Anesthesia at Remote Locations

Index

- Monitoring
- Facilities and equipment : ASA guidelines
- Personnel and staffing
- Medications
- Recovery care
- Remote locations:

I. Radiology suite
II. MRI
III. Interventional neuroradiology
IV. Interventional cardiology
V. ECT
VI. Therapeutic radiation
VII. Miscellaneous

Monitoring

- Oxygenation, ventilation, circulation, and temperature should be continually evaluated.
- Oxygen concentrations of inspired gas: low-concentration alarm
- Blood oxygenation : pulse oximetry.
- Ventilation : observation of the patient and end-tidal carbon dioxide.
- Circulation : ECG, arterial blood pressure (5 minutes)
- Temperature

ASA GUIDELINES, NORA

- A reliable oxygen source with backup
- A suction source
- Waste gas scavenging
- Adequate monitoring equipment to meet the standards for basic anesthetic monitoring and A self-inflating hand resuscitator bag
- Sufficient safe electrical outlets
- Adequate patient and anesthesia machine illumination with battery-powered backup
- Sufficient space for the anesthesia 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

EQUIPMENTS CHECK: “SOAPME”

S (suction) – Appropriate size suction catheters and functioning suction apparatus.

O (oxygen) – Reliable oxygen sources with a functioning flowmeter.

A (airway) – Size appropriate airway equipments

P (pharmacy) – Basic drugs needed for life support during emergency

M (monitors)

E (Equipments)

Personnel and staffing

- Open communication between care teams .
- The ASA has published "**Practice Guidelines for Sedation and Anesthesia by Non-Anesthesiologists**.

  - Patients evaluation before the procedure by qualified personnel, coexisting medical conditions, fasting status, informed consent.
  - Standard monitoring practice: level of consciousness, ventilation, oxygenation, and hemodynamics .
  - Designated personnel: for monitoring and maintenance of sedation and analgesia.
  - BLS trained personnel should be present
  - Supplemental oxygen ,emergency equipments, drugs, defibrillator
  - Adequate recovery care should be provided.

Medications

- Anaesthesia techniques in remote locations:
  - Minimal, moderate and deep sedation/ analgesia
  - General anaesthesia

- **Minimal sedation/analgesia**: level of anaesthesia at which patients are able to tolerate unpleasant procedures through relief of anxiety, discomfort, or pain.

- **Moderate sedation/analgesia:** patient retains purposeful responses to stimulation, requires no airway intervention, and can maintain adequate ventilation and cardiovascular function.

- **Deeper levels of sedation/general anesthesia:** requires the presence of adequately trained anesthesia personnel

Medications

- Combinations of sedative and analgesic medications, such as benzodiazepines and opioids, provide effective moderate sedation
- Doses should be carefully titrated
- Intravenous access maintained throughout the procedure.
- When oral agents are used (e.g., benzodiazepines, chloral hydrate), adequate time must be given to allow complete drug uptake before supplementation can be considered.
- Propofol, ketamine, thiopentone can also be used
- Antagonists should be available: Naloxone and flumazenil

Recovery care

- The patient must be medically stable before transport.
- Must be accompanied to the recovery area by the individual providing the anesthesia or sedation/analgesia care.
- Provision of oxygen delivery and monitoring while the patient is on the transport cart may be required.
- Appropriate recovery facilities and staff must be provided.
- In the recovery area, the patient's condition must be documented and continually assessed.
- Immediate availability of personnel trained in advanced cardiac life support should be ensured.

REMOTE LOCATIONS

Radiology suites

- Procedures:
  - Percutaneous : drain , nephrostomy tubes, feeding tubes, intravascular access catheters
  - Thrombolysis, dilation of stenotic vessels
  - Embolization of tumors or arteriovenous malformations (AVMs)
  - Tissue biopsy specimens
  - Painful metastases may be treated by guided radiofrequency (RF) ablation.
  - Cerebrovascular lesions may be treated endovascularly with guidance by digital subtraction angiography.

