

Manual of Anaesthesia

Arun K Paul



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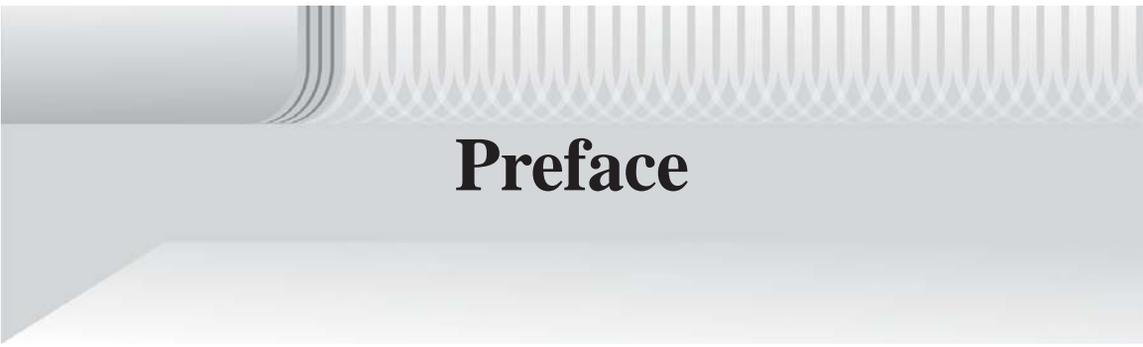
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To
my wife, Kanyakumari
and
daughter, Sushmita
for the love, support and encouragement



Preface

The *Manual of Anaesthesia* is intended to provide a convenient, concise, readable and rapid source of information relevant to anaesthesiology. The book uses a point-wise format for easy reading and better understanding of the text.

The subject matter is discussed in some details and made interesting as well as practicable to grasp the fundamentals of clinical anaesthesia. On the whole, the text will serve as primer and the students, trainee and practitioners will find it suitable.

I wish to thank Mrs Kanyakumari Paul and Sushmita Paul for their cooperation and support in the preparation of this book.

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Arun Kumar Paul

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CHAPTER

1

Preanaesthetic Evaluation

OBJECTIVES

1. History and physical examination of the patient
2. To review medical records including past anaesthetic records
3. To get laboratory studies
4. To determine physical status and anticipate difficulties
5. For planning of anaesthesia management
6. To ensure obtaining consent
7. To develop anaesthetist-patient rapport
8. To make advanced preparation relating facilities, equipment and expertise, to enhance patient safety and minimise the chance of errors.

HISTORY

1. Patient's medications: Aspirin, insulin, antihypertensives, MAO inhibitors, lithium, anticoagulants, etc.
2. Any allergy
3. Past hospitalisation, any anaesthesia/operation
4. Family history
5. Any addiction: Smoking, alcohol, drugs
6. Any associated illness: Metabolic, endocrinal, renal, hepatic, cardiac, pulmonary disease, sexually transmitted disease, hepatitis, HIV
7. Menstrual history in case of females.

ASSOCIATED ILLNESS NEEDING FURTHER INVESTIGATIONS

- a. Central nervous system: Cerebrovascular insufficiency, convulsion.
- b. Cardiovascular system: Chest pain, myocardial infarction, hypertension, rheumatic fever, palpitations, dysrhythmias.
- c. Respiratory system: Dyspnoea, cough, bronchospasm, pneumonia, smoking, upper respiratory infection.

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- d. Liver: Alcoholism, hepatitis, jaundice
- e. Kidney: Polyuria, pyuria
- f. Endocrine system: Diabetes mellitus, adrenal dysfunction, thyroid dysfunction.
- g. Miscellaneous: Allergy, bleeding tendency, myalgia, arthritis, osteoporosis, strabismus, etc.

COMMON MEDICATIONS AND ANAESTHETIC IMPLICATIONS

1. Aspirin: Bleeding tendency, platelet dysfunction
2. Alcohol abuse: Resistance to anaesthetic drugs
3. Antibiotics: Potentiation of muscle relaxants
4. Antihypertensives: Impaired sympathetic nervous system activity, hypertensive crisis
5. Beta blockers: Bradycardia, bronchospasm
6. Benzodiazepines: Potentiation of muscle relaxants, resistance to anaesthetic drugs
7. Calcium channel blockers: Interaction with muscle relaxants, hypotension
8. MAO inhibitors: Increased response to sympathomimetic drugs
9. Lithium: Potentiation of muscle relaxants, impaired thyroid function
10. Digitalis: Dysrhythmias
11. Diuretics: Hypotension, hypovolaemia, hypokalaemia
12. Anticoagulant therapy: Excessive bleeding.

