* Inhalational agents:-

Halothane :-
* most potent inhalational anesthetic
* MAC .75%
↓ Consciousness
MOA ⇒ systemically

CVS:-
Direct myocardial depression:-
↓ CO, ↓ BP, Coron BF ↓
↑ HR, vagal stimulation ↓
⇒ Arrythemia

RS:-
↑ RR, Alveol Ven ↓
$PaCO_2$ ↑
⇒ bronchodilator

CNS:-
CBF ↑, ICP ↑, ↓ CMR_{O_2}
* muscle relaxant ↓ tone
* triggering of malignant hyperthermia

Renal:-
↓ UO, ↓ GFR, ↓ RBF
Perioperative hydration can limit this

hepatic HBF ↓
↳ metabolized by it P-450

SE:-
① Halothane hepatitis ⇒ autoimmune
⇒ fever, jaundice, hepatic necrosis death
② Malignant hyperthermia
autosomal dominant
* TTV dantrolene 2.5 mg/kg
- HR ↑, H+ ↑, CO_2 ↑, K^+ ↑, ↑ BT

Contraindications:-
- liver dysfunction ⇒ previous exposure
- malignant hyperthermia
- severe cardiac disease
- hypovolemic

* not given with
- β-blockers, CCB ⇒ myocardial exacerbation
- aminophylline ⇒ ventricular arrhythmia

Enflurane:-
* MAC 1.68%
CVS:-
↓ BP ↓ SVR ↓ HR arrhythmias

RS:-
↑ TDS, ↑ CO_2, bronchodilator
SE:-
• Fluoride Ion ⇒ Renal toxicity
• Epileptiform EEG patterns.

Isoflurane:-
MAC 1.20%
CV:- minimal cardiac Depression
SVR ↓ ⇒ BP ↓
⇒ HR ↑
~~* emin~~
RS:- ↓ V, bronchodilator
• Irritate U.A.R
CNS:-
ICP ↑, CBF ↑, CMOR ↓
↓ muscle tone, (+) malignant hyperthermia
Renal:-
↓ U/O, ↓ GFR, ↓ RBF
↓ HBF hepatic

Desflurane:-
MAC 6%.
* special vaporizer

CVS:-
SVR ↓ BP ↓ HR ↑
CO ↓ ↓ BP ↑

RS:-
TV ↓ RR ↑
Ar ↓ RCO_2P ↑
* airway irritation

CNS:-
↑ ICP, CBF
$CMRO_2$ ↓
** malignant hyperthermia
Renal ⇒ ↓ Uo

(CO) → toxicity
* contraindicated
Severe ↓ hypV
↑ ICP
mals. Hyperther

⇒ Sevflurane
MAC 2%
⇒ rapid inhalation inductions
Ped & adult

CVS:-
↓ myo-contact
↓ A.BP
↑ HR

RS:- ↑ RR, bronchodilation
Depress respiration

CNS :- CBF, ICP ↑
$CMRO_2$ ↓
toned

Renal:-
↓ RBF

hepatic PVBF ↓

SE:- after metabolizem produce nephrotoxic agent
Contraindicated
↓↓↓ V, mals-hyper, ↑ ICP

NO Inorganic
MAC 104%
good analgesic

CVS:- ↓ myocontact
BP, CO, HR ↑ ss
↑ PVR
pulm.

RS:- RR ↑, TV ↓

↑ CNS:- ICP, CBF, ↑ $CMRO_2$ ↑
(→) M.hyper (→) Relaxation

Renal:- ↑ RVR
↓ U/O, ↓ RBF, ↓ GFR
↓ Hep. B.F
(+) N&V

SE:-
↓ B12, Diffusion to closed spaces
* contain
Pneumothorax, air-embolism
acute. intestinal obstn. P.hypos
intracranial air, Pul. air. cysts,