Anaesthesia technique

- Minimal to moderate sedation/analgesia is the technique used for most patients undergoing these procedures.
- The patient's condition, the anticipated level of stimulation, and patient position during the procedure are all important considerations
- Procedures that might be anticipated to last several hours may best be performed with general anesthesia
- **Regional anaesthesia can also be given**

Considerations in pediatric patients

- Sedation/analgesia: **chloral hydrate** orally for radiologic procedures (25 to 50 mg/kg for infants younger than 4 months, 50 mg/kg for older children)
- Patient characteristics necessitating anesthesiologist referral :
  - history of apnea, age younger than 1 month
  - respiratory compromise,
  - Pierre Robin syndrome, Apert's or Crouzon's syndrome,
  - severe gastroesophageal reflux,
  - poor oral muscle development,
  - sedative/analgesic allergy,
  - new-onset illness,
  - a history of cardiac disease,
  - mitochondrial or metabolic disease

Computed Tomography

- CT is commonly used for diagnostic and invasive therapeutic:.
- Contrast media is used to enhance the quality of image.
- Radiation safety:
  - Dorsimeters should be worn
  - Lead apron and thyroid shields
  - Movable leaded glass screens
  - Video monitoring
  - Remote mirroring of monitor data

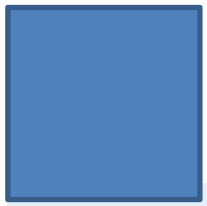
  In the United States, the maximal permissible radiation dose for occupationally exposed persons is 50 millisieverts (mSv) annually, a lifetime cumulative dose of 10 mSv × age, and monthly exposure of 0.5 mSv for pregnant women.

Contrast media

- Soluble contrast media use I-53 to absorb X rays
- Older ionized contrast media: hyperosmolar and relatively toxic.
- Nonionized contrast media :low osmolality, improved side effect profiles
- Adverse reactions to contrast media
  - mild to immediately life threatening,
  - direct toxicity,
  - idiosyncratic reactions,
  - allergic reactions, either anaphylactic or anaphylactoid

Reactions to iodinated contrast media

- **Predisposing factors** :history of bronchospasm, history of allergy, underlying cardiac disease, hypovolemia, hematologic disease, renal dysfunction, extremes of age, anxiety, and medications such as β-blockers, aspirin, and nonsteroidal anti-inflammatory drugs.
- Treatment is symptomatic
- Corticosteroids and antihistamines are given to symptomatic patients under the assumption that the cause is immunologic.
- Patients who have had previous reactions to contrast media may benefit from pretreatment with **prednisolone, 50 mg 12 and 2 hours before a procedure requiring contrast media, and diphenhydramine, 50 mg** immediately before the procedure.



-- Reactions to Iodinated Contrast Media

Mild	Severe	Life Threatening
Nausea, retching	Vomiting	Glottic edema/bronchospasm
Perception of warmth	Rigors	Pulmonary edema
Headache	Feeling faint	Life-threatening arrhythmias
Itchy rash	Chest pain	Cardiac arrest
Mild urticaria	Severe urticaria	Seizures/unconsciousness
	Bronchospasm, dyspnea	
	Chest pain	
	Abdominal pain/diarrhea	
	Arrhythmias	
	Renal failure	

MRI

Principle:

- Atomic nuclei with an odd number of protons or neutrons have the potential to act as magnetic dipoles.
- This property is possessed by all paramagnetic elements (^{1}H, ^{13}C, ^{19}F, ^{23}Na, and ^{31}P).
- Biologic tissues have a high water content. Thus, ^{1}H is present in high concentrations, and its detection is the basis of MRI.
- The magnetic field strength used in MRI scanners is measured in tesla units.
- One tesla (T) equals 10,000 gauss, with the strength of the earth's magnetic field at its surface being between 0.5 and 1.0 gauss.
- **Field strengths used in most clinical MRI examinations vary from 0.05 to 2.0 T, use of 3-T units is increasing**

