Anesthesia for the Obese Bariatric Patient

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Conflict of Interest

- Founder: Weight Loss Clinik

Overview

- Trends in Anaesthetic Practice
- Clinical Situations :
- 1) Non Bariatric Surgery
  - The obese patient
  - The obese patient on Medical Treatment
- 2) The obese patient
  - for Bariatric Surgery / Metabolic Surgery
  - Post Bariatric Surgery

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International trends in Obesity Prevalence

(WHO Mediacentre updated June 2016 , accessed Dec 2016)

- Incidence : 2 x since 1980
  - In 2014:

  Adults > 18 yrs :

  - 1.9 billion :39% ; overweight (BMI > 25)
  - 600 million :13% obese (BMI > 30)

  Children < 5 yrs : 41 million

- **Obesity is preventable**.

Local Trend in Prevalence of Obesity

BMI	Europeans Incl Creoles	Asians
Normal	< 25	< 23
Overweight	25.0-29.9	23.0-24.9
Obese	> 30	> 25.0

BMI European Cutoffs	Men	Women	Total
Normal Weight	50.1	41.6	45.7
Overweight	38.3	32.6	35.2
Obese	11.1	25.8	19.1

BMI Asian & European Cutoffs	Men	Women	Total
Normal Weight	34	29.3	34.0
Overweight	26.7	20.1	23.1
Obese	39.4	50.6	45.5

Anaesthetic Implications of Obesity

- Airway Management
- Co-existing Morbidities
- Pharmacokinetic Considerations

Airway Management

- Ventilation & Intubation > difficult than in std population

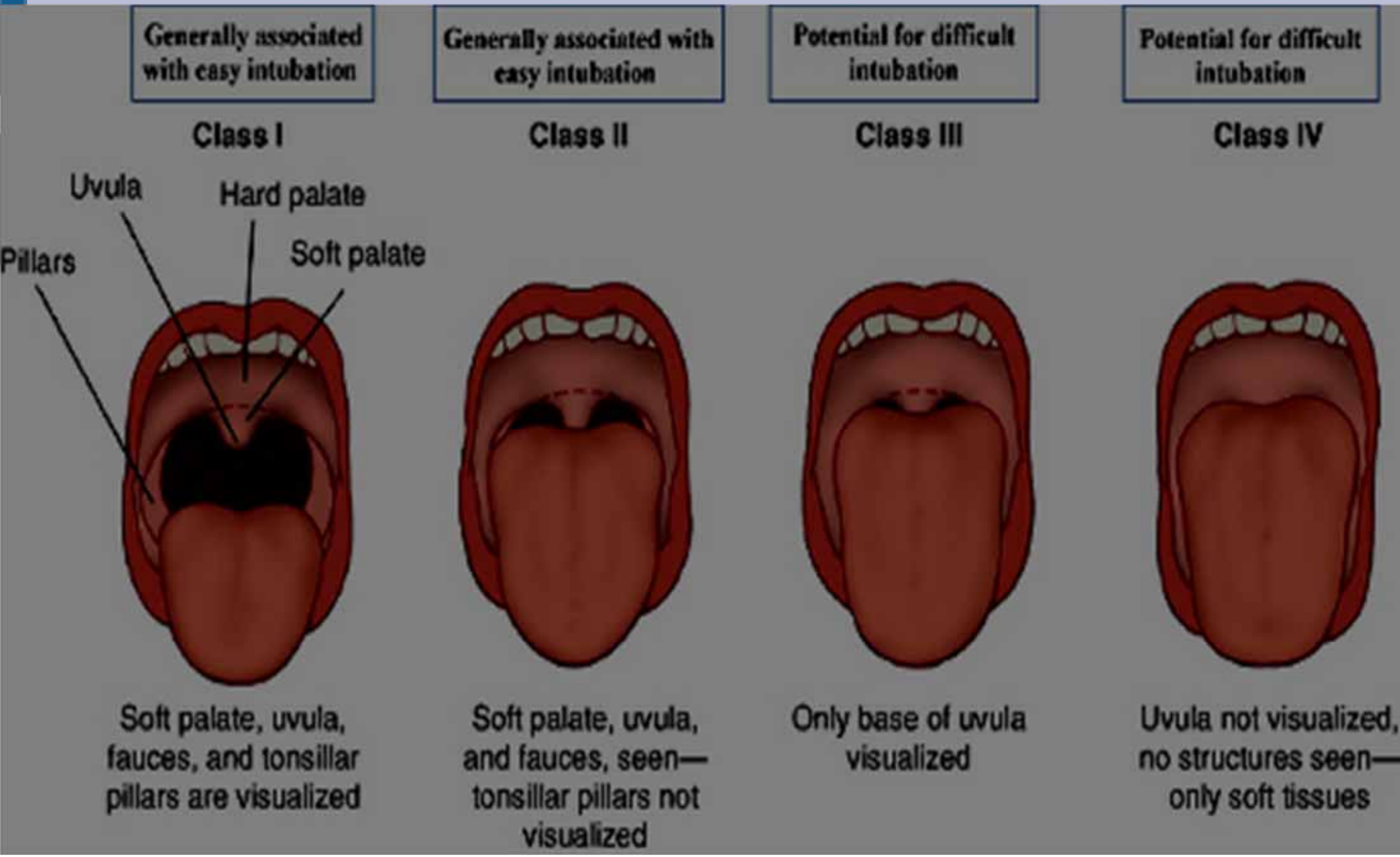
- Possible causes :

