

**RAJIV GANDHI INSTITUTE OF MEDICAL SCIENCES :: ONGOLE
PRAKASAM DISTRICT.**

**The C.M.E. Programme is conducted in RIMS., Ongole between
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TOPIC : ANAESTHESIA & SEDATION IN REMOTE LOCATIONS

[2]
ANAESTHESIA & SEDATION IN REMOTE LOCATIONS

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PROLOGUE

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11 INTRODUCTION:

Modern Practice has seen the role of the anaesthesiologist expand beyond the walls of the operation theatre complex. The new role as a critical care physician is of course, very much established.

Remote locations, where anaesthesiologist may be required to administer anaesthesia or sedation outside the operation theatres include :

- Radiology Suites Eg. Interventional Radiology CT Scan & MRI
- Pulmonary Suites:- Bronchoscopy
- Endoscopy Units
- Cardiology Suites:- Coronary Angiography, Cardiac catheterization /
Electro physiological Mapping Laboratories.
- Dental Clinics
- Burns & Plastic Surgery Units
- Psychiatric Department for ECT
- Urology Clinics for ESWL
- Labour Analgesia
- Gynaecology Unit for invitro fertilization
- Emergency departments
- ICU Sedation & Anaesthetic Care
- Disaster Management

These areas distant to the operation theatres are ill equipped and in general require two anaesthesia personnel to ensure that if disaster occurs, there is an extra hand that can help in resuscitation, run for help, etc.,

ASA Guidelines for non-operating room anaesthetizing locations (Approved by house of delegates on 19th October, 1994 and last amended on 15th October, 2003.);

- A reliable oxygen source with backup
- A suction source
- Waste gas scavenging
- Adequate monitoring equipment to meet the standards for basic anaesthetic monitoring
- A self inflated hand resuscitator bag
- Sufficient safe electrical outlets
- Adequate patient and anesthesia machine illumination with battery powered back up
- Sufficient space for the anaesthesia care team
- Emergency cart with a defibrillator
- Emergency drugs, and other emergency equipment
- A means of reliable two-way communication to request assistance
- Compliance of the facility with all applicable safety and building codes

Many procedures undertaken in remote location can be accomplished under light sedation, local anaesthesia or with no sedation.

However, there are groups of patients who may require deep sedation or general anaesthesia on a routine basis. These include.

- Children
- Uncooperative or Anxious patients
- Claustrophobic Patients (Especially in MRI Suites)
- Elderly or confused patient's procedures
- Patients Undergoing painful Procedures
- Patients requiring Burn dressings.

2] CHALLENGES OF ANAESTHESIA IN REMOTE LOCATIONS

These can be classified as challenges related to :

- 1) Equipment
- 2) Staff
- 3) The Procedure
- 4) The Patient

i) EQUIPMENT:

The anaesthesia machines available for remote locations are often very basic models with minimal monitors that may not be working.

- It is very important to do routine safety checks, making sure that Oxygen failure alarm is working.

- It should be noted that anaesthetic machine is visible during the procedures, as radiology procedures are invariably undertaken in darkened room.

- Anaesthesiologist must be vigilant to detect unexpected events such as cessation of oxygen delivery.

- There may be light on the anaesthesia machine, otherwise a torch is essential.

- Where facilities are available, an emergency trolley with a defibrillator should be immediately available.

a) Oxygen Supply :

Each remote site should have a reliable source of oxygen adequate for the duration of the procedure.

- It is essential to have extra cylinders, in addition to those fitted to Boyle
machine.

- These cylinders should be checked prior to the start of anesthesia, as majority may be empty.

- A backup of at least one full 'B' type cylinder is advisable before starting any procedure in remote location.

b) Sodalime canister

When using circle system it is advisable to put fresh sodalime in the canister before undertaking a procedure, as it will be old and exhausted all the time.

c) Anaesthesia Circuits

Certain procedures require the anaesthesia machine to be at a distance from the patient, therefore circuits and monitors with long extension tubings are necessary.