PHYSICAL EXAMINATION

1. **Vital signs:** Pulse, respiration, blood pressure, body temperature
2. **General:** Weight, weakness
3. **Airway examination:**
Cervical spine: head mobility, Mobility of temporomandibular joint, Teeth : Central incisor prominency, Artificial teeth, if any, loose teeth, Attempt of visualise uvula, any lesion in mouth, hyromental distance (Normal more than 6.5 cm)
Nose and throat: Sore throat, sinusitis, epistaxis, deviated nasal septum, dysphagia, sunken cheeks, patency of nares opening of mouth. Appearance of neck (long or short).
4. **Respiratory:** Breathing rate and pattern, any moist sound, wheezing, cough, sputum, emphysema, pneumonia, tuberculosis, bronchitis.
5. **Cardiac:** Heart rate, rhythm, murmur, blood pressure, pulse, peripheral oedema, dyspnoea, orthopnoea, veins, heart failure.
6. **Central nervous system:** Level of consciousness, numbness, paralysis, skeletal muscle dysfunction, convulsion.
7. **Gastrointestinal system:** Nausea/vomiting, constipation, diarrhoea, jaundice, hepatitis.
8. **Haematologic:** Bruising, anaemia, bleeding.
9. **Endocrine system:** Diabetes, thyroid dysfunction.
10. **Urinary system:** Nocturia, dysuria, haematuria, incontinence.
11. **Prosthesis, if any:** Eye glasses, contact lens, hearing aid, ornaments, ring

12. **Miscellaneous:** Examination of eye; examination of ear, extremities: Claudication, thrombophlebitis, arthritis; skin examination: rashes, wounds, infection; psychiatric problems, anxiety.
- **Breath holding test:** It is the time to hold his breath after full inspiration. Normal more than 25 seconds. Less than 15 seconds indicates severely diminished cardiorespiratory reserve.
 - **Match test:** Patient is asked to blow off the lighted match stick with his open mouth at a distance 15 cm. Failure indicates low maximum breathing capacity.

PREOPERATIVE DIAGNOSTIC INVESTIGATIONS

1. Blood examination
TC, DC, haemoglobin, haematocrit
2. Blood biochemistry
Glucose, urea, nitrogen, creatinine, electrolytes, liver enzymes
3. Urine analysis
4. Coagulation studies
Prothrombin time, platelet count, partial thromboplastin time
5. Chest X-ray
6. Electrocardiogram
7. Pulmonary function tests
FEV₁, vital capacity, peak expiratory flow rate
Arterial blood gas study, pH
[Normal Values :
Vital capacity 5 lits.
FEV₁ 4 lits.
PEFR 600 lits/min.
PaO₂ 75 to 100 mm Hg.
PaCO₂ 36 to 46 mm Hg.]

ASA PHYSICAL STATUS INDEX

Grade 1: Normal healthy patient

Grade 2: Patient with mild/moderate systemic disease

Grade 3: Patient with severe systemic disease that causes functional limitation

Grade 4: Patient with incapacitating systemic disease that causes a constant threat to life

Grade 5: Moribund patient not expected to survive 24 hours without operation

Emergency Operation E: Any patient in whom emergency operation is required. Here the suffix E is added.

FACTORS FOR SELECTION OF ANAESTHETIC TECHNIQUE

1. Safety of the patient
2. Coexisting systemic disorders
3. Site of operation
4. Elective or emergency procedure
5. Age of the patient
6. Preference of the patient, if any
7. Ability of the anaesthetist concerned
8. Convenience of the surgeon.

PREANAESTHETIC ROUTINE PREPARATION

1. Psychological support, reassurance
 2. No food/drink for at least 6 hours before anaesthesia
 3. Urinary bladder should be emptied before taken to OT
 4. False teeth, artificial limbs, artificial eyes, contact lenses, shoes, ornaments, etc. should be taken off
 5. No tight clothing, no lipstick, no nail vernish
 6. Adequate oral hygiene
 7. Identification label should be checked
 8. Consent for anaesthesia/surgery is mandatory
 9. Resuscitative drugs, fluids, etc.
 10. Night sedation
 11. Preanaesthetic medication. It should be given in adequate dose and at proper time.
- No routine preparation is needed in extreme emergencies :
 - i. Rupture of major vessels
 - ii. Severe obstetric emergencies: ectopic rupture
 - iii. Acute upper airway obstruction
 - iv. Surgery on patients trapped and immobile.

COMMON CAUSES OF POSTPONEMENT OF OPERATION

1. Acute respiratory infection
2. Coexisting systemic illness not under optimal control
3. Lack of adequate resuscitation
4. Full stomach
5. Nonavailability of written consent
6. Failure to obtain recent investigation reports.