  - Short & thick neck (Collar Size)
  - Limited Mouth Opening
  - Large tongue
  - Significant redundant pharyngeal tissue

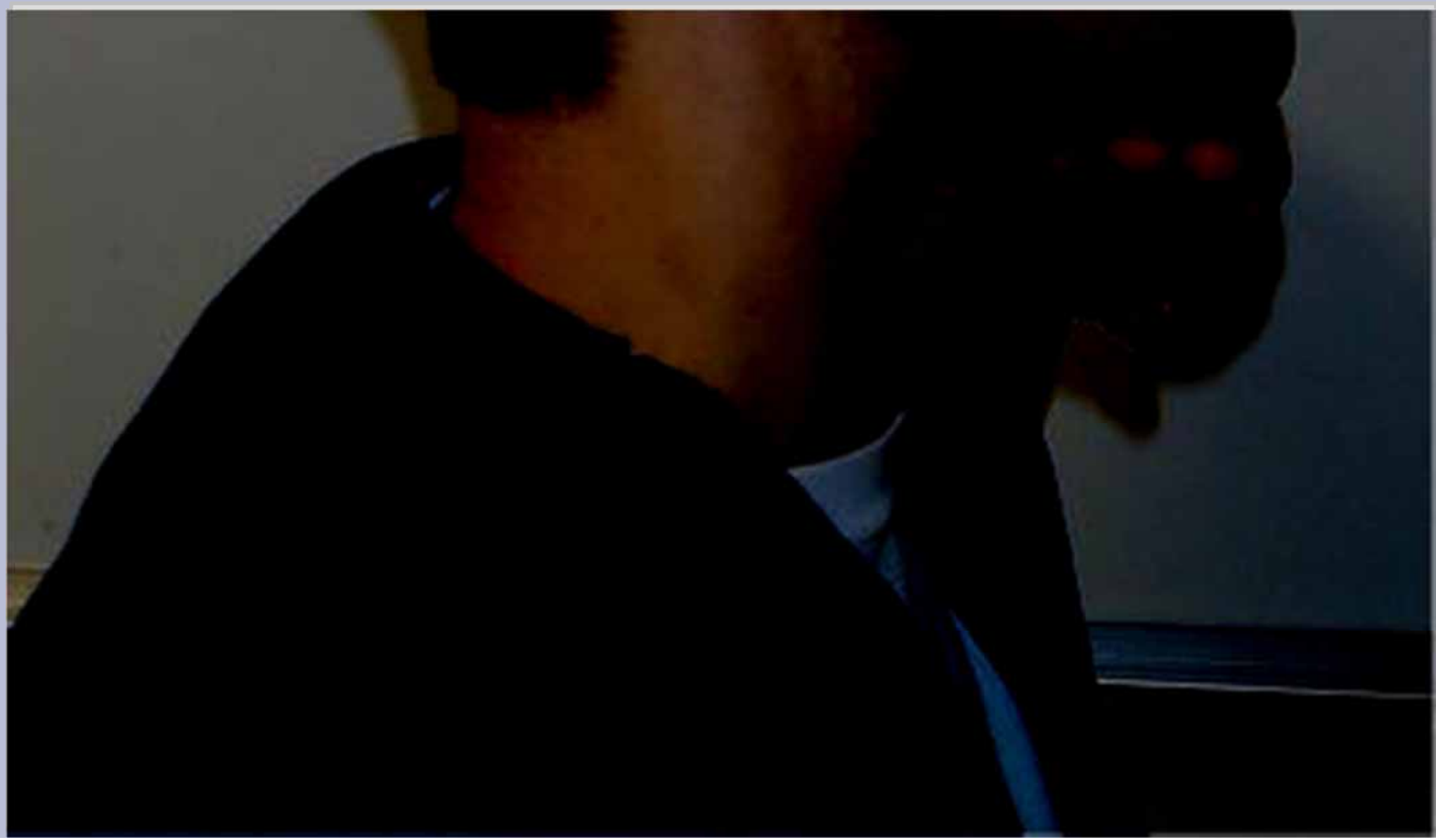
Table 1. Components of the Preoperative Airway Physical Examination