- When Bain's circuit is used, it must be subjected to leak tests thoroughly.
- A Self-Inflating bag should always be available to provide positive pressure ventilation incase of oxygen failure.

d) Electricity

There may not be sufficient electrical outlets for the anaesthesia and monitory equipment.

e) Scavenging

If anesthetic vapours are used, there should be a reliable scavenging systems to let out the gases.

f) Space Constraints

Radiology suites often contain very bulky equipment and it is often difficult to accommodate the anaesthesia machine. One should make sure that there is enough space in the working environment.

g) Operating Tables

An operating theatre table with the expected range of positions may not be available in these location, so the various position adjustments including the height of the table may be difficult to achieve.

h) Illumination

Illumination is not adequately provided and it should be taken care of.

i) Drugs

It should be checked that all the drugs that are required during anaesthesia (including emergency and resuscitation drugs) are available and these drugs should not exceed their expiry date,

j) Working Suction

Central suction is usually not available in remote locations and therefore it is very essential to ensure that a working suction machine is always available along with electrical extension boards. A foot operated suction machine is preferable as a back up and may be mobilized to any place,

k) Monitoring equipment

The basic monitors mandatory for providing sedation and anaesthesia at any place are : (i) Pulse oximetry (ii) NIBP (iii) ECG and (iv) ETco₂ Monitoring (capnography). When muscle relaxants are used PNS is recommended.

- If possible, capnography can be mobilized from operating theatres. Monitoring is challenging in the MRI suite and specially shielded monitoring equipment is required that is MRI compatible and does not interfere with the MRI signal.

Equipment checklist for anaesthesia in a remote location :

Acronym **SOAP ME**

S (SUCTION) - Appropriate size suction catheters and functioning suction apparatus

O (OXYGEN) - Reliable Oxygen source with functioning flow meter

A (AIRWAY) - Airway equipment of appropriate size.

- Face masks
- Nasopharyngeal and oropharyngeal airways
- Laryngoscope blades -ETT
- Stylets
- LMAs
- Bag-Valve-Masks

P (PHARMACY) or (D-DRUGS)

Basic drug needed for life support during emergency

- Epinephrine
- Atropine
- Glucose
- Naloxone
- Flumazenil

M (MONITORS)

- Pulse oximeter
- NIBP
- Capnography
- Temperature Monitoring
- ECG

E (EQUIPMENT)

- Defibrillator
- Safe electrical outlets
- Anaesthesia machine with Gas scavenging
- Adequate lighting
- Means of reliable communication to main theatre site,

ii) STAFF:

As the staff working in these remote areas are not trained in anaesthesia practice, it is the sole responsibility of the anaesthesiologist to check the Boyle machine, monitoring equipment and all the drugs including emergency drugs.

It is better to take the help of an anesthesia technician and to maintain communication with the O.T complex.

iii) **THE PROCEDURE :**

Setting for the procedure

The sites where these procedures are undertaken are poorly equipped, like for the bum dressing etc.

Patient Position

If patient is kept in prone position, it is better to intubate the patient and proceed with general anaesthesia with IPPV, rather than sedation alone.

It is difficult to resuscitate the patient in prone position — reposition of the patient to supine position should be done immediately.

Duration of the Procedure

Duration is unpredictable. They may end abruptly or may be prolonged. It is better to avoid long acting muscle relaxants.

iv) **PATIENT:**

A careful assessment of the patient before the procedure is essential. It is mandatory to look for the co-morbidities and the drug taken by the patient should be noted. Airway assessment is very essential.

- Patients should be given clear intimations regarding:

(i) The dose of the drugs and the modification of the dose and regarding stoppage of some drugs

(ii) Fasting Status

(iii) Consent Forms

(iv) Metal Check (for hairclips, Jewellery, coins, Credit cards mobile phones etc.,) for M.R.I.

3] **CHOICES OF ANAESTHETIC TECHNIQUE**

- Monitored Anaesthesia care
- Sedation
- Regional Anaesthesia
- TIVA
- General Anaesthesia & Controlled Ventilation.

DRUGS USED FOR SEDATION & DOSAGE

i) MIDAZOLAM : Is preferred to because of its short half life (100 min) and amnesia effect.

Dose and onset of time of midazolam are

oral: 0.5-0.75 mg /kg - (10-30min).

nasal: 0.1-0.3mg /kg (10min). rectal:

0.3 -0.5mg/kg (20 -30mins).

I. V dose: 0.05 -0.1mg/kg.

ICU Sedation: Loading dose 0.1-0.3mg/kg with maintenance dose of 0.03-0.25mg/kg /hr.

ii) LORAZEPAM:

For ICU Sedation: Loading dose 0.03-0.07 mg/kg.

