Malay Dave

#### Secretary

Dr. Aavula Muralidhar

#### Treasurer

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Dr. Anju Gupta

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Dr. Ravi Nagaprasad Y

Dr. P.V. Shiva

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Dr. Anisha De

Dr. Anjolie Chhabra

Dr. Sunidhara Reddy P

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Yaddanapudi

#### Examination committee

Lead - Dr. MSRC Murthy

#### Research Committee

Lead – Dr. Rakhee Goyal

#### Website Committee

Lead – Dr. MSRC Murthy

#### Newsletter Editor

Lead – Dr. Ekta Rai

#### Wake Up Safe India

Lead – Dr. Elsa Varghese

#### PPLS Co-ordinator

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#### State Branches Co-ordinator

Dr. Aavula Muralidhar

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Bangalore**

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## Crossword

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Regional anesthesia in children is today a basic component of peri-operative multimodal analgesia. When I entered the world of anesthesia in 1980, regional block in children were rarely performed by anesthesiologists. My exposure to caudal blocks in children began in the early 90s, during my fellowship training in Pediatric Anesthesiology at the Children's Hospital in Detroit, Michigan, USA. The block was just becoming popular in Europe.<sup>1</sup>The caudal block was easy to perform, effective and children emerged from anesthesia pain free and remained so, well into the postoperative period. It took some effort to convince some surgeons of the benefits of a caudal block. Some considered it a waste of time but were soon convinced and insisted the block be routinely administered!

During my clinical practice in Kasturba Medical College, Manipal, caudals became the norm when indicated. Recognition of intravascular injection of the drug was always a concern, which lead me to research in the mid-90s on pretreatment with atropine to improve the efficacy of an epidural test dose in children anaesthetized with halothane. We learnt that this test dose did pick up transitory increase in heart rate with an intravascular injection of lidocaine with adrenaline.<sup>2</sup> Around that time, a 2-year-old boy developed a cardiac arrest about 40 minutes into surgery, he had been administered a GA with a caudal block with bupivacaine. Effective CPR was administered for an hour before the cardiac rhythm changed from a flat line to ventricular fibrillation. Defibrillation then reverted it to sinus rhythm. Fortunately, the event had a happy ending, the child walked out of the ICU the next day. This scary experience gave me plenty of food for thought.

I realized that lower doses of local anesthetic are effective to provide analgesia and safer (less likely to cause accumulated toxicity) and avoid muscle weakness. Bupivacaine doses of 0.25% were reduced to 0.125% intra-operatively or 0.06% with tramadol for postoperative pain management. When ropivacaine was introduced that became our drug of choice. Our further research on test dosing in pediatric regionals under sevoflurane anesthesia recommended using 0.1 mL.kg<sup>-1</sup> of 1% lidocaine with adrenaline 0.5 µg.kg<sup>-1</sup>, or add adrenaline 0.5 µg.kg<sup>-1</sup> to bupivacaine or ropivacaine. A reliable sign of intravascular injection was a transient increase in T wave amplitude on the monitor occurred within 30 seconds of injection. This could only be observed if one had a clear view of the monitor while injecting the drug.<sup>3</sup>

Prolonging the duration of a caudal block became a priority in the early 2000s. The options were limited to injectable analgesics additives without preservatives. Initially my practice involved adding tramadol with great success, however nausea and vomiting was an unpleasant side effect.<sup>4</sup> Once clonidine appeared in the market that became our additive of choice and more recently dexmedetomidine.

What did I learn to do different over the years? Though caudal blocks are simple and easy to perform, they can be potentially dangerous. I have learned to respect them. I do not allow myself to be distracted.

1. Position the child well, for an awake neonate get a good assistant to hold the baby in the frog position. If a child is under GA or sedation, ensure that someone is watching the airway. Use an ultrasound if you see a dimple, tuft of hair or scar; it may show a normal caudal space.<sup>5</sup>
2. Calculate the local anesthetic dosage and preferably use lower concentrations and small dose of adrenaline as test dose.
3. Use an IV cannula instead of a hypodermic needle, once in place, remove the stylet, by the time you pick up the syringe, you will know if the tip is in the subarachnoid space or intravascular.<sup>6</sup> After an initial aspiration if the tip is intravascular, the vessel wall may collapse around the cannula tip, following injection on aspirating again, the vessel may now open and a bloody tap may be seen.
4. Follow aseptic precautions, just like you would in an adult.

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## Why is my article not accepted for publication? – Common mistakes

Dr Sandhya Yaddanapudi  
Chandigarh

A large proportion of manuscripts submitted to any peer reviewed journals get rejected. The Indian Journal of Anaesthesia( IJA) accepted only about 25% of the submitted manuscripts in 2017 (Performance of Indian Journal of Anaesthesia in 2017: How did we do and where do we go from here? Indian J Anaesth2018; 62:91-93). Reviewers and editors accept a paper mostly based on robustness of methodology and clinical applicability of the study. The foundation of a good manuscript is a well-planned and rigorously conducted study. Some of the common mistakes that lead to rejection are described here along with suggestions to rectify them.

The mistakes may be related to the content, format or ethical issues.

### Content related Mistakes-

The research question is the first step in the planning of any study. Reviewers, editors, and readers are likely to find a research question interesting if it is clinically meaningful and biologically plausible. A thorough review of the literature on the subject helps in finding the gaps in current knowledge and formulating a hypothesis. You should state a focused research question along with the hypothesis being tested. You should define the primary and secondary objectives clearly and failure to do so is one of the common reasons for the rejection.

In addition to stating the hypothesis, the researcher needs to calculate a proper sample size using an estimate of meaningful effect size of the primary outcome. Studies with fewer patients than the calculated sample size lead to invalid results. Studies with more than required patients are unethical as several participants are needlessly exposed to an ineffective treatment, either the intervention or the control. It is essential to calculate the sample size *a-priori* for all types of studies. Any study with incorrect or absent sample size calculation is likely to be rejected.

It is equally essential to choose a suitable study design with view to minimum bias, incorporating details of patient population, confounders and other factors. Describe interventions and controls adequately. Choose outcome measures which are valid for the condition being studied and define them objectively. List all possible side effects of the intervention. Describe the plan for appropriate statistical analysis of each outcome. Inappropriate methodology is one of the common reasons for rejection of the study.

Report the flow of all the patients through the study, including exclusions, drop-outs, lost to follow-up, and protocol violations. Failure to account for all the patients leads to straight rejection of the proposed study.

### Format Related Mistakes-

Make sure that all the illustrations including the charts are of high resolutions with appropriate labels. Ensure you submit the paper as per journal's instructions to the authors. Failure to do so can lead to outright rejection.