Limitations and Hazards of MRI

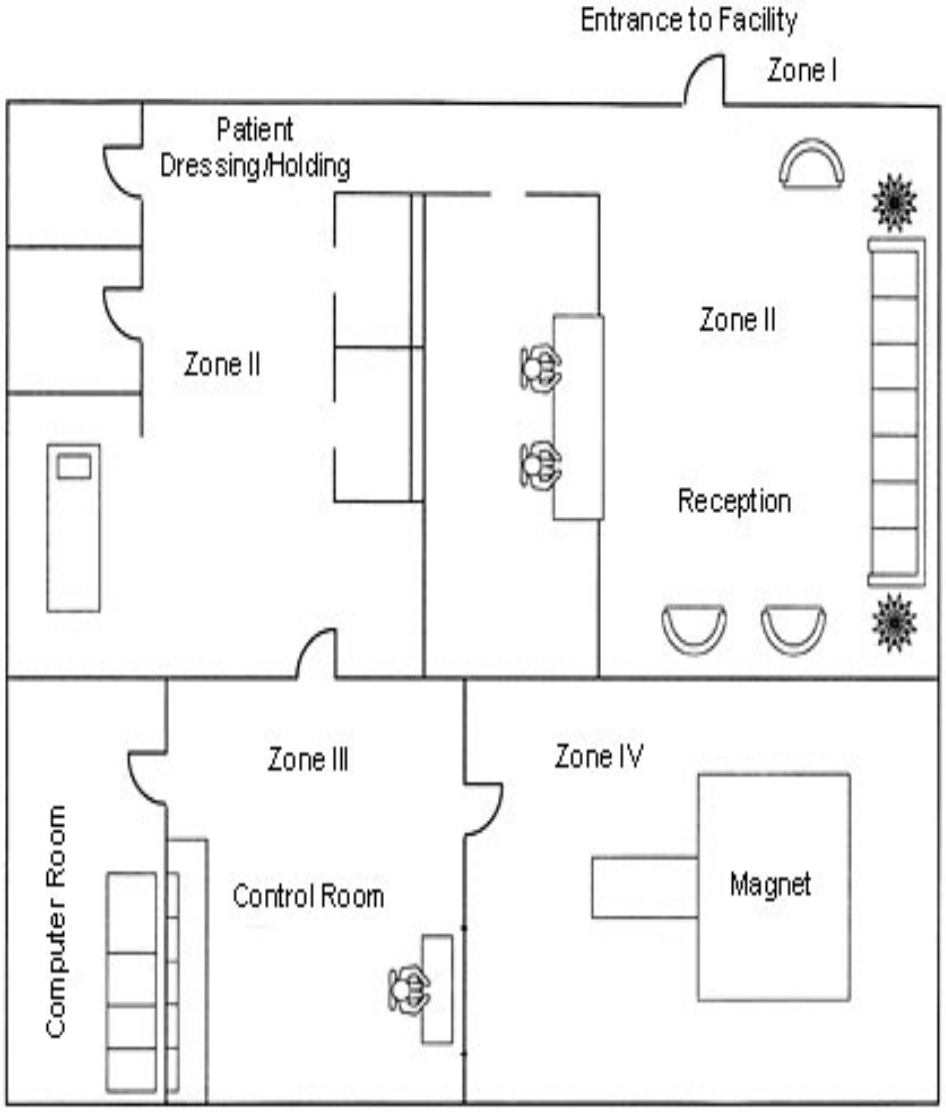
- Time consuming,
- Any patient movement, even that resulting from physiologic motion (e.g., cardiac and vascular flow pulsations, cerebrospinal fluid flow and pulsation, respiratory excursion, and peristalsis in the gastrointestinal tract), can produce artifacts on the image.
- To optimize information when imaging the cardiovascular system, the signal acquisition is synchronized or "**gated**" with phases of the cardiac cycle (R wave of ECG) to virtually freeze cardiac motion.
- The magnet generating the large static magnetic field has a small-diameter hollow bore, typically 50 to 65 cm in diameter.
- Switching the RF generators on and off produces loud noises **(>90 dB).**
- **Antenna effect**

Limitations and Hazards of MRI

- Dislodgement and malfunction of implanted biological devices:
  - vascular clips and shunts,
  - wire spiral endotracheal tubes,
  - pacemakers,
  - automatic implantable cardioverter-defibrillators (ICDs),
  - mechanical heart valves,
  - implanted biologic pumps.