Airway Examination Component	Nonreassuring Findings
Length of upper incisors	Relatively long
Relationship of maxillary and mandibular incisors during normal jaw closure	Prominent "overbite" (maxillary incisors anterior to mandibular incisors)
Relationship of maxillary and mandibular incisors during voluntary protrusion of mandible	Patient cannot bring mandibular incisors anterior to (in front of) maxillary incisors
Interincisor distance	Less than 3 cm
Visibility of uvula	Not visible when tongue is protruded with patient in sitting position (*e.g.*, Mallampati class >2)
Shape of palate	Highly arched or very narrow
Compliance of mandibular space	Stiff, indurated, occupied by mass, or nonresilient
Thyromental distance	Less than three ordinary finger breadths
Length of neck	Short
Thickness of neck	Thick
Range of motion of head and neck	Patient cannot touch tip of chin to chest or cannot extend neck

Mallampati Score (Modified)



Thyromental Distance – 3 FB



Neck circumference

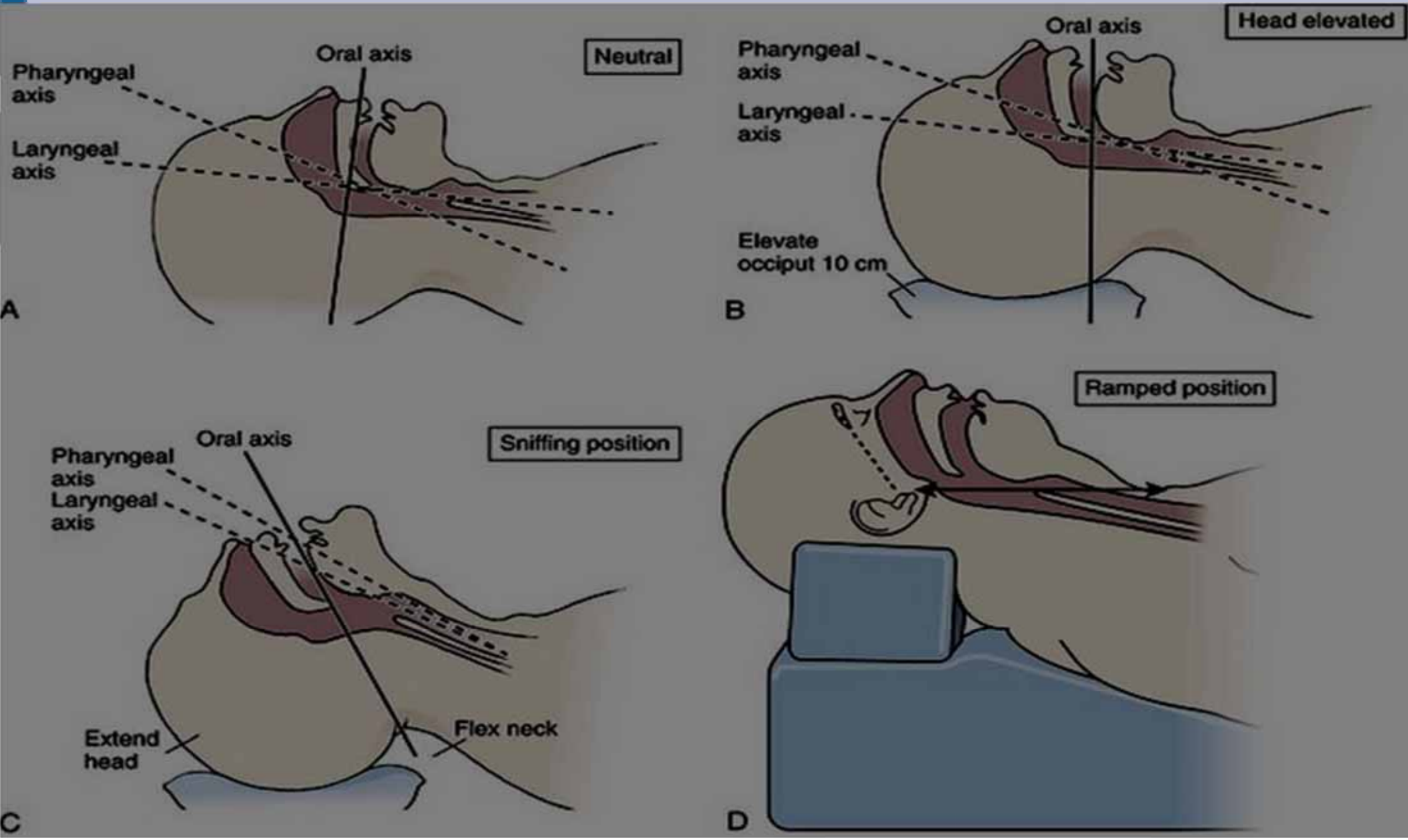
- At the level of the thyroid cartilage
- Increased risk of Difficult Intubation with increasing neck circumference :
- NC > 40 cm
- NC > 50 cm : 20%
- NC > 60 cm : 40%
- NC: TMD > 5
- AUC 0.865