ROUTINE REQUIREMENT BEFORE INDUCTION OF ANAESTHESIA

- A. Anaesthesia machine**
 - Anaesthesia breathing system
 - Gas cylinders
 - Soda lime
 - Vaporisers
 - Mechanical ventilator
 - Suction apparatus
 - Monitoring equipment.
- B. Drugs**
 - Local anaesthetic drugs
 - iv inducing agents
 - Muscle relaxants
 - Opioids and opioid antagonist
 - Benzodiazepines and its antagonist
 - Anticholinergic drugs
 - Vasopressor drugs
 - Bronchodilators
 - Catecholamines.
- C. Miscellaneous**
 - Infusion set, fluids
 - Suction catheter, oral/nasal airway
 - Laryngoscope, endotracheal tubes
 - Nasogastric tube, Magill forceps.
- D. Blood should be crossmatched and available in time.**

CHAPTER

2

Preanaesthetic Medication

AIMS OF PREANAESTHETIC MEDICATION OR PREMEDICATION

1. To relieve anxiety, fear and tension
2. To provide a degree of autonomic block
3. To produce sedation, analgesia and amnesia
4. To reduce salivary secretions and secretions of respiratory tract
5. To reduce metabolic rate
6. To depress unwanted vagal reflex activities
7. To potentiate anaesthetic drugs
8. To protect the patient from the toxic effects of anaesthesia
9. To reduce the incidence of postoperative complications.

CRITERIA FOR IDEAL PREMEDICATION

1. It should be anxiolytic, analgesic, sedative and anesic
2. It should facilitate smooth anaesthesia
3. It should depress salivary and respiratory secretions
4. It should prevent nausea/vomiting
5. It should be safe and can be easily administered
6. There should not be undue depression of cardiovascular, respiratory and central nervous system.

FACTORS FOR PROPER SELECTION OF PREMEDICANT DRUGS

1. General condition of patient, age and weight, psychological status, level of anxiety, presence of pain, etc.
2. Proposed operation: Nature of surgery, site of operation, posture during surgery, duration of operation
3. Elective/emergency surgery
4. Inpatient/outpatient

5. Availability of nursing care
6. Availability of adequate surgical and anaesthetic management and care
7. Tolerance of depressant drugs
8. Previous history of adverse reaction of drugs
9. Presence of allergy.

COMMON DRUGS USED IN PREMEDICATION

1. Sedatives : Barbiturates, benzodiazepines, phenothiazines
2. Narcotic analgesics: Opioid drugs
3. Neuroleptic drugs: Droperidol
4. Anticholinergic drugs: Atropine, hyoscine, glycopyrrolate
5. Anxiolytic drugs: Diazepam, midazolam, lorazepam
6. Phenothiazine drugs: Promethazine, trimeprazine, prochlorperazine
7. Antiemetic drugs: Metoclopramide, ondansetron
8. H₂ antagonists: Ranitidine, cimetidine famotidine
9. Antacids
 - These drugs are being used either alone or in combination according to the need of the individual patients.

MORPHINE SULPHATE

1. Alkaloid of opium, a standard potent analgesic
2. Sedative, hypnotic, anxiolytic
3. Overall depression of central nervous system
4. CSF pressure raised
5. Depression of respiration, decreased response of chemoreceptors to anoxia, depression of cough reflex, increased bronchial muscle tone
6. Direct myocardial depression, hypotension, reduction of cardiac output and stroke volume, peripheral vasodilation
7. Nausea/vomiting, constriction of sphincters, diminished peristalsis, constipation
8. Passes through placental barrier
9. Constricted pupils
10. May cause hyperglycaemia
11. May cause addiction
12. Antidiuresis
13. Pruritus
14. Dose: About 0.2 mg/kg im.

PETHIDINE HYDROCHLORIDE

1. Synthetic opioid agonist one-tenth as potent as morphine
2. Dose: 1 to 2 mg/kg

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3. Analgesic, sedative, euphoric, anxiolytic
4. Respiratory depressant, raise CSF pressure
5. Atropine like effect: dry mouth
6. Direct effect on smooth muscles of bronchioles, intestines, ureters and arteries causing reduction of tone
7. Can cause addiction
8. Does not cause constipation
9. May release histamine
10. Passes through placental barrier
11. Side-effects: Nausea/vomiting, hypotension, vertigo, tremor, limb tingling.

PENTAZOCINE

1. Synthetic narcotic analgesic, a benzomorphan derivative. A partial agonist of μ -receptors
2. It is short-acting and induces less respiratory depression
3. Dysphoria is common. Less addiction liability
4. Sympathomimetic action
5. Nausea/vomiting : less ; constipation : less
6. It crosses the placental barrier less
7. It is less cumulative
8. Dose: 20 to 60 mg by injection, 25 to 100 mg orally.