Most journals mandate registration of the study protocol prior to enrollment of the first participant. Clinical studies conducted in India are required to be registered with CTR-I. The process of registration has the added benefits of improving the quality of the protocol and honesty in the conduct of the study.

Another possible reason for rejection is incomprehensible or magniloquent language. Simple, straightforward, and grammatically correct language is desirable for scientific writing. Use concise and precise language. Ensure correct spellings and capitalization. Maintain a smooth flow of thought in each section of the manuscript. Always do a plagiarism check before submission.

### Ethical Mistakes-

Some investigators selectively present only "statistically significant" results, fearing the rejection of a "negative" study. This is inappropriate and unethical. Report all the outcomes mentioned in the methodology.

Submitting an article to multiple journals simultaneously or using previously published data again in another study, are unethical practices. Submitting an article without institutional review board acceptance or without complete financial disclosure is serious misconduct. These are not common mistakes, but one must be extremely cautious of these issues.

In case of rejection, most editors provide the reasons for rejection as well as suggestions for improvement. These are helpful in revising the manuscript before the next submission. Select a journal based on its topicality, readership and adherence to a fair editorial process including peer review. Follow the journal guidelines for preparation of the manuscript. Most journals use the IMRAD (Introduction, Methods, Results and Discussion) format. The reporting guidelines for various types of studies available on the equator-network are also useful (<https://www.equator-network.org/reporting-guidelines/>).

To summarize, select a topic of interest to your readers. Ensure that all components of the study (such as title, methodology, results, discussion, and conclusions), are focused on the primary objective. Plan in detail before starting the study. Report exactly what was done and what was found in a systematic manner.

## HEARTY CONGRATULATIONS TO DR SANTHANAM SURESH

Dr Santhanam Suresh (MD, MBA, FASA), the Professor of Anaesthesiology & Paediatrics, at the Northwestern University Feinberg School of Medicine, Chicago, Illinois was recently awarded the prestigious Gaston Labat award from American Society of Regional Anaesthesia and Pain Medicine. This award is a validation of his years of efforts to promote and advance paediatric regional anaesthesia. He is also the senior vice-president at the Ann and Robert H Lurie children's hospital of Chicago and was earlier the president of American Board of Anaesthesiology. He has extensively worked and published in regional anaesthesia, cardiac anaesthesia, and paediatric pain management.

Dr Suresh is an alumnus of Stanley Medical College, Chennai and has been involved with teaching assignments during his visits to India. Many of his writings on the NYSORA website are often referenced to by paediatric regional anaesthesiologists. We had the privilege to get him to inaugurate the Tamil Nadu and Puducherry Chapter of IAPA. IAPA is proud of his achievements and wishes him many more laurels.



## Fellows, Fallots, And Everything In Between – An IAPA Fellowship In Hindsight

Dr.Vedhika Shanker

IAPA Fellow at NH-SRCC Children's Hospital, Mumbai

I am currently an IAPA Fellow at NH-SRCC Children's Hospital in Mumbai, nearing the end of my tenure here. This fellowship has been a metamorphic experience, in terms of my anaesthesia career. I have been fortunate to have worked at a purely paediatric hospital that houses all specialities under one roof. I have done over 450 cases in my time here, ranging across specialities like neurosurgery, plastic and craniofacial, orthopaedics, interventional radiology, cardiac catheterisation lab, NORA and plenty more. My pre-anaesthetic assessment skills have seen an upgrade and I have refined my patient interaction technique. If there has been a biscuit or an accidental chocolate consumed within six hours, you best believe I'll find out about it. The finesse of handling procedures in these small patients has made me a more careful and more skilled anaesthesiologist. I have also seen an improvement in my understanding of the concept of 'depth of anaesthesia', airway management and sedation. And you know what I mean by that subtle 'call for help' look when you see that very cute, chubby baby in your pre-operative holding area, sans IV line.

Regional analgesia formed a cornerstone of our anaesthesia management during our fellowship; every case that could receive a neuraxial or peripheral block, got one. Pain assessment in paediatrics is in itself a challenge, so offering the best pain relief possible is our standard operating procedure. We routinely performed advanced and basic level blocks for all ages of patients, all under ultrasound guidance. We also consulted on chronic pain calls, mostly for our oncology patients.

In addition to our clinical work, our academics were thorough. Especially those post-induction, pre coffee sessions of grilling that would occur on the regular; fellows were kept on their proverbial toes. The fortnightly nation-wide IAPA classes are a boon; they are conducted with so much passion and effort taken by the presenters who are only the best in the industry. The case discussions brought about a paradigm shift in how classes were conducted; from didactic lectures to interactive, hot-seat placing, brain puzzling questions to the question answer sessions at the end, held amongst and with the best of the best – we learned a lot. Additionally, we had 3 classes per month held within the department, presented by fellows and moderated by the consultants.

As fellows, we were taught that in paediatric anaesthesia, especially, safety and preparation are key. We got the opportunity to attend a PPLS course, and we are both, now, PALS certified instructors. We have also presented at our in-house academic events, at the national IAPA conference that was held in Coimbatore, and virtually at ASPA 2023. The entire department rallies behind our continued academic endeavours, and are available to correct and proof read all our work – what more can be asked for, when it comes to a fellowship programme.

As I near the end of this fellowship, I am still unsure about where my career will take me, but one thing is certain: having a paediatric anaesthesia fellowship in my retinue has tremendously benefited my anaesthetic practice. This one year has taught me a lot, and I've met some incredible anaesthesiologists who motivate me to be better every day. I recommend anyone who is able to take advantage of this chance; regardless of what you do later, this one year will alter you for the better. Thank you to the extremely hard working and passionate executive council of the IAPA; the fellows and all the paediatric patients anaesthetised by them benefit from it.



The dream-team at NH-SRCC Children's Hospital

### Answers Crossword IAPA

- |                         |
|-------------------------|
| 1. Death                |
| 2. Pediatric Anesthesia |
| 3. Snehalata            |
| 4. Hyderabad            |
| 5. Secretary            |
| 6. Children Safety      |
| 7. Noida                |
| 8. Neerja               |
| 9. Pradnya              |
| 10. Office Bearers      |
| 11. Three               |
| 12. Fifteen             |
| 13. Seven               |
| 14. Vice President      |

### CONGRATULATIONS IAPA

Three Indian anaesthesiologists were selected as ASPA office bearers, the highest representation so far in ASPA.

**Dr Vrushali Ponde** is now the President-elect.

**Dr Vibhavari Naik** and **Dr Ekta Rai** are the honorary secretary and executive committee member respectively.

Earlier **Dr Rebecca Jacob** and **Dr Elsa Varghese** have held coveted positions in ASPA.

