Hypotensive Anaesthesia

**DEFINITION**
- It is a State of induced controlled hypotension during anaesthesia to reduce bleeding and improve the surgical field adjusted to the patient’s age, pre-operative blood pressure and past medical history.
- First used by Cushing in 1917

**ADVANTAGES**
- Decreases blood loss during surgery
- Decreases operative time
- Provides bloodless operative field

**PRINCIPLE**
- Reduction in systolic blood pressure to 80 – 90 mmHg.
- Decrease in MAP to 50 – 60 mmHg in normotensive patients.
- Reduction in MAP by 30% of the baseline values.

**VITAL ORGAN PHYSIOLOGY**
- Controlled hypotension rarely results in damage because organ blood flow is normally well maintained.
- Three main organs whose proper functioning is vital which autoregulate their blood pressures include:
  - Brain
  - Kidney
  - Heart

**CEREBRAL CIRCULATION**
- Many feel that it is the perfusion of the cerebral circulation that is the critical factor that limits MAP reduction.
- **Auto regulation** – MAP range of 50-150mmHg

**VARIOUS FACTORS UNDER CONTROL OF ANAESTHETISTS TO MAINTAIN MAP ARE :**
- **paCO₂** (partial pressure of Arterial CO₂) ➔ increase in PaCO₂ there is an increase in cerebral blood flow
- **paO₂** ➔ High O₂ mainly in hyperbaric range can lead to cerebral damage and thus brain compensates by Vasoconstriction.
- If O₂ below normal then Vasodilation
- **Volatile anaesthetics**
  - Volatile anesthetics attenuate or abolish the auto regulation of cerebral blood flow in a dose dependent manner in the following order : halothane > enflurane > isoflurane. (HEI)
- **Vasodilators**
CORONARY CIRCULATION

- Coronary blood flow is dependent upon the aortic diastolic blood pressure and the coronary vascular resistance.

RENAL BLOOD FLOW

- Renal blood flow is controlled in two ways: Extrinsic autonomic and Hormonal mechanisms and Intrinsic auto regulation.

BLOOD PRESSURE GOAL

- The aim of Hypotensive anaesthesia is to reduce blood loss and provide a “dry” operating field. Hence, the degree of hypotension should be individualized.
- The hypotension should be considered satisfactory when bleeding appears to be minimal and organ perfusion adequate.
- Inducing hypotension to a MAP of 30% below a patient’s usual MAP, with a minimum of 50mmHg in young patients and 80mmHg in the elderly is clinically acceptable.

PATIENT LIMITATIONS

- Cardiac disease
- Diabetes mellitus
- Anaemia, haemoglobinopathies, polycythaemia
- Hepatic disease
- Ischaemic cerebrovascular disease
- Renal disease
- Respiratory insufficiency
- Severe systemic hypertension
- Intolerance to drugs available to produce hypotension

ANAESTHETIST LIMITATIONS

- Lack of understanding of the technique.
- Lack of technical experience.
- Inability to monitor the patient adequately.

TECHNIQUE:

MAP = CARDIAC OUTPUT X SYSTEMIC VASCULAR RESISTANCE

= (Stroke volume x Heart rate) x SVR

- Arterial bleed directly prop to MAP – **beta blockers** reduce Stroke volume and **Alpha blockers** reduce Peripheral vascular resistance
- Capillary bleed by local adrenaline and hyperventilation to reduce arterial and venous pCO₂
- Venous Tone reduced by intravenous nitrates, positioning
Hence MAP can be manipulated by reducing either SVR or Cardiac output or both. Inducing hypotension purely by a reduction in cardiac output is not ideal because the maintenance of tissue blood flow is essential.

SVR can be reduced by peripheral vasodilatation (of the resistance vessels) whilst cardiac output can be reduced by lowering venous return, heart rate, myocardial contractility or a combination of these.

**MECHANICAL MANEUVERS**

- Positioning
- Positive airway pressure.
- Spinal anesthesia.
- Epidural anesthesia.

**DRUGS COMMONLY EMPLOYED**

- Volatile agents ➔ Halothane, Isoflurane, Enflurane
- Vasodilators like Na Nitroprusside, Nitroglycerine
- Ca Channel Blockers
- Beta Antagonists
- Remifentanil

**PREOPERATIVE MANAGEMENT**

- Thorough knowledge by the anesthetist.
- Proper patient evaluation and selection.
- HB of 10 g/dl.
- Arterial blood gas analysis sampling.
- Good level of anxiolytics, analgesics.
- Vagolytic drugs should be avoided.

**INTRAOPERATIVE MANAGEMENT**

- Stress free induction.
- Enough peripheral venous access.
- Thorough Monitoring
  - Invasive blood pressure.
  - ECG V5 lead with ST segment analysis.
  - Central venous pressure.
  - Urine output.
  - Temperature.
  - Blood loss.

**POSTOPERATIVE MANAGEMENT**

- Rebound hypertension.
- Reactionary hemorrhage.