Maintenance dose - 0.03-0.07mg /kg at 4-6 hr intervals.

iii) PROPOFOL - 0.5- 2mg /kg I.V

For TIVA.- Initial bolus : 0.8-1.2mg/kg. (After fentanyl inf.)

Start at: 140-200µg / kg / min.

After 10min :100-140 µg / kg/ min.

After 2hr.: 80-120(µg / kg/ min.

Turn off Propofol infusion about 5-10min prior to the desired time of emergence.

Maintenance of ICU sedation: 50-250 µg /kg/min.

(Beware of propofol infusion syndrome).

iv) KETAMINE :

Excellent Analgesic and sedative.

For Sedation : I.V. - 0.25-0.5mg/kg

orally, rectally - 6-10mg/kg or I.M - 2mg/kg.

Combination of ketamine with propofol (given separately ketofol) is tried.

v) FENTANYL :

Is very useful for short painful procedures.

Doses start from 0.5 to 1/ μg / kg, should be titrated to effect or a maximum of 5 μg / kg.

vi) DEXMEDETOMIDINE:

Promising μ -2 agonist for ICU and perioperative sedation without respiratory depression.

- Supplied in 100 μg /ml -2ml vial to be diluted with 50 ml of Nacl prior to administration.
- For adult patient, it is administered by a loading infusion of 0.5-1 μg / kg over 10min followed by maintenance infusion of 0.2-0.7 μg /kg/hr.
- The effect appears in 5-10min, and is reduced in 30-60min. The maintenance infusion is adjusted to achieve the desired level of sedation.

41 SPECIAL CONSIDERATIONS

A] RADIOLOGY SUITES ;

a) C.T SCAN :

-Needs immobility in patient for 20-40 mts.

-communication problems in children, unconscious, non-cooperative, head injury patients - requires sedation / anesthesia.

May cause :

- airway obstruction -kinking of tube
- apnoea, cyanosis & cardiac arrest.
- causes radiation to anesthetist.
- problems of allergic reactions to contrast dyes.

b) MRI:

Since it is a narrow tunnel it causes :

- difficulty to access the patient.
- claustrophobic effect,
- strong magnetic field,
- absolute immobility for a long time.

Precautions :

i) All equipment that is taken into the MRI suite should be MRI compatible or should be fixed at a safe distance from the magnet.

ii) Oxygen cylinders should not be taken into MRI suite.

iii) Anaesthesiologists should not take any ferrous metal into the MRI suite including Laryngoscopes, stethoscope, mobile phones and monitoring device made of ferrous metal cabin.

iv) Plastic laryngoscope powered by paper Jacketed lithium batteries or fibre-optic light source are used.

v) If any emergency occurs, it is better to take the patient out of the MRI room

c) CYCLOTRON THERAPY:

- Proton beam radiation is used in the treatment of A.V malformations, pituitary tumors & retinoblastomas.
- Radiation is painless but positioning may take several hours.
- Head fixation may be painful.

d) CARDIAC CATH LAB :

- Anaesthesiologist should take measures to minimize radiation exposure.
- Note the usage of anticoagulants and evaluate the coagulation profile before the procedure.
- When using electrocautery , exit pads should be placed in positions that direct current is away from pacing and Automatic Implantable Cardioverter Defibrillator devices (AICDS).

- Majority of the diagnostic procedures are performed under sedation.
- Anaesthetic procedures vary from MAC to G.A with IPPV. In infants and children undergoing procedures such as balloon valvuloplasty, dilatation or stenting of pulmonary arteries, device closure of V.S.D., balloon dilatation of coarctation of Aorta - G.A with IPPV is preferred.

e)GASTROENTEROLOGY :

Common procedures

- ERCP
- Sigmoidoscopy
- Colonoscopy
- TIPSS..etc

Propofol provide excellent conditions for GI endoscopy and ERCP.

Upper GI endoscopy:-

- Patients have number of comorbidities (hepatic dysfunction, coagulopathy, ascites, esophageal varices)
- In 66 to 81 % of patients -no sedation
- Conscious sedation is sufficient.
- For remaining GA ETT/LMA, LA spray ,bite block.