- Tattoo ink (high concentrations of iron oxide): may cause burns
- Intraoccular ferromagnetic foreign body migration.
- Rapid movement of ferromagnetic objects: Scissors, pens, keys ATM cards, mobiles, cyllinders

Recommended 4-Zone MRI Suite Design Recommended by the American College of Radiology



Reprinted with permission from American College of Radiology (ACR). ACR White Paper on Magnetic Resonance (MR) Safety Combined Papers of 2002 and 2004. Available at: http://www.acr.org/SecondaryMainMenuCategories/quality_safety/guidelines/WhitePaperonMRSafetyCombinedPapersof2002and2004Doc11.aspx. Accessed June 30, 2008.[4]

Zones of MRI

- **Zone One** consists of all areas freely accessible to the general public
- **Zone Two** acts as a buffer between Zone One and the more restrictive Zone Three. Here, patients are under the general supervision of MR personnel
- **Zone Three** should be restricted by a physical barrier. Only approved MR personnel and patients that have undergone a medical questionnaire and interview are allowed inside Zone Three. The MR control room and/or computer room are located within Zone Three
- **Zone Four** is strictly the area within the walls of the MR scanner room, sometimes called the magnet room. Access into the MR scanner room should only be available by passing through Zone Three

Anaesthetic concerns

1. Limited patient access and visibility
2. Absolute need to exclude ferromagnetic components
3. Interference/malfunction of monitoring equipment
4. Potential degradation of the imaging caused by the stray RF currents from monitoring equipment and leads
5. The necessity to not move the anesthetic and monitoring equipment when the examination has started to prevent degradation of magnetic field homogeneity
6. Limited access to the MRI suite for emergency personnel in accordance with recommended policies

Anaesthetic monitoring concerns

1 **Electrocardiography**: Voltage induced by blood flow in the aorta when the patient is in a static magnetic field produces T- and ST-wave abnormalities

2. **Pulse oximetry:** The "antenna effect" in conventional pulse oximetry wires results in thermal injury.

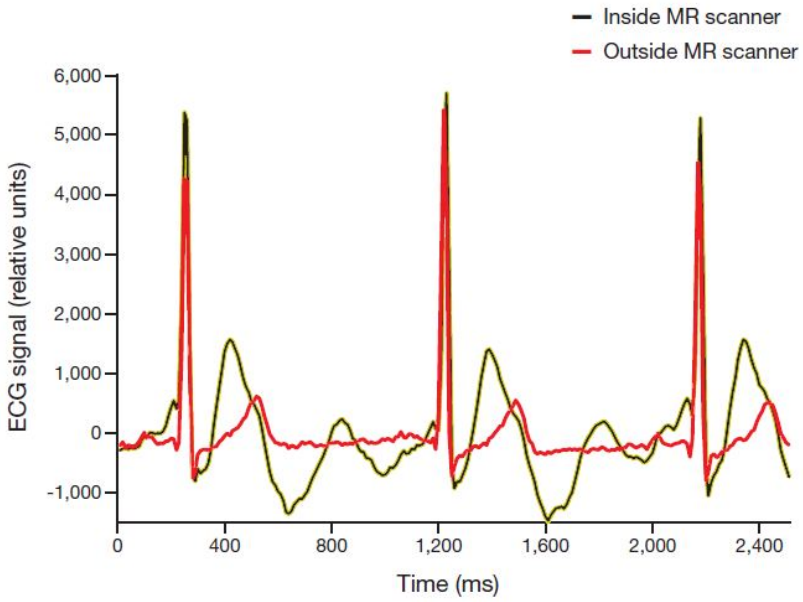
3. **Noninvasive blood pressure monitoring**: connections of the blood pressure cuff and hoses should be plastic.

4. **Precordial and esophageal stethoscopes**: interference by the noise of the scanner during operation.

5. **Capnography**: length of the sample tube: delay in signal transduction.