## Anaesthetic Management of a Child with Staged Palliation Fontan's Repair Undergoing Craniotomy and Frontal Abscess Drainage

Drs Katukuri Jagruthi, Sunidhara Reddy,  
Hyderabad,

### Introduction

The Fontan procedure is a palliative operation for complex congenital heart lesions in children, wherein biventricular separation and function cannot be safely achieved. Incremental refinements in this surgical technique, along with improvements in the long-term medical management of these patients, have led to greater survival and a remarkably steady increase in the number of adults living with this unusual circulation and physiology.

### Case Report

A 10-year-old boy, weighing 26 kg with known congenitally corrected transposition of the great arteries (CCTGA) with ventricular septal defect (VSD) and hypoplastic left ventricle (LV) presented with fever for four days and two episodes of seizures; which manifested as dysarthria, up-rolling of eyes and facial twitching lasting for 10 seconds. There was no history of motor weakness or unconsciousness. He had undergone a Blalock Taussig shunt at 6 months of age, and Fontan procedure in 2018. He was on oral warfarin 1mg–2mg, aspirin 75mg and lisinopril 2.5mg.

His baseline vitals were stable and oxygen saturation on room air was around 75%. On examination cyanosis and clubbing were present. Baseline investigations included: haemoglobin 16.3g/dL, platelet count 240000/mm<sup>3</sup>, total WBC count 7400/mm<sup>3</sup>, PT/INR 15 seconds/1.0, ApTT 32 seconds, ABG pH 7.338, PaO<sub>2</sub> 51.1 mmHg, PaCO<sub>2</sub> 40.1mmHg, SpO<sub>2</sub> 77.4%. echocardiogram showed CCTGA with VSD, Hypoplastic LV, Staged Palliation Fontan procedure, Large fenestration flows present, with right to left shunting. There was no evidence of vegetation. The MRI brain showed a left frontal lesion (4.7 x 4.1 x 4.1cm) with perilesional oedema. He was started on oral levetiracetam 250 mg once a day, and planned for craniotomy and frontal abscess drainage.



### Peri- operative Management

After obtaining informed consent from the child's parents and ensuring an adequate nil per oral status, the procedure was performed under general anaesthesia. Intravenous and arterial access were established under local anaesthesia. After preoxygenation for 3 minutes, anaesthesia was induced with fentanyl 40mcg, midazolam 1mg and ketamine 25mg. rocuronium 15mg was given for muscle relaxation and the child was intubated with a 5.5 sized cuffed endotracheal tube. Anaesthesia was maintained with sevoflurane 3% in air and oxygen. ampicillin 1.3gm and amikacin 250mg were given for endocarditis prophylaxis.

Heart rate, ECG, invasive blood pressure, oxygen saturation, end tidal carbon dioxide temperature and urine output was monitored throughout the procedure.



Ringer's lactate solution was infused at a baseline rate of 10ml/kg/hr, and further increments were guided by pulse pressure variation (PPV). Intra-operatively, there was a gradual fall in the blood pressure for which a fluid bolus of 50mL was given and infusions of noradrenaline 0.2-0.5µg/min and dobutamine 0.1-0.3µg/kg/min were started. These were gradually weaned off by the end of procedure. Throughout the procedure, ECG showed sinus rhythm, SpO<sub>2</sub> ranged 76-80% with FiO<sub>2</sub> 0.7. The left frontal craniotomy and excision of the lesion lasted for 3hours. Other medications given during surgery included IV mannitol 20g and levetiracetam 250mg. Analgesia was supplemented with fentanyl 1µg/kg boluses, IV paracetamol 500mg IV and diclofenac 25mg suppository. The child was extubated on table, and was shifted on oxygen by mask (4 L/min) to the paediatric ICU for observation, with vital parameters of HR 120bpm, BP 110/67mmHg and SpO<sub>2</sub> 69%.

## Discussion

In 1971, Francis Fontan and Eugene Baudet first described a procedure that diverted all systemic venous blood into the pulmonary arteries, without the interposition of a ventricle in tricuspid atresia. Conversion to a Fontan circulation is considered in all patients with complex congenital heart disease when a biventricular repair is not possible. These include patients with tricuspid atresia, pulmonary atresia with intact ventricular septum, double inlet left ventricle, hypoplastic left heart syndrome, double outlet right ventricle, and complete atrioventricular septal defects.

**Complications:** The severity and rate of progression of complications varies between individuals, due to differences in their pulmonary vascular resistance (PVR), ventricular morphology and atrioventricular valve function. These include; *Cardiac complications* present as diminished exercise tolerance and ventricular dysfunction, arrhythmias, right to left shunts, increased PVR. *Protein losing enteropathy:* characterized by excessive loss of proteins from serum into the intestinal lumen, possibly due to impedance to drainage of the thoracic duct by high superior caval venous pressure together with mesenteric vascular inflammation. *Developmental deficit:* These patients are at particular risk of having neurological and developmental deficits due to the impact of multiple episodes of cardiopulmonary bypass, thrombotic events, chronic hypoxaemia, and pre-existing neurological deficits.

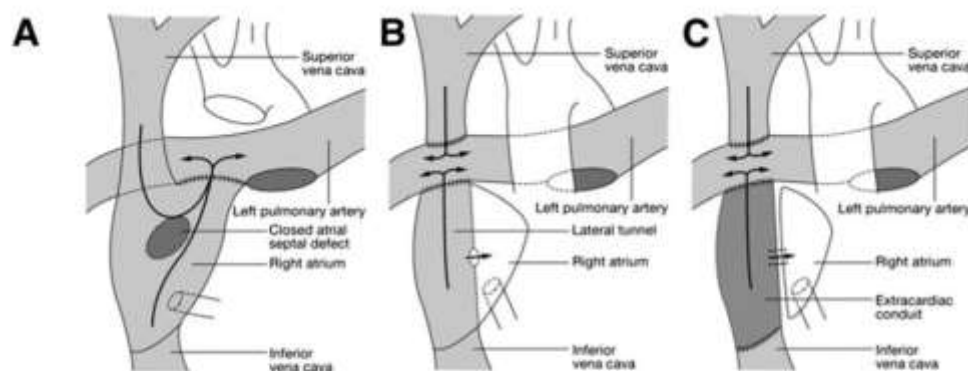
**Anaesthetic Implications:** The main determinants of Fontan circulation are systemic venous pressure, PVR, atrioventricular valve function, cardiac rhythm, and ventricular function. Disturbance of any of these factors compromises cardiac output. The following should be avoided: *Drugs with negative inotropic effects e.g.,  $\beta$ -blockers.* *Drugs that increase PVR e.g.,  $\alpha$ -adrenergic agonists.* *Factors that increase PVR e.g., alveolar hypoxia, hypercarbia, acidosis.*

**Pre-operative period:** A detailed history, physical examination, functional status and baseline haematological and biochemical investigations are assessed, even before minor surgery. End-organ damage secondary to low cardiac output and chronically high venous pressure may be present. A 12-lead ECG and echocardiography allow assessment of rhythm, and ventricular and valvular function. Perioperative antibiotic prophylaxis with broad spectrum cover is required for all procedures likely to produce a bacteraemia. The risk of air or fat emboli occurring during major surgery is relatively high in patients with a fenestration.

