Anaesthetic Challenges in Paediatric Neurosurgery

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BIR HOSPITAL

- Conflict of Interest
- None

- Disclosures
- None

- “Children are not the small adults”

- Brain : Important Vital Organ
- Cerebral blood flow varies with the different pediatric ages
- CMRO2 is more in children than adult
- Head poses larger percentages of body surface area resulting the increased blood volume: prone for the blood loss and hemodynamic fluctuation

children

MDPI

Review

Special Anaesthetic Considerations for Brain Tumour Surgery in Children

Sandra Jeker [1,*], Maria Julia Beck [1] and Thomas O. Erb [1,2]

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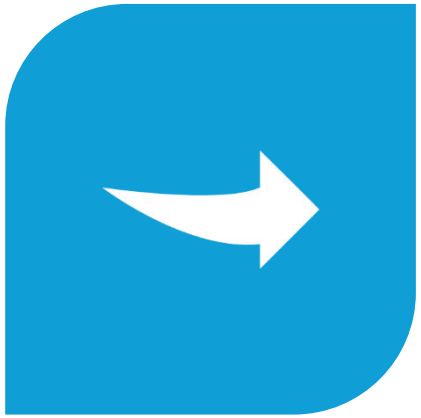
Table 1. Cerebral blood flow for different age groups [6,7].

Age	Cerebral Blood Flow (mL/100g/min)
Premature neonate	12–20
Full term neonate	23–40
6 months to 3 years	90
3–12 years	100
Adult	50

CHILDREN HAVE DEVELOPING BRAIN

NEUROLOGICAL AND PHYSIOLOGICAL STATUS ARE IN THE PROCESS OF MATURITY



OPEN FRONTANALLE GIVE SPACE FOR PATHOLOGLY EXPANSION RESULTING IN THE LATE PRESENTATION

Objectives

- To high light the reasons for the anaesthetic challenges in Paediatric neurosurgery
- To project the paediatric neuroanaesthesia in Nepal’s Perspective

Challenges in Anaesthesia

Different perspectives

1. Surgical
Advanced Subspeciality
Position
Morbidity and Mortality
Neurocritical Care

Surgical and anesthetic perspective

- Sharing of the Airway
- Small Body covered by drapes along with the sophisticated equipments like Microscope, navigations, etc

Surgical perspective: Advanced subspeciliteis

- Tumor
- Hydrocephalous
- Neurointerventional
- Vascular Malformations
- Craniosynthesis
- Functional surgeries
- Imagings (CT, MRI)

Postions

- Positions related complications , pressure points, protection of eyes and other parts
- Unusual positions than supine

➢Prone

➢Lateral

➢Park bench

➢Sitting (Venous Air embolism)

Supine

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Pediatric neuroanesthesia

Sulpicio G. Soriano, MD*, Elizabeth A. Eldredge, MD,
Mark A. Rockoff, MD

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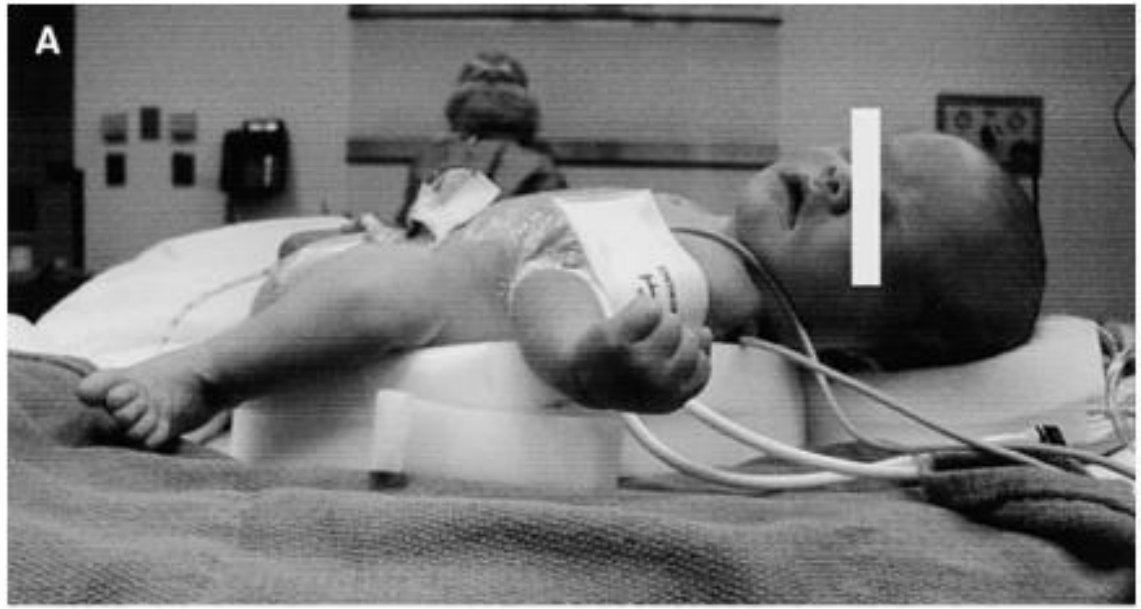