Meta - Analysis

- Conflicting results
- 35 studies
- Difficult Intubation :
- 3x in obese

- Collins & al *:Laryngoscopy and morbid obesity , Obes Surgery 2004*
- Morbidly obese patients
- Ramped position vs Sniffing position
- Statistically significant superior laryngeal inlet view

Morning Sniff v/s Ramped position



Pulmonary Physiology

- Decreased
  - Vital Capacity
  - Expiratory Reserve Volume
  - Residual Volume
  - Functional Residual Capacity
  - Total Lung capacity
  - Tidal volume +/-

Closing Capacity

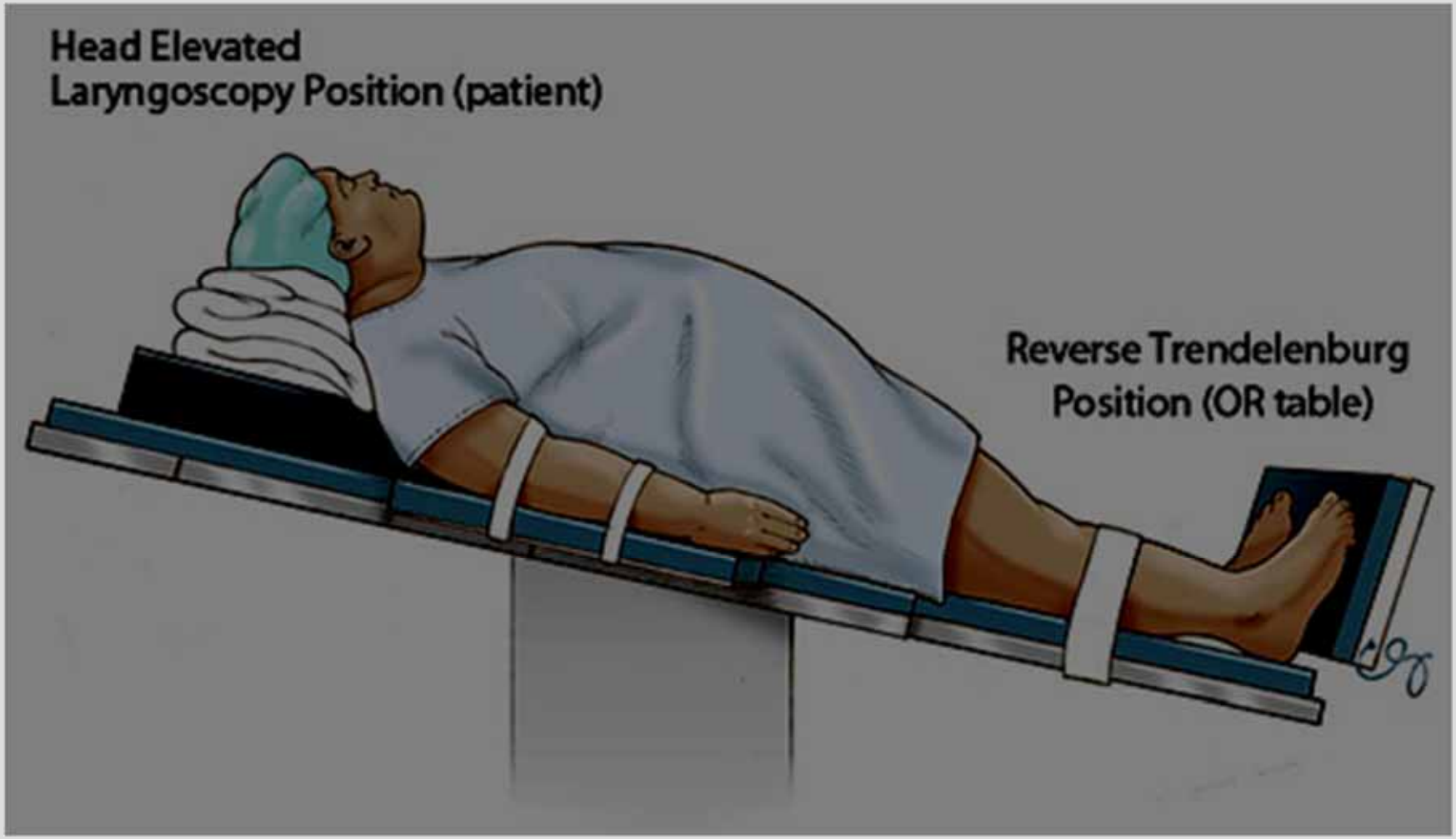
Close to tidal breathing

- More prone to atelectasis
- General Anesthesia / Use of muscle relaxants /Pneumoperitoneum / Retractors
- Positioning : Trendelenberg / Supine position
- Diminution of FRC with Type of surgery:
- Thoracotomy : 35%
- Upper abdominal : 30 %
- Lower abdominal : 10-15%

Pre-Oxygenation

- Obese patients have
- Limited FRC
- Less reserves after pre-O2
- Desaturation faster : 6 mins vs 3 mins to SpO2 < 90%
- Benefit from CPAP 10 cmH2O at induction
- Need for recruitment manoeuvres to recruit atelectatic lung segments
- Need for PEEP to keep segments recruited

Reverse Trendelenberg position



Post Induction

- Tidal Volume : 6-10 ml/kg IBW
- Aim for normocapnia : ph 7.35 – 7.45
- FiO2 : 0.4 – 0.8
- I:E ratio 1 : 1-1.3
- Recruitment manoeuvres : Pplat 40-55 cmH2O for 7-8 seconds
- Peep 10 – 15 cmH2O