6. **Temperature:** temperature probes with RF filters to be used

ECG wave in MRI



Other anaesthesia concerns

- Several manufacturers make MRI-compatible anesthetic machines.
- Deep sedation/analgesia is not advisable. Patients requiring more than moderate sedation/analgesia :administer GA with airway control by ET or LMA (MRI compatible).
- Lithium batteries
- Plastic laryngoscopes
- Emergency situations in the MRI scan room itself should be treated with BLS techniques while the patient is rapidly moved out of the scanner vicinity for definitive treatment.

ANESTHESIA FOR INTERVENTIONAL NEURORADIOLOGY

Commonly performed procedures:

- Embolization of cerebral and dural AVM's
- Coiling of cerebral aneurysms
- Angioplasty of atherosclerotic lesions
- Thrombolysis of acute thromboembolic stroke.

General considerations

- Procedures requires:
  - deliberate hypotension /hypertension
  - deliberate hypercapnia
  - deliberate cerebral ischemia

- Rapid transition between deep sedation and an awake responsive state

- High resolution fluoroscopy + DSA- real time images: high exposure of radiation

- Contrast media used

Anesthetic management

- Airway examination must: intraop. manipulation not possible
- History of contrast media reaction
- Evaluation of hypertension: deliberate hypo/hypertension required
- Patient completely immobile during procedure YET awake for neurologic testing
- Urinary catheters: contrast /osmotic diuretic used frequently
- Coagulation profile check: heparin commonly used (ACT 2-2.5 baseline)
- Smooth emergence essential: avoid coughing/bucking

Anesthetic management

- General anesthesia and conscious sedation are both suitable techniques for interventional neuroradiology depending on
  - the complexity of the procedure,
  - the need for blood pressure manipulation,
  - and the need for intraprocedural assessment of neurologic function
- Propofol infusions or combinations of a benzodiazepine and opioid are frequently used.

Interventional cardiology

- Coronary angiography
- Percutaneous cardiac interventions
  - Cardiac catheterization
  - Coronary artery angioplasty/ stenting
  - Valvotomy
  - Endovascular closure of intracardiac defects,cardiac valve replacement
- Electrophysiologic studies with pathway ablation
- Cardioversion

Coronary angiography

- Catheter has been inserted through the femoral artery, brachial, radial, or ulnar arteries.
- Supplemental oxygen is administered, typically by nasal cannula,
- Standard ASA monitors are used.
- Arterial blood pressure can be directly transduced from the arterial introducer
- The usual anesthesia management is by sedation/analgesia, with general anesthesia reserved for failure of sedation
- Anesthetic agents used commonly include **fentanyl** and **midazolam**, sometimes supplemented with **propofol** or **dexmedetomidine.**

Coronary angiography

- Heparin is frequently administered, even for diagnostic catheterization, and the effects are often reversed with protamine.
- Typical heparin doses range from 2500 to 5000 IU intravenously.
  - For interventional procedures, higher heparin doses (i.e., 10,000 IU intravenously) are given, with a target ACT of greater than 300 seconds.
- After **protamine** administration :anaphylactic and anaphylactoid reactions
- **Platelet aggregation inhibitors and LMWH**
- **Provocative agents**: ***ergonovine maleate***, ***methylergonovine maleate, or intracoronary acetylcholine :*** may be given to provoke spasm while contrast medium is injected into the coronary artery.
- **Intracoronary vasodilators such as nitroglycerin** may be required when provocative agents are administered.
- **Intracoronary diltiazem** may be used to treat resistant vasospasm.

PTCA (Percutaneous trans luminal coronary angioplasty)

- During ischemia and frequently during reperfusion after dilation of the stenotic coronary artery, ventricular arrhythmias may develop and require treatment.
- Hemodynamically significant PVC s and nonsustained VT should be initially treated with **amiodarone/ cardioversion**
- Rupture of the coronary artery may result in hemopericardium and pericardial tamponade : emergency pericardiocentesis,
- Vascular spasm may often be relieved by the **injection of 200 µg of nitroglycerin** through the coronary artery.
- When a thrombus has formed**, intracoronary injection of thrombolytic agents, such as urokinase, m**ay dissolve the thrombus.