Xenon MAC 71%
- No meta, low toxicity
- analgesic
↓ V, N, (⇒ M.relaxed

HR		CVS			RS (bronchodilators)			CNS (dose-dependent)			Renal
		BP	SVR	MAP	RD	RR	CO_2 Retention	CBF	O_2 R	ICP	AP
↓	Halothane (hepatitis)	↓	≠	↓	+	↑	+ * ↓	↑	↓	↑	↓
↑	Isoflurane	↓	↓↓↓	↓	+	↑	+ ↓	↑	↓	↑	↓
	Enflurane (~~nephrotoxic~~)	↓	↓	↓	+	↑	+ ↓	↑	↓	↑	↓
N/C	Sevoflurane	↓	↓	↓	+	↑	+ ↓	↑	↓	↑	↓
N/C ↑	Desflurane	↓	↓	↓	+	↑	+ ↓	↑	↓	↑	↓
	Xenon	↓	↓	↓	+	↑	+ ↓	↑	↓	↑	↓
/C	NO	↓	≠ (PHTN)	no or [illegible]	+	↑	+ ↓	↑	↑	↑	↓

xalveoli-V

* dose dependent ↓ GFR, UO, RBF
* hepatic blood flow maintained or ↓
* malignant Hyper (+) [illegible] Xenon, N_2O
* Cross placenta & reach the fetus.

Induction → Sevoflurane

CVS ✓ → Sevoflurane

Emergency, Meta, titration → Desflurane

Fentanyl

Products of metabolism- Norfentanyl
1° metabolite

Combining of loading dose of fentanyle
2 → 6 (mg/kg)

⇒ long acting, widespread distribution

Use it in induction of Anesthesia

Alfentanil

⇒ very fast onset
Short duration
un-ionized 90% at normal pH

Remifentanil

* ester linkage
* Rapid metabolism
* Rapid reduction of [blood] after cessation of infusion.

* IV, transdermal, Iontophoresis, Transmucosal, extended-Release epidural morphine, orally

Meperidine

⇒ excitation of CNS
- ⇒ tremors
- ⇒ muscle twitches
- ⇒ seizures

Caused by metabolite
⇒ Mr. normeperidine
⇒ well-known local anesthetic properties

*dose (12.5 - 35 mg) → to prevent post operative Shivering

Opioid antagonists
⇒ to reverse ⇒ RD
⇒ N & V
⇒ rigidity
⇒ biliary spasm
⇒ Urinary Retention
⇒ pruritus

Naloxone ↑ HR ↑ BP , may cause pulmonary edema

(1-2) onset of A IV (can be used intratracheal)

$t_{\frac{1}{2}}$ 30-60min

Recurrence of RD after naloxone results from the short t ½ of naloxone

✗ chromaffin T-T /Pheochromocytoma
↳ rare - non Cancerous benign tumor develop in adrenal gland

IV. anaesthetics drugs:-

Propofol:- ✱
⇒ 1.5. 2.5 mg/Kg ⇒ induction Dos
↑ binding affinity of GABA to GABAaR

Onset : 30-60 sec
*support bacterial growth.

half life 2-8 min
⇒ meta → liver, kidney, blood
⇒ SE
↓ C. contractility ⇒ ↓ BP.
* Cardio-depressant ✱
* antiemetic ✓
* antipruritic

thiopental:-
Barbiturate
GABA A R ✓
⇒ Induction D :- 3-5 mg/Kg
⇒ onset : 30-60 sec
Dose (3-5 mg x weight) / 25
⇒ protective effect:-
↓ $CMRO_2$, ↓ ICP, ↓ CBF
⇒ meta ⇒ liver
⇒ contraindicated in pt with porphyria. → acute crisis

⇒ Etomidate ✱
Induction ,2 - ,3 mg/Kg
bind GABA A
↓ $CMRO_2$, ↓ ICP, ↓ CBF
Safe for heart
✱ Superior hemodynamic stability ✱
* Cause V & N Post.op
* inhibit 11-B hydroxylase
✱ both ⇒ adrenal suppression
Cause pain & irritation ⇒ lidocaine
contraindicated ⇐

Ketamine:-
IV 2mg/Kg IM 4 - to 6 mg/Kg
*several routes of administrations

✓ MOA ⇒ N-methyl-D-aspartate.
⇒ analgesia Cortex ⊥ limbic sys
⇒ ✱ Dissociative amnesia
⇒ bronchiodilation

↑ CBF, ↑ ICP, ↑ $CMRO_2$
⇒ emergence reaction, with hallucinations & fears ⇒ contraindicated in pts with space occupying CNS lesions
⇒ minimal Respiratory depression
⇒ direct myocardial depression But
↑ Catecholamine Release ⇒ ↑ CO, ↑ HR, ↑ BP.