- Pplat < 30 cmH2O
- Adequate preload
- Reverse Trendelenberg

Patients with OSA/HS
(70% patients Obese)

What Do You Do if OSA Is Suspected: STOP-BANG

STOP Questionnaire

- Snoring
- Tiredness
- Observed you stop breathing
- Blood Pressure

BANG

- BMI >35
- Age >50
- Neck circumference >40 cm (>15.7")
- Gender male

High risk: Yes to ≥3 items → Refer for sleep testing

Table 2. Diagnostic criteria and classification of OSA in adults.

Diagnostic criteria (ICSD-3) (A+ B) or C		Classification (AASM Task Force)[26]
A) Clinical. Presence of one or more of the following 1) Complaint of sleepiness, non-restorative sleep, fatigue or insomnia 2) Complaint of awakenings with sensation of breath holding, gasping or choking 3) Reports by observers of snoring or breathing interruptions 4) Diagnosis of hypertension, mood disorder, cognitive deficit, coronary artery disease, stroke, congestive heart failure, atrial fibrillation or diabetes mellitus type 2	**B) Polysomnographic** 1) Five or more predominantly obstructive respiratory events (obstructive or mixed apneas, hypopneas or RERA), per hour of sleep **C) Polysomnographic** 1) Fifteen or more predominantly obstructive respiratory events (obstructive or mixed apneas, hypopneas or RERA), per hour of sleep	A) Mild: ≥5 and <15 events/hour of sleep B) Moderate: ≥15 and <30 events/hour of sleep C) Severe: ≥30 events/hour of sleep