PTCA (Percutaneous trans luminal coronary angioplasty)

- These patients may require relatively **massive autologous platelet transfusions** should emergency cardiac surgery be necessary
- Acute coronary occlusion may not respond to transluminal treatment in the catheterization laboratory and may require emergency coronary artery bypass grafting (CABG).
- The patient may have angina, **hypotension, and arrhythmias and may benefit from the insertion of an intra-aortic balloon pump.**
- Anesthesiologists must be aware of the **current protocols for pharmacologic regulation of hemostasis and intimal proliferation** for the various procedures performed at their institution because they are evolving constantly.
- Developments in perfusion technology have increased the portability of **temporary ventricular assist devices** to maintain hemodynamic stability during procedures
- **Transesophageal echocardiography** is also used for ventricular monitoring, as well as cannula placement.

Intracoronary radiation therapy (Coronary brachytherapy):

- To prevent neointimal proliferation by breaking DNA strands and hence mitosis
- Concerns of radiation safety important
- Anaesthetic concerns:
  - concerns of radiation safety during deployment of the radiation probe,
  - personnel may be required to leave the intracoronary radiation room.
  - Provision for remote monitoring needs to be ensured.

Pediatric Cardiac Catheterization

- General concerns:
  - Cardiac anomalies vary from relatively simple atrial septal defects to complex congenital cardiac anomalies
  - Shunts may be present at multiple levels, and patients may be profoundly cyanotic
  - Patients may also have coexisting noncardiac congenital abnormalities
  - young patients may be uncooperative

Pediatric Cardiac Catheterization

- **Anaesthetic concerns:**
  - "Steady state" must be maintained for diagnostic accuracy
  - Even in cyanotic patients, supplemental oxygen is **not** administered unless oxygen saturation falls below baseline levels
  - **Care must be taken to maintain ventilation and PaCO_2 within normal physiologic limits to avoid alterations in PVR**
  - Medications : fentanyl, midazolam, propofol, and ketamine. ***Premedication with midazolam, 0.5 mg/kg orally***
  - Infants and small children : GA preffered
  - If intravenous access is not present: induction with inhaled nitrous oxide, oxygen, and a volatile anesthetic such as sevoflurane is performed

- Anesthesia is maintained with volatile anesthetics and controlled ventilation with room air
- Controlled ventilation avoids the increases in $PaCO_2$
- Close monitoring
  - Repeated ABGs
  - Hypocalcemia and hypoglycemia
  - Hypothermia (Rectal temperature monitoring)
  - Hematocrit monitoring
- Chronic cyanotics(Polycythemia) ; sufficient fluid should be given to balance osmotic effects of contrast media{ avoid microembolic events and hemoconcentration}

Complications of cardiac catheterization

- Bleeding at vascular access sites,
- Perforation of cardiac chambers or great vessels by catheters
- Vascular dissection or hematoma
- Embolic phenomena
- Arrhythmias
- Second- or third-degree heart block
- Sinus bradycardia
- Pericardial tamponade

Other Interventions During Cardiac Catheterization

- Balloon atrial septostomy: requiring communication between the pulmonary and systemic circulations
- Balloon-tipped catheters have been used to dilate stenotic heart valves and great vessels
- Balloon valvuloplasty
- Septal ablation for hypertrophic cardiomyopathy
- Repair or replacement of defective heart valves
- Septal ablation
- Electrophysiological studies
  - Placement of special multipolar catheters within cardiac chambers to define the mechanism, origin, and pathways of arrhythmias
  - ***Antiarrhythmic drugs are stopped before these studies*** and are avoided during the procedure :prevent detection of the accessory conducting pathways and arrhythmogenic foci.