DIAZEPAM

1. Benzodiazepine group of drug with main pharmacological actions:
 - a. Sedative, hypnotic, anxiolytic, amnesic
 - b. Muscle relaxation
 - c. Anxiolytic
 - d. Anticonvulsant.
2. Not analgesic, does not cause nausea/vomiting
3. May decrease blood pressure and increase heart rate
4. Respiratory depression is less
5. Potentiates nondepolarising muscle relaxants
6. Dose: In premedication 10 to 20 mg orally or im; for induction of anaesthesia 0.5 mg/kg iv.

ATROPINE SULPHATE

1. Anticholinergic, parasympatholytic drug
2. It crosses the blood-brain barrier and stimulates higher cortical centres and medulla
3. In therapeutic doses atropine can cause stimulation of vagal centre and initially cause bradycardia. Later on this is overcome by antimuscarinic action on sinoatrial node causing tachycardia
4. Bronchiolar dilatation, may increase rate and depth of respiration

5. Salivary and bronchial secretions diminished
6. Diminishes tone and Peristalsis of gut
7. Can reduce the tone of lower oesophageal sphincter and lower oesophageal pressure
8. Can raise body temperature, stimulate heat regulating centre, increase basal metabolic rate, diminish sweating
9. Dilates pupil, causes paralysis of accommodation (cycloplegia), significant effect on intraocular pressure in cases with narrow angle glaucoma
10. Reduces motor activity and tone in detrusor muscle of urinary bladder
11. Dose: 0.65 mg ; in children 0.02 mg/kg ; for vagolytic action 1.5 to 3 mg.

HYOSCINE

1. Levorotatory alkaloid, anticholinergic, parasympatholytic, tertiary amine
 2. Crosses the blood-brain barrier and placental barrier easily
 3. Marked sedation, amnesia, antanalgesic
 4. Restlessness and delirium—common
 5. Pronounced antisalivary effect
 6. Can cause rise of body temperature
 7. Effects on heart and gut : Weaker than atropine
 8. Marked mydriasis and cycloplegia
 9. Dose: 0.3 to 0.6 mg ; in children 0.015 mg/kg.
- **Atropine/hyoscine should be used cautiously**
 1. Thyrotoxicosis
 2. Febrile patients
 3. Glaucoma
 4. Some cardiac patients: Mitral stenosis
 5. Elderly patients
 6. Tachycardiac patients.
 - **Unwanted effects of anticholinergics**
 1. CNS toxicity
 2. Mydriasis and cycloplegia
 3. Rise of body temperature
 4. Tachycardia
 5. Drying of airway secretions
 6. Relaxation lower oesophageal sphincter.

GLYCOPYRROLATE

1. Synthetic quarternary ammonium compound with anticholinergic parasympatholytic activities
2. Strong vagal bloking effect on heart
3. Strong antisalivary effect
4. Antagonises the muscarinic effects like bradycardia, bronchospasm, intestinal motility

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5. Can suppress gastric fluid volume and its acidity
6. Does not cross blood-brain barrier and placental barrier
7. Dose: 0.1 to 0.3 mg; in children 0.004 mg/kg im.

PROMETHAZINE

1. Phenothiazine group of drug
2. Sedative, antihistaminic
3. Mild atropine like activities
4. Depression of upper airway reflexes
5. Potentiates the effects of hypnotics, narcotics and anaesthetic drugs
6. Mild hypotensive effect
7. When used alone, it increases the sensitivity of pain (antanalgesic)
8. Reduces the incidence of nausea and vomiting
9. Marked local analgesic effect
10. Usual dose: 25 mg ; in children 1 mg/kg
11. May produce extrapyramidal side effects.

TRIMEPRAZINE

1. Phenothiazine derivative
2. Sedative, antihistaminic, antiemetic
3. Potentiates the effects of sedative and narcotics
4. Spasmolytic, antipruritic effect
5. Mild anticholinergic effects
6. Dose: 1.5 mg/kg, in children 1mg/kg im
3 to 4 mg/kg orally.

PROCHLORPERAZINE

1. Phenothiazine derivative
2. Antiemetic effect is profound
3. Weak antihistaminic and spasmolytic effect
4. Does not produce hypotension
5. Dose: 12.5 mg, in children 2.5 to 5 mg orally.

METOCLOPRAMIDE

1. Derivative of procainamide
2. Potent antiemetic effect
3. Increases the rate of gastric emptying, relaxes pylorus, dilates the duodenal bulb, increases the peristalsis of gut
4. Inhibits vomiting centre, depresses cortex and reticular activating system