**Intra-operative period:** Induction can reduce cardiac output secondary to myocardial depression, systemic vasodilatation, and artificial ventilation. Induction agents that depress myocardial contractility e.g., thiopental should be avoided. High concentrations (>1.5 MAC) of volatile anaesthetic agents should not be used, as they increase the likelihood of arrhythmias. Inspired oxygen concentration should be adjusted so that the peripheral oxygen saturation is 95%. An increase in oxygen requirement is indicative of increasing right to left shunting through a fenestration or intrapulmonary shunts. This will be due to a decrease in ventricular function, decreased pulmonary blood flow, ventilation-perfusion inequalities, or any combination of these. Inadequate pulmonary blood flow may occur either secondary to decreased vascular volume or increased PVR. The most common causes of a perioperative increase in PVR are inadequate analgesia or anaesthesia, hypercarbia, acidosis, use of vasoactive drugs, and increased mean intrathoracic pressure. Fluid administration must be guided by CVP, transoesophageal ECHO, or oesophageal Doppler. Even moderate hypotension may be damaging in post-Fontan patients, because it may result in a critically low arteriovenous pressure gradient, resulting in inadequate tissue perfusion, metabolic acidosis, and increase in PVR.

**Postoperative care:** Adequate monitoring of vascular volume status after major surgery, particularly when further fluid shifts are likely to occur, requires the patient to be nursed in an intensive care unit. Patient controlled intravenous or epidural opioid analgesia helps provide good quality pain relief after major surgery and minimizes sympathetic tone. Monitoring of oxygen saturations in all patients for at least 24 h after major surgery, and the inspired oxygen concentration adjusted to maintain saturations above preoperative levels is required. Thromboprophylaxis should be continued throughout the perioperative period. Patients on warfarin who undergoing minor surgical procedures may need hospital admission for a short time so that the period of reduced anticoagulation is kept as short as possible.

A good knowledge of physiological derangements and their anaesthetic implications will help in safe management of these children.



An illustration of the different types of Fontan palliation. (A) The atriopulmonary connection consists of the right atrium connected directly to the pulmonary artery. Although this surgical reconstruction is not performed in modern practice, patients with atriopulmonary connections are presenting to the perioperative setting as adults. (B) The intracardiac total cavopulmonary connection, or lateral tunnel, consists of a superior vena cava surgically connected directly to the right pulmonary artery. Inferior vena cava traverses through the atrium via a baffle directly to the pulmonary artery. A fenestration is shown here connecting the baffle to the common atrium. (C) The extracardiac cavopulmonary connection also consists of a direct anastomosis of the superior vena cava to the pulmonary artery. However, an extracardiac conduit is used to route inferior vena cava blood directly to the pulmonary artery without traversing the right atrium.

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## ANSWERS to QUIZ

- 1) c
- 2) a
- 3) c
- 4) a
- 5) b
- 6) b
- 7) c
- 8) b
- 9) a
- 10) c

## Artificial Intelligence: A Look At Its Prospective Application In Paediatric Airway Management

Dr Gayatri Sasikumar  
Bangalore

Artificial Intelligence (AI) is the burgeoning topic of discussion today. And anaesthesia as a speciality has been the frontrunner of technological advancements right from the time ether was introduced by Morton in 1846. So, it comes as no surprise that we are on a quest now to use AI technology to make anaesthesia safe, accurate and tailor-made for each patient.

### Understanding the basics of AI:

When we think AI, our mind is automatically drawn to the image of a robot. Robotics is an essential component of AI, but it is important to understand the other aspects of AI namely, machine learning (ML) and natural language processing (NLP). Robotic systems in anaesthesia are classified as either pharmacological robots that are the basis of the closed-loop anaesthesia delivery system (CLAD) or mechanical robots that some authors propose can be used to perform actions that need precision and dexterity like intubation and peripheral nerve blocks.<sup>1,2,3,4</sup> NLP is the technology used by machines to understand human language. Siri and Alexa are examples of application of NLP. Machine learning (ML) is an exciting subset of AI that enables machines to analyse data by using algorithms and then make predictions or decisions based on this analysis. In ML language the data that is analysed is called the input or independent variable and what the machine predicts after analysing the input data is called the output or dependent variable. Unlike in statistical models, the machine tries to find complex nonlinear relationship between the dependent and independent variables.

ML can be supervised, unsupervised or reinforced. In supervised learning, the machine is trained using a data that is well labelled. For example, data containing photographs of men with difficult airway. Now the input data is randomly divided into two- the training data set and the test dataset. The computer first analyses the training data (photographs) using an algorithm which it tests repeatedly to find an association between input and the desired output (difficult airway in this case). Once this is done, this algorithm is applied on the test dataset to see if it can accurately predict the desired outcome (to analyse the photographs to predict if it is a difficult airway). In unsupervised learning, the data is unlabelled. The computer tries to find patterns and associations between variables within a dataset which can be used in new ways to classify patients. An example would be if the data contains photographs of both men and women and the computer applies its logic to differentiate between the two genders. Reinforcement learning refers to a process by which an algorithm is made to attempt a certain task and learn from its mistakes and successes. An example would be a machine that controls propofol infusion rates using bispectral index and mean arterial pressure values of patients as feedback<sup>6</sup>.

Deep learning is a subset of ML that develops algorithms using artificial neural networks that has layers similar to the human brain to process data. Now that we have understood the basics of AI, we can look at the prospective application of this technology in paediatric airway management.