Pacemaker and Cardioverter-Defibrillator Implantation

- GA is necessary during testing of the ICD
- When the ICD is tested, ventricular tachycardia or fibrillation is induced, and the ability of the device to sense the arrhythmia and deliver appropriate cardioversion-defibrillation energy is confirmed.
- Return of hemodynamic variables to baseline after cardioversion-defibrillation must be closely monitored: poor ventricular functions

- **Complications (during removal of infected /malfunctioning ICD)**
  - Rupture of the superior vena cava, right atrium, or right ventricle
  - Severe TR may result from removal of right ventricular leads adherent to the valvular or subvalvular apparatus
  - Leads in place for longer than 1 year may have extensive fibrosis, which may make removal difficult.
  - Vascular occlusion.

Elective cardioversion

- Elective cardioversion is uncomfortable, and general anesthesia is required
- In the case of chronic atrial fibrillation, echocardiography is performed before cardioversion to rule out the presence of left atrial thrombi, which could cause stroke
- Standard anaesthesia technique and monitoring

Electroconvulsive therapy (ECT)

- Indications
  - Major depression
  - Mania
  - Certain forms of schizophrenia
  - Parkinson's syndrome
- Contraindications
  - Pheochromocytoma
  - Increased ICP
  - Recent CVA
  - Cardiovascular conduction defects
  - High risk pregnancy
  - Aortic and cerebral aneurysms

Electroconvulsive therapy (ECT)

- **Principle:**
  - ECT consists of programmed electrical stimulation of the central nervous system to initiate seizure activity.
  - The seizure is monitored by observation of the patient and by an electroencephalogram on the ECT machine.

- Periods: 6 to 12 treatments over 2 to 4 weeks

- **Physiologic effects:**
  - Increases in cerebral blood flow and intracranial pressure.
  - Initial parasympathetic discharge manifested by bradycardia, occasional asystole, premature atrial and ventricular contractions.
  - Hypotension and salivation may be noted.
  - Followed by sympathetic discharge associated with tachycardia, hypertension, PVCs, and rarely, ventricular tachycardia.
  - ECG changes, including ST-segment depression and T-wave inversion (Self limited)

General considerations of ECT

- **Antidepressants:**
  - TCA (block reuptake of catecholamines)-anticholinergic, antihistaminic, sedative, slow cardiac conduction
  - MAOI (blocks metabolism of catecholamines)-hypertensive crises,inhibit hepatic microsomal enzymes
  - Lithium-prolongs NMB , bzd, barbiturates duration;cognitive effects post ECT (discontinue pre ECT)
  - Newer antidepressents (trazadone, bupripion, fluxetine): less side effects; preferred

Anesthetic Management of ECT

- **Pre operative evaluation**: CNS/ CVS evaluation, Osteoporosis

- **Anticholinergic pretreatment-** glycopyrrolate/atropine: To prevent transient asystole, bradycardia, antisialogogue

- Induction : Intravenous anaesthetics
  - **Methohexital** (.75-1 mg/kg)**---Gold standard**
  - Propofol,etomidate, thiopental, Bzd, ketamine not usually a choice
- Volatile anesthetics- **Sevoflurane** agent of choice in children specially
- Opoids- **Remifentanil**
- Neuromuscular blockers:
  - **Sch** 0.5 mg/kg, (DOC)
  - **Mivacurium** :alternative to Sch, but not be as effective as Sch in preventing tonic-clonic muscle contractions
  - Atracurium/cisatracurium: pseudocholinesterase deficiency.
- **Esmolol and labetalol** have been successfully used to control hypertension and tachycardia after ECT: routinely not recommended because the hypertension and tachycardia are usually self-limited

Therapeutic Radiation

- Intraoperative Radiation Therapy:
  - IORT is the delivery of radiation during exposure of a tumor or tumor bed during an operative procedure
  - Brachytherapy with temporary or permanent implantation of radioactive seeds
  - IORT can be effectively used as a supplemental boost to external beam treatments
  - **Advantage:** increase the tumor dose with less damage to adjacent healthy tissues and more accurate localization of the radiation field.
  - **Disadvantages** :an operation is needed, optimal dose combinations of external beam radiation and IORT are complex to calculate
  - **Complications** : pain, nausea and vomiting, bowel dysfunction, ureteral obstruction, neuropathy, abscesses, and delayed wound healing