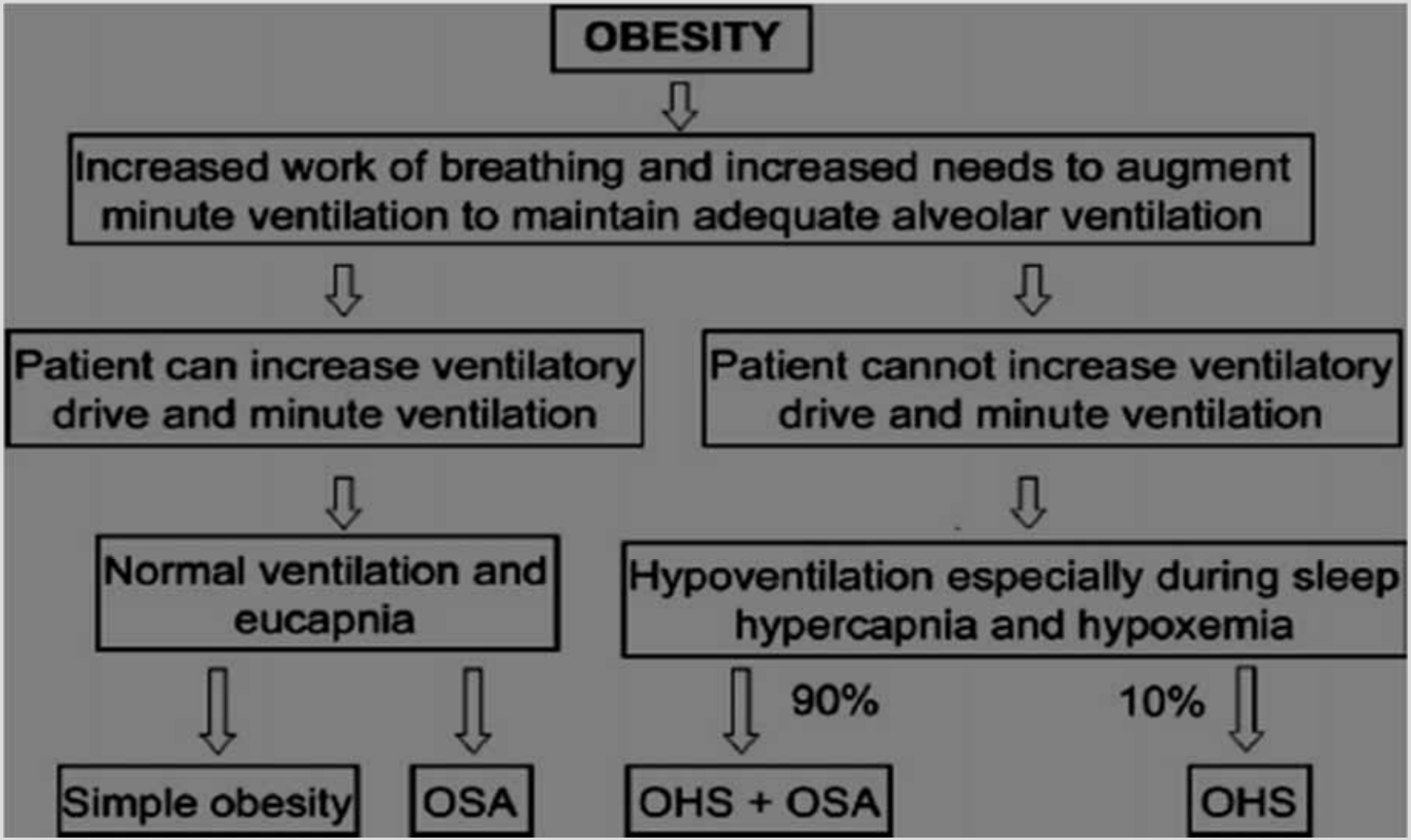
ICSD-3- International Classification of Sleep Disorders-Third Edition; AASM: American Academy of Sleep Medicine; RERA: respiratory effort related arousals.

OSAHS related complications

- Systemic & Pulmonary Hypertension
- Left & Right Ventricular Hypertrophy
- L/R Heart Failure
- Cardiac Arrythmias
- Cognitive impairment
- Predisposition to increased airway obstruction with hypnotics and opioids

Obesity Hypoventilation Syndrome

BMI > 30 kg/msq + PaCo2 > 45 mmHg



Obesity Hypoventilation Syndrome , Al Dabal et al , Ann Thorac Med 2009

Impact on Cardiovascular System

Changes	Anaesthetic Considerations
Triad : increased blood volume ; Q ; symp tone Increased preload	Greater fall in Cardiac index at induction compared to non obese patients Hypotension may perisist post operatively
Hypertension / LVH	Diastolic dysfunction & Failure
Coexisting Coronary Artery Disease	Risk of periop ACEs
Risk of Left Atrial Dilatation	Risk of AF
Pulmonary Hypertension / Cor Pulmonale	Avoid : hypoxia , hypercarbia , acidosis , high Vt / PEEP , pain
Obesity Related Cardiomyopathy	Duration (> 10 yr) & obesity dependent , diastolic HF

Should Obese patients be considered as “ full stomachs”?

Gastric Volume in obese patients :
fasting v/s 300 ml clear fluids 2 h prior to induction

- Rapid Sequence Induction / Awake intubation only for patients : for patients at risk of Aspiration – GERD ; Gastroparesis

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Pharmacological Considerations

- Obesity : fat mass & lean body mass not proportional
- Lipophilic drugs : increased Vd
- Hydrophilic drugs : unchanged Vd
- Obesity : exclusion criterion in many clinical trials

Definitions

- IBW :
- a weight that is believed to be maximally healthful to a person , based chiefly on height but modified by factors such as gender , age , built and degree of muscular development

- In males : 50 kg + 2.3 kg for each inch > 5 ft

- In females : 45.5 kg + 2.3kg for each inch > 5ft

- LBW : TBW – fat weight

- CBW : IBW + 0.4 (TBW-IBW)