Machine learning and its application in the paediatric airway:

1. *Recognition and prediction of difficult airway:* There are several scoring systems used to assess the airway preoperatively. The application of these clinical parameters in children is however a challenge because often they are either uncooperative or too young to comprehend our instructions. Therefore, this is one aspect of paediatric airway management that can benefit immensely from machine learning<sup>7</sup>. AI can be used to predict difficult airway in children by analysing facial structure from 3 D images<sup>8</sup>. Connor and Segal<sup>9</sup> developed one such algorithm to differentiate easy from difficult airway by recognising facial features from face photographs of 80 men.
2. *ML in detection of airway obstruction:* Bright et al<sup>10</sup> used neural networks in patients with goitre to detect the presence of upper airway obstruction by analysing their flow-volume loops. Researchers are using ML to identify apnoeic events using acoustic signals from snoring<sup>11</sup>. Atracheal sound monitor (digital stethoscope) is being used to identify airway obstruction in patients undergoing procedures under sedation. It could also differentiate laryngospasm from upper airway obstruction<sup>12</sup>.
3. *ML in monitoring of paediatric airway:* Monitoring of the airway during sedation is crucial in both adults and children. Despite the existing monitoring techniques like capnography and pulse oximetry, critical incidents pertinent to the airway continue to be reported. Major factors contributing to these events could be human factors like, error in judgement, lack of caution, knowledge, monitoring and early detection<sup>13,14</sup>. ML algorithms can be used to recognise patterns that could be early warning signs of critical respiratory events<sup>7</sup>. Knorr and colleagues<sup>15</sup> used a photoplethysmography based neural network to identify airway obstruction in patients in the post anaesthesia care unit (PACU). This is of great importance in paediatric anaesthesia practice since most critical events in children happen in the PACU.
4. *ML in airway management:* AI is being applied to develop mechanical robots that can perform intubations<sup>3</sup>. For this technology to be translated to the clinical setting, machines should have dexterity and precision. Neural networks are being used to analyse chest x rays or ventilatory flow and pressure wave forms to differentiate between tracheal and oesophageal intubations. This is especially useful in the paediatric and neonatal critical care and emergency room setting<sup>7</sup>. ML is also being used to support airway procedures. Neural networks can be used to provide a global positioning system "GPS" like guide during fiberoptic bronchoscopy and video laryngoscopy to prompt the anaesthesiologist's real time location inside the airway<sup>7,16</sup>. Analysis of chest x ray and CT scan images could also be probably used to provide the clinician the size of the endotracheal tubes and double lumen tubes and the depth of insertion of these tubes.
5. *ML in children with anomalies of the airway:* Machine learning algorithms could possibly be used in future as a non-invasive method to interpret ultrasound assessment of vocal cord movement to detect vocal cord palsies, analyse acoustic signals to detect the aetiology of stridor, and numerically detect the degree of stenosis in the airway from radiological images thereby enabling a definitive treatment plan to be made during airway surgeries. This could probably limit the number of repetitive procedures which these children are typically subjected to, thus reducing the overall cost.

6. *ML in predicting airway outcomes*: Critical airway events such as bronchospasm, laryngospasm and desaturation are common in the paediatric population. The incidence is greater in the younger age group and the common risk factors predisposing to such events are known to us. If data regarding these risk factors and the airway outcomes is collected, then we could use AI algorithms to accurately predict children who are at risk of adverse airway outcomes. Lundberg and colleagues<sup>17</sup> developed a ML system that not only predicted hypoxemia but also explained the risk factors. Kuo and colleagues used an artificial neural network in the ICU setting for predicting weaning outcomes. We could use a similar algorithm to predict successful extubation of paediatric patients after general anaesthesia<sup>18</sup>.
7. *ML in airway education and skill-based training*: Advancements in AI can be used to create high fidelity simulators that closely mimic the highly dynamic operating room environment to give the trainees a real feel of their work environment and help develop skills to not only manage a difficult airway scenario but also think and act with clarity in high stress situations without feeling vulnerable. These systems can also be used in the assessment of trainees<sup>1</sup>.
8. *AI in tele medicine*: AI can be used to remotely help management of difficult airway scenarios in underserved areas.

### Limitations of AI application in Anaesthesia:

From understanding the basics of ML, it is easy to see that for building an AI algorithm that is accurate, reproducible, and safe to use in any given clinical scenario, the data used to train it should be of high quality and free from bias. A term that commonly appears in AI discussions is overfitting. Overfitting typically occurs when a machine learning model becomes so familiar with the training data that it fails to predict outcomes in a new set of data<sup>19,20,21</sup>. For example, if the data on difficult airway patients consist only of photographs of men, then the AI model may fail to accurately recognise features of difficult airway women because in the training set it has identified predictors of difficult airway only in males. Overfitting occurs when the sample size of the data is too small, or if it has a lot of irrelevant information (called noisy data)<sup>20</sup>. It is important therefore to collect as much data as possible to avoid such bias. The collection of large data bases leads to another key issue in AI which is data ethics and data security<sup>1</sup>. Informed consent, patient privacy, security, data protection are all important aspects of AI that need to be investigated and legislature pertaining to these must be put into place. Another factor that may act as barrier for use of AI in clinical anaesthesia is the concern that someday machines may overpower and replace humans. Matthias Görge and Mark Ansermino bring in an interesting terminology called “augmented intelligence”, to describe AI. Since it is essentially the integration of traditional statistical methods with machine learning, AI can empower anaesthesiologists to make proactive decisions in varied clinical contexts, making the operating room environment safe for the patients<sup>22</sup>.

### Conclusion:

Right from performing mundane tasks like turning on lights in our homes or calling a friend in our contact list by voice command to putting space scientists up on the moon; computers have slowly but surely invaded all aspects of human life. It's not surprising then that healthcare and anaesthesia have not been left untouched by it. The current research on use of AI in anaesthesia is focused mostly on the adult population. It will help if we clinicians who are in the front-line can closely collaborate with computer scientists, database architects and data managers to explore the vast opportunities that AI offers to advance care in the specialty of paediatric anaesthesia<sup>1</sup>.

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### Activities

A CME on Paediatric Anaesthesia and Mid-term meeting of IAPA was organised by the Paediatric Anaesthesia division of the Department of Anaesthesia and Intensive Care, PGIMER, Chandigarh on 27-28 August 2022. The theme of the CME was “Anaesthesia for surgery in the head and neck region in children”. The Punjab Medical Council awarded eight credit points for this event. This CME was attended by more than 120 participants which included stalwarts of paediatric anaesthesia as well as young budding anaesthetists. Most of the participants were from Chandigarh and nearby states of Punjab, Haryana, Himachal and Uttar Pradesh. However, there were delegates as well as faculty from Delhi, Karnataka, Tamil Nādu, Telangana and USA.

The topics discussed included paediatric neuro-anaesthesia, anaesthesia for eye and ENT procedures, cleft lip and palate repair, craniosynostosis surgery and dental procedures. Paediatric trauma, burn injuries, perioperative fluid and blood management in children was also discussed. A large number of e-posters (27) were presented during the CME. They were classified into two categories: 1) Postgraduate students and 2) Senior residents, Fellows and DM students. A panel of judges assessed all the posters and selected one best paper in each category. Fellowship exit exam for the IAPA fellows was also conducted. The CME concluded with a quiz for postgraduate students.