Dexmedetomidine "Precedex"
used for ICU pt not for induction of anesthesia
* act on α_2 Receptor "agonist"

* Sedation, analgesia, No RV, anxiolytic
* half $T_{\frac{1}{2}}$ ⇒ 2 hrs.

,5 - 1 mcg/Kg
,2 - ,7 mcg/Kg

Benzodiazepines ✱ Reverse ⇒ Flumazenil
Midazolam, Diazepam, Lorazepam
* GABA A / allosteric
* Res, Cardi: → mild depression
* $T_{\frac{1}{2}}$ ⇒ 3 hrs.
* anxiolytic, amnestic, sedative, hypnotic anti-convulsant
* Premedication
* Midazolam → pre → ,04 - ,08 mg/Kg IV
Indn → ,1 - ,2 mg/Kg IV

IV. anaesthetics drugs:-

Propofol:- ✱
⇒ 1.5. 2.5 mg/kg ⇒ induction Dose
↑ binding affinity of GABA to GABA$_A$R

Onset: 30-60 sec
✱ support bacterial growth.

half life 2-8 min
⇒ meta → liver, kidney, blood
⇒ SE
↓ C. contractility ⇒ ↓ BP.
✱ Cardio-depressant ✱
✱ antiemetic ✓
✱ antipruritic

thiopental:-
Barbiturate
GABA$_A$ R ✓
⇒ Induction D:- 3-5 mg/kg
⇒ onset: 30-60 sec
Usual $\frac{(3\text{-}5\ mg \times weight)}{25}$
⇒ Protective effect:-
↓ $CMRO_2$, ↓ ICP, ↓ CBF
⇒ meta ⇒ liver
⇒ contraindicated in pt with porphyria. → acute crisis

⇒ Etomidate ✱
Induction ,2 - ,3 mg/kg
bind GABA A
↓ CMR_{O_2}, ↓ ICP, ↓ CBF
Safe for heart
✱ Superior hemodynamic stability ✱
✱ Cause V & N Post.op
✱ inhibit 11-B hydroxylase
✱ both ⇒ adrenal suppression
Cause pain & irritation ⇒ Propofol
contraindicated ⇐

Ketamine:-
IV 2mg/kg IM 4 - to 6 mg/kg
✱ several routes of administrations

✓ MOA ⇒ N-methyl-D-aspartate
⇒ analgesia cortex ↓ limbic sys
⇒ ✗ Dissociative amnesia
⇒ bronchodilation

↑ CBF, ↑ ICP, ↓ $CMRO_2$
⇒ emergence reaction, withdrawal & Fears ⇒ contraindicated in pt with space occupying CNS lesions
⇒ minimal Respiratory depression
⇒ direct myocardial depression but ↑ Catecholamine Release ⇒ ↑ CO, ↑ HR, ↑ BP.

Dexmedetomidine "Precedex"
used for ICU pt not for induction of anesthesia
✱ α_2 Receptor "agonist"

✱ Sedation, analgesia, No R.V, anxiolytic
✱ half $T_{\frac{1}{2}}$ ⇒ 2 hrs.

,5 - 1 mcg/kg
,2 - ,7 mcg/kg

Benzodiazepines ✱ Reverse ⇒ Flumazenil
Midazolam, Diazepam, Lorazepam
✱ GABA A / allosteric
✱ Res, Cardi → mild depression
✱ $T_{\frac{1}{2}}$ ⇒ 3 hrs.
✱ anxiolytic, convulsive, sedative, hypnotic anti-convulsant
✱ Premedication
✱ Midazolam ⇒ Oral → ,04 - ,08 mg/kg IV
Indu → ,1 - ,2 mg/kg IV

histamine release
Vomiting & Constipation

meperidine
- mydriasis "anticholinergic effect"
- no bradycardia might cause tachycardia

morphine

Metabolized:- liver by conjugation
& enterohepatic metabolism by kidney

Onset:- 1-2 min IV
Peak effect:- 3-5 min IV , 20 min 90 min
products of metabolizeme- M6G 10% of morphine
more potent μ-receptor
agonist.
similar duration of action

Case-based MCQ