Drug Dosing

IBW	LBW	CBW	TBW
Cis-Atracurium Rocuroniu m IV Fluid therapy	Paracetamol Opioids Propofol – Induction Thiopentone Etomidate Ketamine Neostigmine 70 mcg/kg , max 5mg	Neostigmine 50 mcg/kg	Succinnyl Choline 1- 1.5 mg/kg Antibiotics Enoxaparin Propofol : Maintenance

Neuromuscular Blockade

- Continuous monitoring intra=operatively
- Site : ulnar nerve
- If wrist circumference > 18 cm → :
- Supramaximal currents > 18 mA might be required (not achievable with monitoring devices)
- Use facial nerve stimulation
- Extubation T4:T1 ratio > 90%

Patient Positioning

- More frequent nerve injuries?
- Rhabdomyolysis of gluteal muscles → ARF / death
- “usual” cushion gels/pads subjected to excessive pressure → skin breakdown
- Excessive axillary fat tissue : axillary rolls redundant
- Table of adequate width and weight bearing
- Use of waist & leg straps

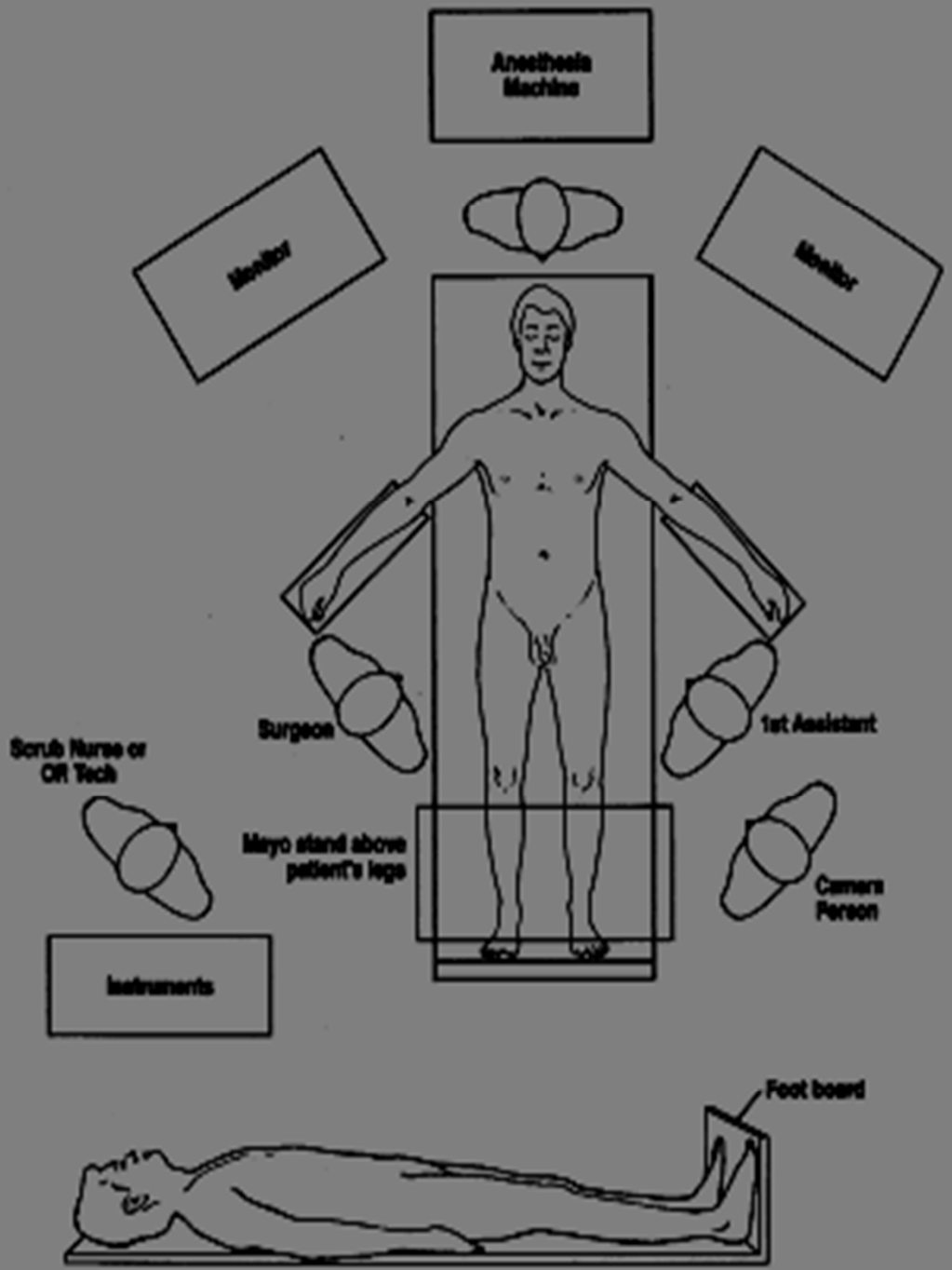
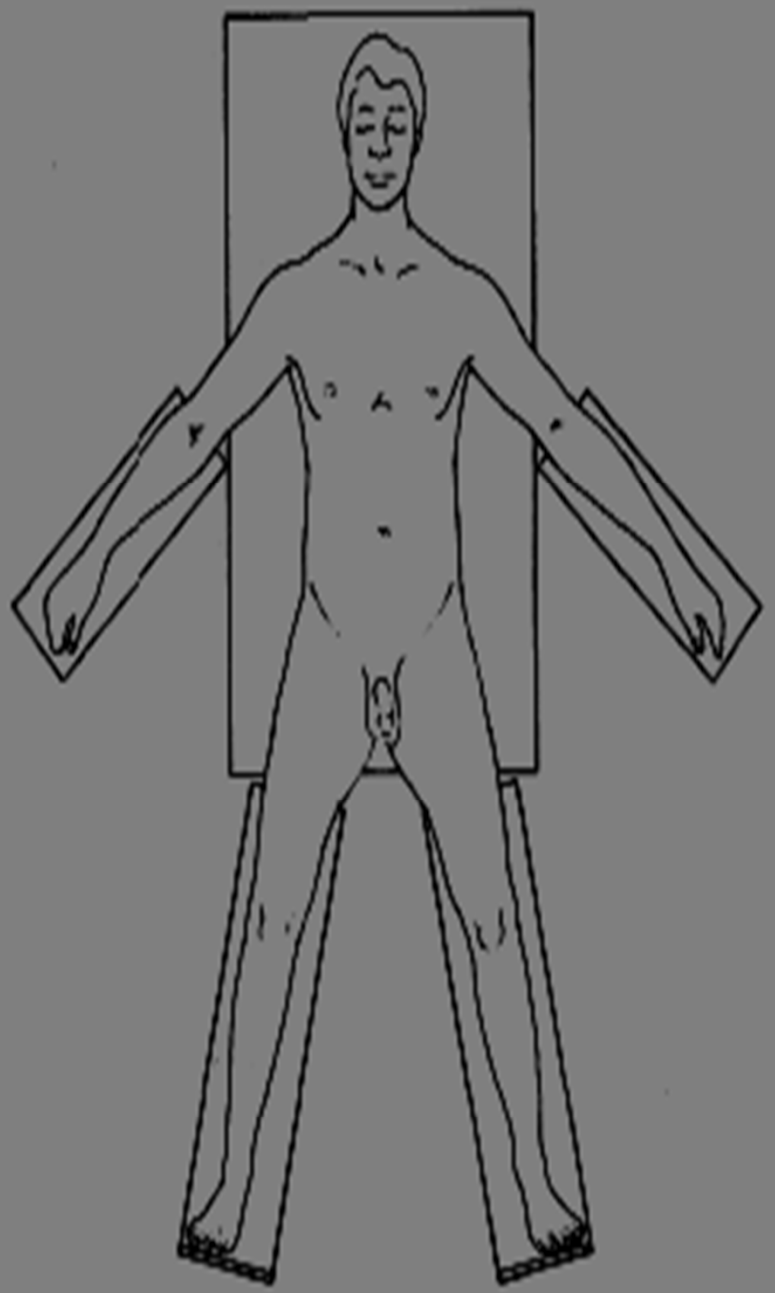


Figure 9.1.1. Operating room setup. Patient and operating room positions for laparoscopic band and laparoscopic gastric bypass. Inset shows footboard.



igure 9.1.2. Alternate position of patient with legs abducted and/or flat leg ards.

Possible Peripheral Nerve Injuries

- Stretch injury to the Brachial Plexus
- Ulnar neuropathy
- Meralgia paraesthica : raised IAP + lithotomy
- Sciatic nerve
- Vagal Nerve injury in Gastric Banding : nausea/vomiting
- Bradyarrythmias with overdistension by Gastric Balloons

Post Operative Pain Regimen

- Ideal : no further respiratory depression
- ASA Closed Claims : 48% respiratory Aes in obese / MO related to Opioids
- Multimodal Analgesia
- Robust in improving post operative recovery
- NSAIDS ++
- Regional analgesia techniques :
- Epidural / epineural nerve catheters
- Local wound infiltration
- TAP blocks

Other analgesic regimens

PCA

- Fentanyl preferred to Morphine
- Avoid background infusions
- Adjust lockout period to minimize :
  - sedation &
  - respiratory depression

Opioid free Anesthesia:

- Propofol
- Ketamine
- Dexmedetomidine

Thank you