### 2<sup>nd</sup> Exclusive Pediatric Airway Seed Workshop, 15<sup>th</sup> April 2023

Dr Ranju Singh, Dr Kavita Rani Sharma  
Delhi

The second exclusive Pediatric Airway Seed Workshop of Indian Association of Pediatric Anesthesiologists, Delhi branch was conducted in collaboration with Airway Management Foundation on 15<sup>th</sup> March 2023 at Hotel Metropolitan, New Delhi. The event was a great success with around hundred delegates and forty faculty members participating. The event had pediatric airway specific didactics and case discussions followed by hands on training with experienced faculty instructors facilitating skill empowerment and knowledge transfer at twelve simultaneous running workstations, working on specific neonatal and infant airway manikins. The basics of airway management, including optimum positioning, oxygenation, mask ventilation, direct laryngoscopy and intubation using different blades and supraglottic airway devices placement were an integral part of the skill stations. Intubation using supraglottic airway as a conduit and front of neck access provided advanced skills to the delegates. A wide range of advanced pediatric airway equipment including fiberscopes and video laryngoscopes were also available for practice by the delegates. The workshop was very well appreciated by all participating delegates and faculty alike.



**CME on PAEDIATRIC ANAESTHESIA****Dr Sumanta Ghosh Moulik  
West Bengal**

A half day CME on PAEDIATRIC ANAESTHESIA was held at Burdwan Medical College, Burdwan, West BENGAL organized by Dept of Anaesthesiology and Critical Care on 8th May 2023, as an endeavor to update the knowledge and skills on Paediatric Anaesthesia.

The program was initiated by welcoming the speakers and chairperson. Principal, Burdwan Medical College delivered an encouraging inaugural speech which was followed by inauguration by Chairperson Prof Debasish Saha. Three lectures were conducted consecutively by honorable speakers, Prof Jayanta Chakraborty, Unit-in-Charge, Paediatrics Surgery, NRS Medical College and Dr Ratul Kundu, Consultant Anaesthesiologist, Ruby General Hospital, Kolkata This was followed by presentation of three case reports by the Second year Postgraduate Trainee of the Department, Dr Madhurima Roy, Dr Rounak and Dr Sweta Prasad. The topics included Anaesthetic considerations in children with Ano-vestibular Malformation with mediastinal mass, Congenital Diaphragmatic Hernia and Infantile Hypertrophic Pyloric Stenosis This was concluded by a panel discussion conducted by the chairperson with the speakers on the case reports.

Comments and questions from the house were taken and a consensus was arrived at regarding the optimum management of such cases within a limited set up. Suggestions regarding improvement of logistics support were well taken. The panelists stressed on development of liaison between the Paediatric intensivist, Anaesthesiologist and Paediatric Surgeon throughout perioperative period while dealing with difficult cases to obtain a reasonable outcome. The guests commended on such endeavor under the Aegis of IAPA and advocated organizing more such CME s in different institutions so as to spread the message of creating a ripple which will ultimately spread into waves in days to come. The junior faculty and trainees were encouraged to take up IAPA membership in large numbers. The program was concluded with vote of thanks and photo session with the guests.

**Inauguration of IAPA Karnataka State Chapter, May 21st, 2023****Dr Madhavi Ravindra,  
Bangalore**

The Karnataka branch of IAPA, marked its inaugural meeting with a CME titled "Essentials of Paediatric Anaesthesia Practice- An Update" on 21st May in Bangalore. There were a whopping 180 registrants comprising of practising anaesthesiologists, residents, and fellows. Eminent speakers and faculty from all over India and the overseas, enthralled the delegates with their knowledge and experience in Paediatric Anaesthesia. The day was kick started by Dr Rajeev Subramaniam Iyer, Associative Professor, University of Pennsylvania Perelman School of Medicine with a virtual talk on patient safety.

Following this we had brilliant talks by Dr PM Chandrasekhara, Dr Neerja Bhardwaj, Dr Aavula Muralidhar, Dr N Krishnan, Dr M Subrahmanyam, Dr S Ramesh, Dr Krishna HM and Dr Sreedhara S Joshi, on varied relevant topics in Paediatric Anaesthesia. Dr Fiona Campbell, Professor University of Toronto, Department of Anaesthesia and Pain Medicine, The Sick Children's hospital, joined us virtually to speak on improving perioperative pain outcomes for children across the globe. A poster and quiz competition were also held as part of the CME.

We had the blessings and support of our veteran leaders Dr Rebecca Jacob, Dr Elsa Varghese and Dr Chandrika YR. Our sincere gratitude to Dr Neerja Bhardwaj and Dr Aavula Muralidhar for their encouragement. We hope this is the beginning of an exciting journey of not only creating awareness and spreading knowledge in paediatric anaesthesia but also of building a community of strong members who can take the association of paediatric anaesthesiologists in India to greater heights.



No	Post	
1	President	Dr Suresh Pandurangam
2	Vice president	Dr Chandrakala KR
3	Secretary	Dr Madhavi Ravindra
4	Treasurer	Dr Surjakant Mohanty

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9	Dr Lokesh
10	Dr Sagar
11	Dr Shalini
12	Dr Sheetal K
13	Dr Shishir Chandrashekar
14	Dr Surangama

## REPORT OF WORKSHOP ON OBSERVATIONAL STUDIES

Dr Vibhavari Naik,  
Hyderabad

'Workshop on Observational Studies' was conducted on 24th June 2023 from 9 am to 5 pm. This activity was organized by Basavatarakam Indo-American Cancer Hospital and Research

Institute, Hyderabad and was supported by Indian Society of Anaesthesiologists (ISA)

Hyderabad together with Indian Association of Paediatric Anaesthesiologists (IAPA) Telangana. The facilitators for this course were Dr Narayana Yaddanapudi and Dr Sandhya Yaddanapudi from PGI Chandigarh and Dr D Padmaja from NIMS, Hyderabad. Dr Krishna Mohan was the hosting team faculty.

Twenty eight participants registered for this course. The topics covered were cohort and case control studies, outcome measures, confounding, data handling and analysis. Each topic was introduced by a small lecture and was covered in project based small group discussion. Additional topics included were ethics committee approval, CTRI registration and consent form design. The workshop had impressive feedback with most sessions scored as good and very good. The average pre-test score was 5.88 and the average post-test score was 6.7. Majority of the participants expressed that they were glad to attend an unconventional non-clinical workshop on statistics which included small group based discussions and were willing for more similar sessions. We thank all the eminent faculty for sharing their knowledge, skills and experience to make this workshop a success. Last but not the least, we are grateful to the support from our institute and the staff from our department, both medical and administrative, for their enthusiasm throughout the preparation and conduct of the workshop.