Prone position

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Sitting position

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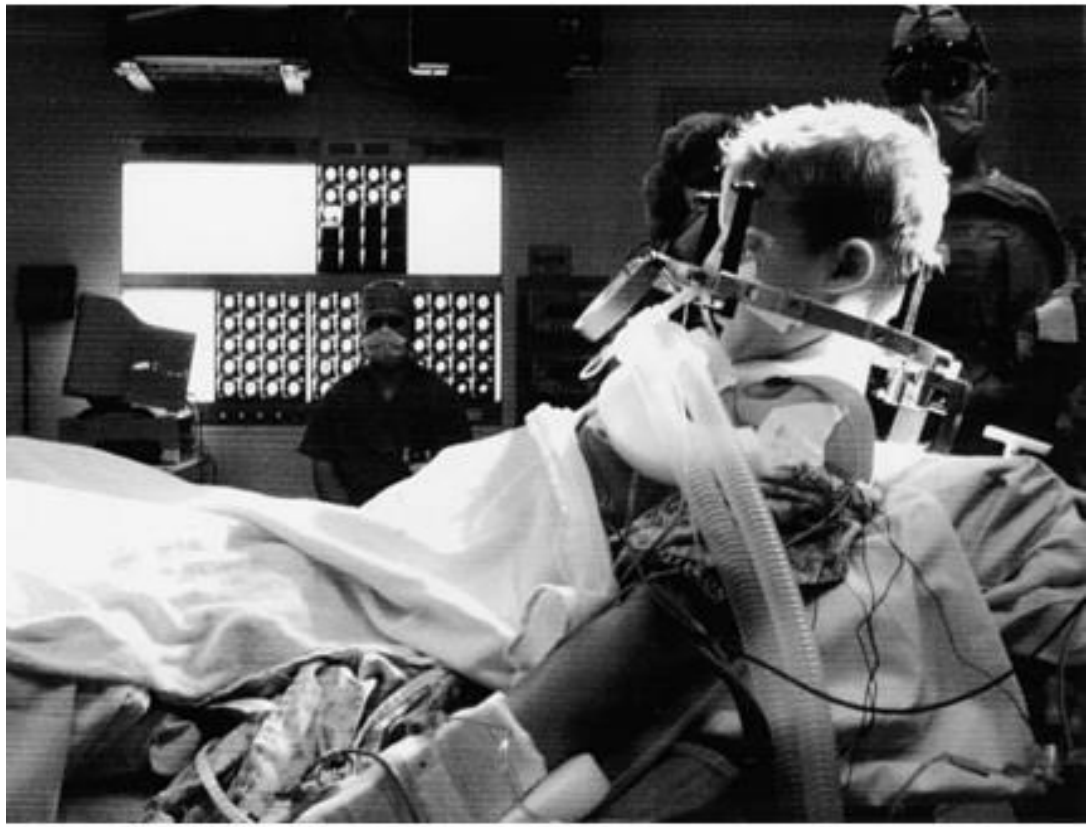