Prone or semi-prone position with head rotated to the side

Care and attention paid to the pressure areas

ERCP

- For diagnosis & treatment of biliary and pancreatic disease
- Endoscope inserted orally
- Discomfort to the patient
- Conscious or deep sedation required
- GA:- 5 to 8% of patients, airway is shared with endoscopist
- Positioning same as GI endoscopy
- Avoid atropine, glycopyrrolate
- Opioids:- morphine and fentanyl cause spasm of sphincter of Oddi

- Patients may have significant comorbidities.
- Antibiotic prophylaxis
- Antispasmodics: Hyosine 0.5mg bolus can be used.

TIPSS :

- Created via catheter inserted via internal jugular vein
- Preoperative considerations:-
 - Airway -risk of aspiration problems related to RS
 - Problems related to CVS
 - Hematological system:- coagulopathy,
 - thrombocytopenia Neurological system: hepatic encephalopathy .

Performed in patients who failed to respond to medical treatment

- Procedure lasts 2 to 3 hrs, causes minimal stimulation
- Performed under sedation or GA
- Significant hepatic dysfunction
- Careful pre op assessment is necessary
- Careful monitoring
- Blood gas & chemistry analysis and blood glucose
- Electrolyte abnormalities
- Urine output monitoring.

Equipment checklist for Anaesthesia in the Radiology Suites :

- a) Anaesthesia Drugs
- b) Resuscitation Drugs
- c) Defibrillator
- d) A difficult airway trolley containing oropharyngeal and Nasal airways, LMAs (LMAs re-inforced with Plastic spirals), ETT of different sizes, bougies and stiletos, should be available.

- e) Infusion pumps with the extension tubing
- f) Warming Devices
- g) Lead aprons, thyroid collars and dosimeters need to be worn in the radiology suites to reduce and monitor the exposure to radiation.

B] INECT :

1) The principle of Anaesthesia for ECT is to provide ultra brief light general anaesthesia with moderate degree of muscular relaxation.

2) Pre-procedural evaluation should include the detailed inquiry about the psychotropic medications, taken by the patient.

Tricyclic Antidepressants (TCA) - hypertension and dysrhythmia during ECT.

MAO inhibitors - hypertension.

Lithium - prolong benzodiazepines, barbiturates and muscle relaxants effects, also increases the post ECT Cognitive side effects and delirium.

3) Methohexital has been considered to be most ideal anaesthetic agent for ECT because of its ability to decrease seizure threshold. But etomidate provides longer window of seizure activity than methohexital and Propofol.

4) Muscle relaxation is essential and succinylcholine is the agent of choice. Tracheal intubation is usually not required unless there is H/o G.E reflux or hiatus hernia. But ventilation must be supported during the procedure.

Absolute contraindications for ECT are

- i) Raised ICT
- ii) Pheochromocytoma.
- iii) Recent MI < 3 months.
- iv) Severe angina, CHF.
- v) Aneurysm of major vessels.
- vi) Severe Respiratory failure.

Relative contraindications for ECT are

- i) Pregnancy.
- ii) Cardiac Dysrhythmia.
- iii) Thyrotoxicosis.
- iv) Glaucoma.
- v) Retinal Detachment.

C] IN EXTRA CORPOREAL SHOCK WAVE LITHOTRIPSY (ESWL):

- Mild sedation to deep sedation is usually sufficient.
- Pre-existing pulmonary and cardiac problem are taken care of.
- In patients with cardiac dysrhythmia undergoing ESWL, the shock wave is discharged by the R wave in the cardiac cycle, thus preventing possible tachyarrhythmias.

5] POST SEDATION DISCHARGE CRITERIA :

- Cardiovascular function and airway patency are satisfactory and stable.
- Patient is easily aroused and protective reflexes are intact.
- Patient can talk (if age appropriate).
- Patient can sit up unaided (if age appropriate).
- Very young or handicapped children - the pre-sedation level of responsiveness should be achieved.
- The state of hydration is adequate.

6] CONCLUSION :

Flexibility of anesthesia coverage for outside OT procedures may be enhanced if these procedures are scheduled properly rather than arranged on a “last minute” basis.

While the operation theatre have experienced staff, adequate equipment, monitors, providing anaesthesia outside the O.T. complex is challenging and requires expertise, skill and patience.

Ultimately the outcome of anesthesia for remote location depends exclusively on skilled anesthesiologist with appropriate equipment and drugs along with back-up facilities.

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