## The Indian Delegation in ASPA 2023, Seoul

The Asian Society of Paediatric Anaesthesiologists (ASPA) 2023 was hosted in Seoul, Korea from 16th to 18th June 2023 by the Korean Society of Paediatric Anaesthesia. The theme of the conference was 'Equity and Quality in Paediatric Anaesthesia'. True to its theme, the conference had representation from many Asian countries including India. The Indian delegation which comprised of 61 delegates including 14 in-person attendance, had diverse representation in the conference proceedings.

Dr Rebecca Jacob shared the challenges faced in providing safe anesthesia to children in low and middle income countries while Dr Elsa Varghese illustrated the journey of quality improvement in paediatric anaesthesia in India. Dr Vrushali Ponde shared her tips in regional anesthesia for neonates and infants while Dr Vibhavari Naik and Dr Abhyuday Kumar shared their experiences on blood transfusion triggers and supraglottic airways respectively. Dr Ekta Rai moderated a session on intraoperative ventilation in children. There were 7 in-person and 11 virtual poster presentations from India displaying the enormous work done in paediatric anaesthesia in our country.



**Workshop on Emergency Intra-Osseous Access in Children, 7th July 2023**

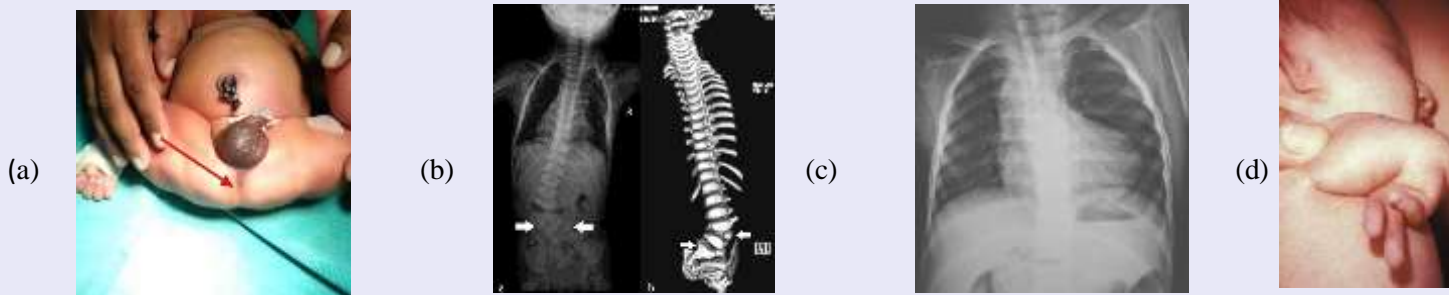
The Department of Paediatric Anaesthesia in association with IAPA Maharashtra conducted a hands-on workshop on emergency intra-osseous access in children at KEM Hospital, Mumbai. The session began with a welcome speech and felicitation of the senior faculty by Dr Indrani Chincholi, President IAPA Maharashtra, followed by a detailed lecture on the PALS Guidelines on Vascular access and the conduct of Intra-Osseous access in children by Dr Raylene Dias, Head of Department. The lecture followed live demonstration and hands-on workshop on bone models, using the Arrow EZ-IO system with a hand held drill to establish immediate vascular access. The workshop saw an enthusiastic participation by the residents from the Department of Paediatrics, Paediatric Anaesthesia and Paediatric Surgery and was a success in honing their skills in establishing immediate vascular access in children during an emergency. The workshop was concluded with a vote of thanks.



**PICTURE QUIZ**

**Dr Meera Gandhi, Vellore**

1. The most common syndromic association seen with tracheoesophageal fistula (TEF)



2. What is not seen in a new- born whose chest x-ray ?

- a) Large for gestational age, has crepitus at his collar bone, and is not moving his right arm
- b) Excessive drooling and coughing or choking when breastfed
- c) A baby who has abnormal respiratory sounds at one hour old and breathing difficulty
- d) A baby who has a high respiratory rate and cyanosis on feeding



3. In a case of TEF/OA what is the surgical approach if the coronal CT thorax?

- a) Large for gestational age, has crepitus at his collar bone, and is not moving his right arm
- b) Excessive drooling and coughing or choking when breastfed
- c) A baby who has abnormal respiratory sounds at one hour old and breathing difficulty
- d) A baby who has a high respiratory rate and cyanosis on feeding



4. Which type of TEF does not correlate with the following bronchoscopy image

- a) Type C
- b) Type D
- c) Type E
- d) Type A



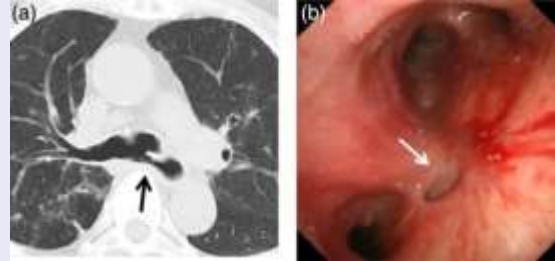
5. Which of the following best correlates with the X ray findings of a new born with TEF

- a) Isolated oesophageal atresia
- b) Proximal atresia with distal fistula
- c) Isolated fistula
- d) Double fistula



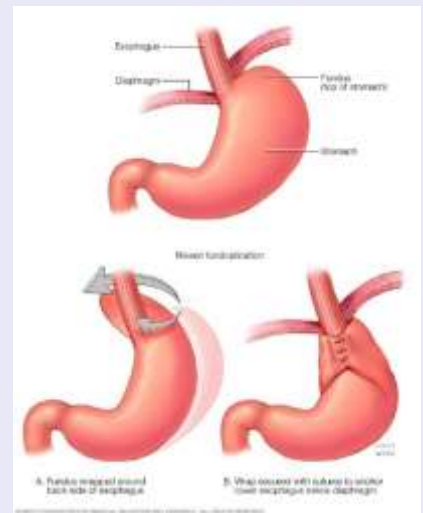
6. Anaesthetic management of the following case of TEF involves all, except

- a) Spontaneous ventilation and rigid bronchoscopy
- b) ETT positioned distal to the fistula
- c) One lung ventilation
- d) ETT placement, Fogarty catheter in fistula



7. The following surgery is offered for which postoperative complication of TEF repair

- a) Anastomotic leak
- b) Recurrence of fistula
- c) Severe gastro oesophageal reflux disease
- d) Oesophageal stricture