Review Article

Anaesthesia for neurosurgical procedures in paediatric patients

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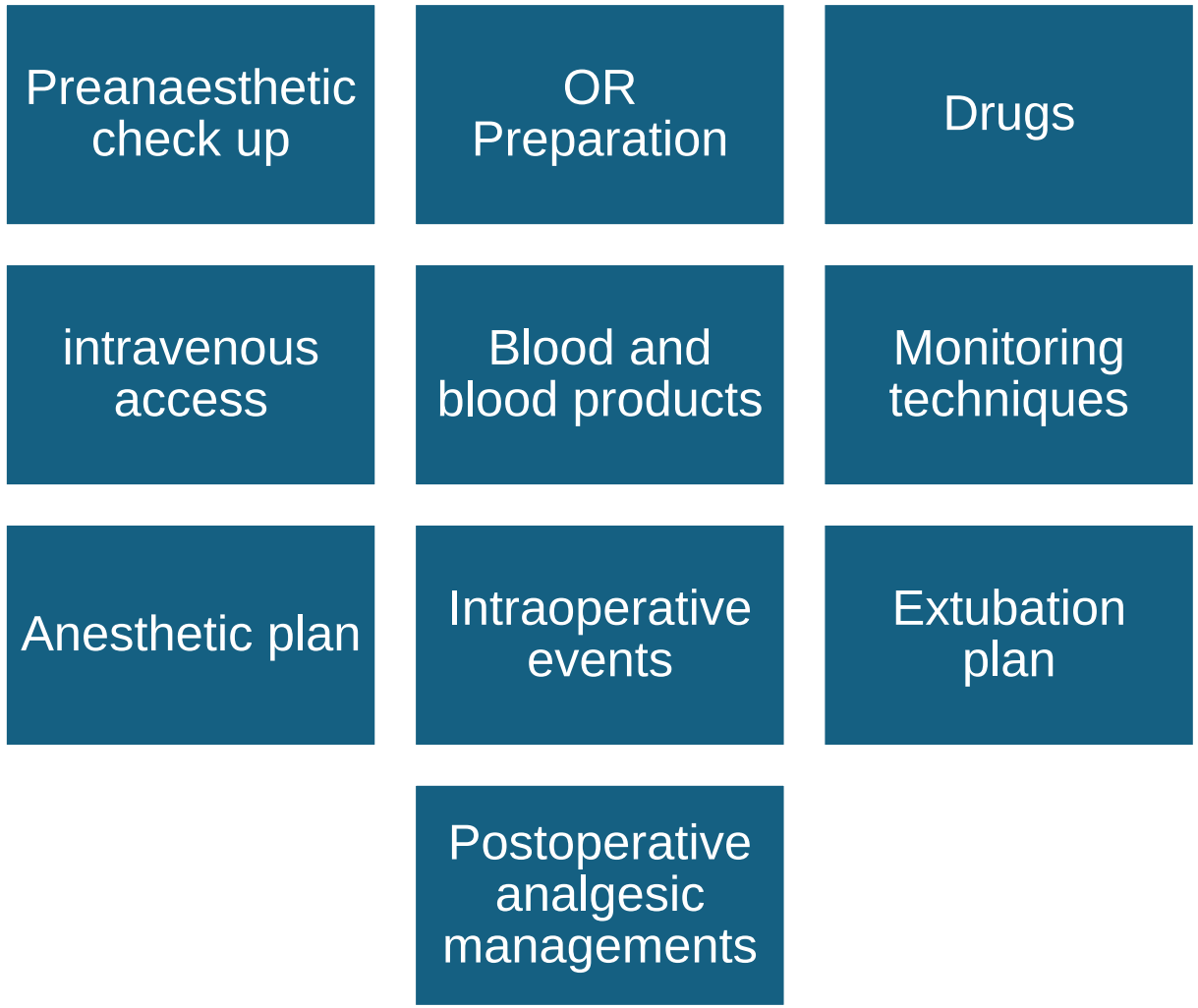
ABSTRACT

Recent advances in neurosurgery, neuromonitoring and neurointensive care have dramatically improved the outcome in patients affected by surgical lesions of central nervous system (CNS). Although most of these techniques were applied first in the adult population, paediatric patients present a set of inherent challenges because of their developing and maturing neurological and physiological status, apart from the CNS disease process. To provide optimal neuroanaesthesia care, the anaesthesiologist must have the knowledge of basic neurophysiology of developing brain and effects of various drugs on cerebral haemodynamics apart from the specialised training on paediatric neuroanaesthesia. This article highlights on the perioperative management of paediatric neurosurgical patients.

Key words: Craniosynostosis, hydrocephalus, meningomyelocele, neurointensive care, neuromonitoring, positioning

Challenges in Anaesthesia

Anesthetic perspective



Pre-anaesthetic check up

Different age groups

Communication

Anxiety

Associated conditions

consent

Table 1
Perioperative concerns for infants and children with neurological disease

Condition	Anesthetic implications
Congenital heart disease	Hypoxia and cardiovascular collapse
Prematurity	Postoperative apnea
Upper respiratory tract infection	Laryngospasm and postoperative hypoxia/pneumonia
Craniofacial abnormality	Difficulty with airway management
Denervation injuries	Hyperkalemia after succinycholine
	Resistance to nondepolarizing muscle relaxants
Chronic anticonvulsant therapy for epilepsy	Hepatic and hematological abnormalities
	Increased metabolism of anesthetic agents
Arteriovenous malformation	Potential congestive heart failure
Neuromuscular disease	Malignant hyperthermia
	Respiratory failure
	Sudden cardiac death
Chiari malformation	Apnea
	Aspiration pneumonitis
Hypothalamic/pituitary lesions	Diabetes insipidus
	Hypothyroidism
	Adrenal insufficiency

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Intravenous access

- Difficult
- Central venous cannulation
- Subclavian
- Internal Jugular??
- Femoral
- General Anesthesia