Therapeutic Radiation

- Tumors treated with IORT have included locally advanced colorectal cancer, retroperitoneal sarcomas, limb sarcomas, gynecologic malignancies, and pediatric malignancies

- GA with endotracheal intubation required

External Beam Radiotherapy for Cancer in Children

- The goals of anesthesia for pediatric radiotherapy
  - Assurance of immobility
  - Rapid onset
  - Brief duration of action
  - Not painful to administer
  - Prompt recovery
  - Minimal interference with eating or drinking and playing
  - Avoidance of tolerance to the anesthetic agents
  - Maintenance of a patent airway in a variety of body positions

Stereotactic Radiosurgery

- Stereotactic radiosurgery is the delivery of a large radiation dose to ablate tissue localized stereotactically.
- The procedure consists of the initial placement of a stereotactic head frame, usually under local anesthesia, followed by neuroradiologic (MRI/ CT Angio)
- This technique has been used to treat AVMs, dural arteriovenous fistulas, pituitary adenomas, acoustic neuromas, trigeminal neuralgia, and malignant tumors
- Only mild sedation/analgesia for the procedure.
- Because absolute head immobility is necessary, uncooperative adults, those with movement disorders, and pediatric patients may require general anesthesia

Miscellaneous

- GI Procedures
- Dental Procedures
- Urological procedures

GI PROCEDURES

ENDOSCOPY-

- - endoscope is passed into the GI tract
- - evaluates mucosa of the esophagus, stomach &
- duodenum
- - dilation of strictured areas.

COLONOSCOPY-

- -scope is inserted into the rectum
- - evaluate the colon

ERCP(Endoscopic retrograde cholangiopancreatography)

- – Diagnosis of obstructive, neoplastic, or inflammatory pancreatobillary structures.

Anesthesia for GI Procedures

- Pre anesthetic assessment

- Type of anesthesia:
  - Moderate sedation- Midazolam and Fentanyl
  - Deep sedation- Addition of propofol
  - Some cases required general anesthesia

- Anesthetic considerations:
  - Strong vagal nerve stimulation as result of stimulation to colon
  - Most patients tolerate these procedures well

Dental Procedures

- Pediatric Dentistry- fillings, crowns, pulpotomies, tooth extractions and space maintainers
- Oral and Maxillofacial Surgery- extractions of impacted teeth, insertion of dental implants, treatment of infections of the head and neck and facial cosmetics
- Peridontics- surgery of teeth, gingiva, connective tissue, periodontal ligament and alveolar bone

  - Anesthesia : general anesthesia, minimal sedation,moderate sedation with local anesthetic for particular areas of surgery

Urological procedures

- Extracorporeal Shock Wave Lithotripsy-
  - kidney and ureteral stones

- Cystoscopy/ ureteroscopy-
  - diagnosis and treat lesions of the lower (urethra, prostate, bladder) and upper (ureter, kidney) urinary tracts

Anesthesia Technique

Depending on the pt and procedure anesthesia

- Topical lubrication
- MAC
- Regional

Regional Anaesthesia

- T-6 level - upper tract instrumentation
- T-10 level - lower-tract surgery

Clinical pearls

- Standards of anesthesia care and patient monitoring do not vary with the anesthetizing location.
- Open communication between anesthesiologists and physicians working.
- Anesthesiologists should be knowledgeable regarding radiation safety and take adequate precautions to ensure their own safety.
- The iodinated contrast media used in the radiology and neuroradiology suites, as well as the cardiac catheterization laboratory, may cause significant adverse reactions
- The unique nature of the magnetic resonance imaging suite with its powerful magnetic fields mandates special care

- Provision of quality anesthetic management in the cardiac catheterization laboratory requires an understanding of the patient's underlying condition and the procedure to be performed.
- Electroconvulsive therapy has profound physiologic effects that must be understood and dealt with by anesthesiologists providing care to patients undergoing such therapy.
- Provision of anesthesia services in areas where therapeutic radiation is used requires further understanding of radiation to allow remote monitoring of patients under general anesthesia.
- Preoperative and postoperative management of pulmonary problems in elderly patients is of particular importance in the prevention of morbidity and mortality.

Thank you