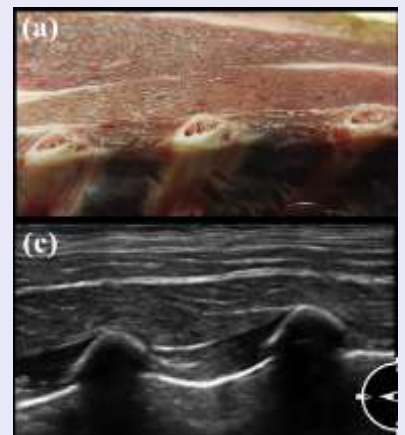
8. Identify the following airway device used for lung isolation

- a) Arndt endobronchial blocker
- b) Univent Tube
- c) Double-lumen endobronchial tube
- d) E-Z endobronchial blocker



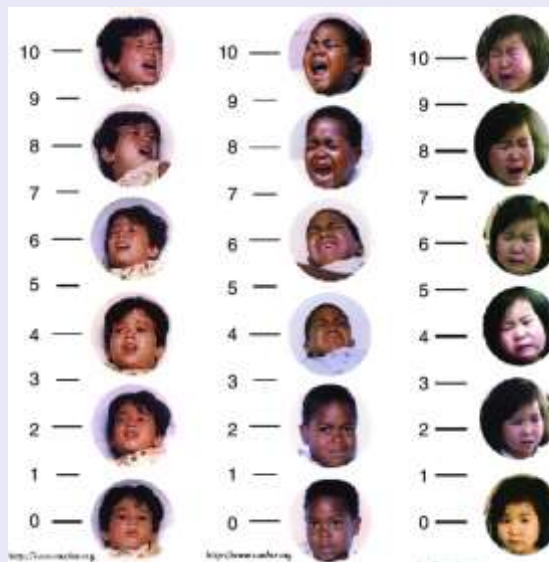
9. With the help of the image given below, identify the regional block performed for TEF repair

- a) Intercostal nerve block
- b) Paravertebral block
- c) Pectoral interfascial plane block
- d) Serratus anterior plane block



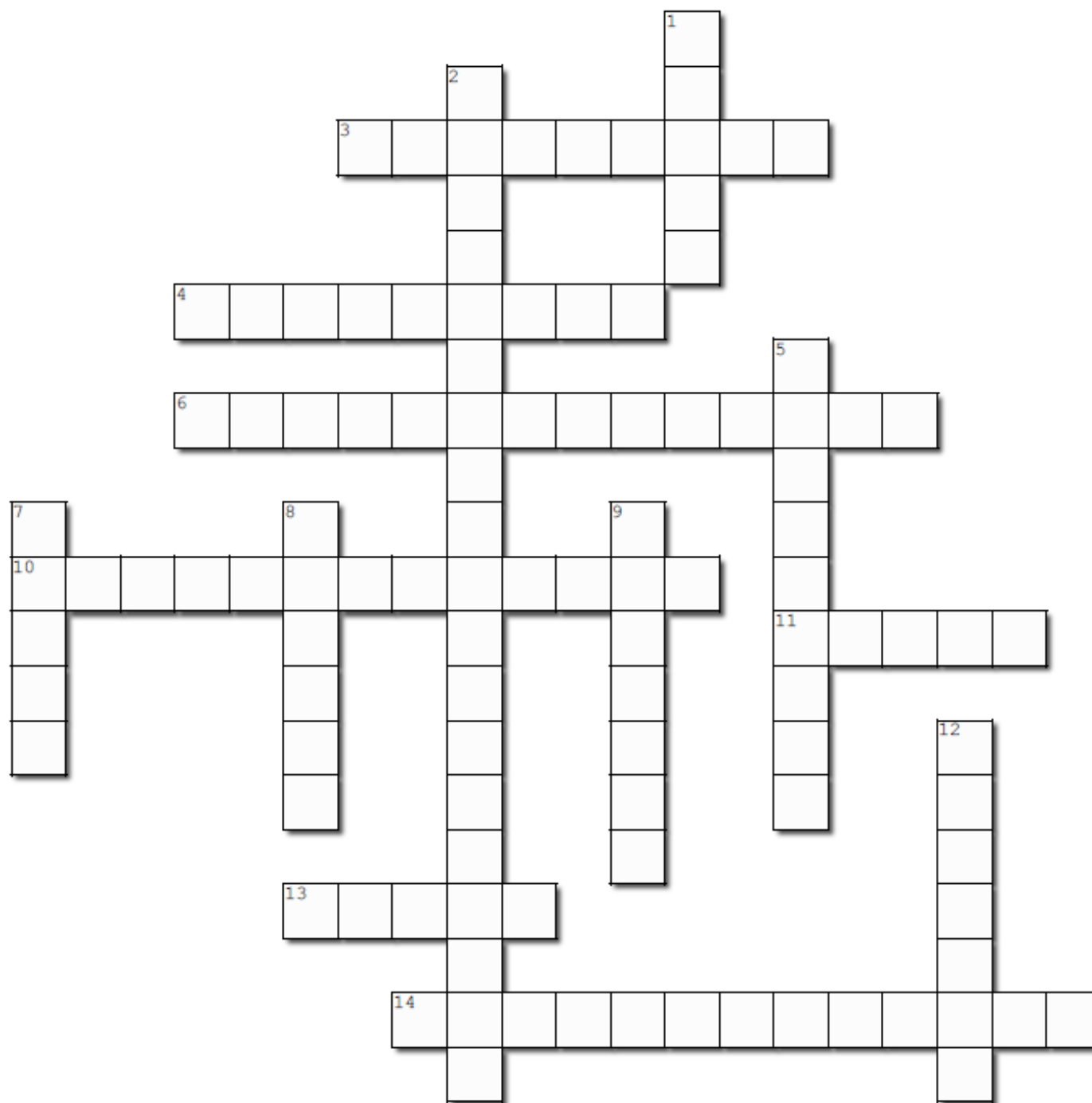
10. Identify the paediatric pain scale from the picture given

- a) FLACC scale
- b) Wong Baker Faces pain scale
- c) OUCHER scale
- d) N-PASS



Name: Ekta Rai**KNOW OUR IAPA**

Complete the crossword puzzle below

**Across**

3. Who is IAPA's Founder President ?
4. Where is IAPA secretariat located ?
6. What was the purpose of the establishment of IAPA?
10. Members who holds the office of President, Vice president, Secretary, Organising Secretary and Treasurer are known as
11. What is the period of the Managing Committee elected in the Annual General Body Meeting ?
13. How many state branches exist?
14. Who acts as the chairman of the Annual GBM in the absence of The President ?

**Down**

1. A member may cease as a member of this association, on the following ground
2. Which journal has partnered with IAPA ?
5. Who is authorised to release the notice for the Annual General Body Meeting?
7. Which city is hosting the 2024 IAPA national conference
8. Who is IAPA 's current president?
9. Who conceived the idea of forming IAPA?
12. How many editions of iapa Newsletter have been released?