Intravenous fluid

- Judicious fluid management
- Calculated dose
- Infusion pumps
- Volume issues

Drugs

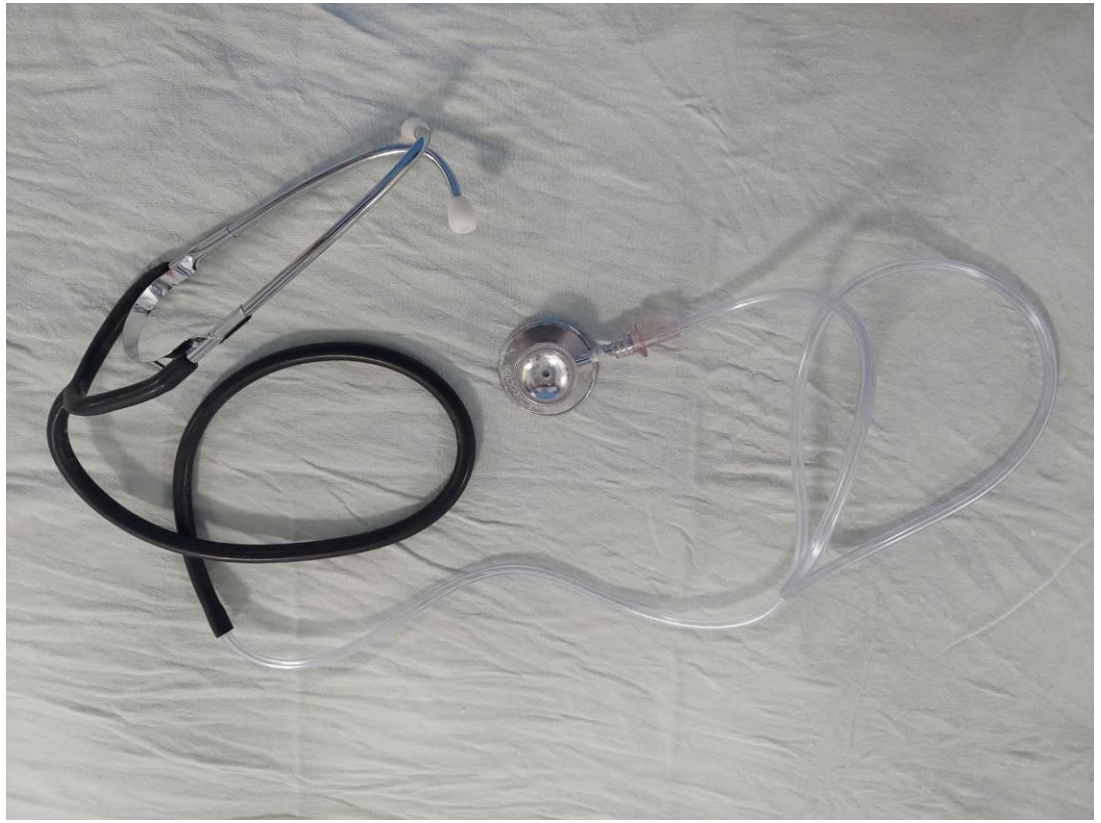
- Fentanyl
- Propofol
- Sevoflurane induction
- Rocuronium/ Succinylcholine
- Isoflurane/ Sevoflurane
- Paracetamol (via different routes)
- Neostigmine and Atropine
- ***Calculated dose is required***

Monitoring Techniques

- Standard ASA I and II monitors
- Invasive monitors

- ***Rely on oneself ,not on monitors only***

Monitoring techniques



Blood and blood products

- Significant blood volume loss Compared to adults
- Drop in blood pressure is the delayed sign
- Lack of viscoelastic coagulation tests
- Massive blood transfusion protocols may be activated
- Volume issues
- Infusion devices required

Intraoperative events in neurosurgery

- Airway related : tube displacement, secretions, Kinking
- Breathing : ETCO2 measurement, bulky circuit, dead space due to catheter mount and HME filter
- Circulation: Hemodynamic fluctuation due to surgical bleedings, operating site manipulation, Air embolism, cerebral edema
- Temperature : specific challenges to maintain body temperature due to prolong surgery, position, Normal Saline wash in the brain

Extubation Plan

- Awake extubation
- Elective mechanical ventilation:
- Non kinking tube must be replaced with the normal PVC tube
- Depends on the hemodynamic status, surgical site, duration of surgery

Post operative care

- Neurosurgical ICU
- Judicious use of opioids and fluid
- Glucose monitoring
- Avoid Secondary brain injury by avoiding hypoxia, hypercarbia, acidosis, hypo/hyperglycemia,hyperthermia
- Electrolytes: hyponatremia (most common)

Challenges in Nepal

Neuroanaesthesia : a developing subspeciality with scanty paediatric neuroanaesthesiologists

It is the responsibilities of general anaesthesiologists

Referral centres have high demand in case volumes

Summary

- Delivering anaesthesia for the paediatric neurosurgery requires judicious planning
- Decision should be made on individual case basis
- Communication with surgeons regarding their surgical plan and position is a crucial part
- Multidisciplinary approach as per the requirement is important in special cases

- THANK YOU

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