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Preanesthetic Drugs

These are the drugs used prior to the administration of an anesthetic agent and may be also used prior to chemotherapy.

Aims of premedication

1- For sedation the animal (reduce anxiety and apprehension) to allow a procedure, such as intravenous catheterization to be carried out (Reduce stress before and during induction of anesthesia).

2- Facilitate animal handling. This increases safety for animal and personnel during restraint.

3- To contribute to a balanced anesthetic technique.

4- To reduce the dose of other anesthetic agents required for induction and maintenance of anesthesia.

5- To obtain smooth and rapid induction with quiet recovery.

6- To counter the effects of other anesthetic drugs.

7- To relieve or minimize pain.

8- Reduction of secretions.

9- Reduction of vagal reflexes to intubation.

Pharmacology of preanesthetic drugs

The choice of drugs used for premedication depends on the procedure, case status and anesthetic technique. The appropriate selection of premedication drugs can significantly improve cardiovascular and respiratory stability, analgesia and quality of recovery.

The preanesthetic drugs commonly used as a premedication are includes the following:-
1-Anticholinergics, e.g. Atropine, Glycopyrronium.
2-Alpha-2 agonists (Sedatives),e.g. Xylazine, Deteomidine, Medetomidine.
3-Phenothiazines(Tranquilizers), e.g. Acepromazine (Calmivet),Propionyl promazine

(Comblene), Chloropromazine.
4-Benzodiazepines(Hypnotics), e.g. Diazepam, Midazolam
5-Opioids, e.g. Morphine, Methadone, Pethidine, Hydromorphone, Buprenorphine, Fentanyl.

The drugs that used as a premedication should ideally have the following properties:-
1-Produce reliable sedation and anxiolysis.
2-Have minimal effects on the cardiovascular system and minimal respiratory depression.
3-Produce analgesia.
4-Reversibility.

No individual drug used for premedication and sedation possesses all of these characteristics, therefore combinations of drugs with different properties are employed.

Contraindications of preanesthetic drugs

All premedication drugs, except the anticholinergics, are considered central nervous system (CNS) depressants. It must be remembered that these drugs will cause a certain degree of respiratory and cardiovascular depression, especially if used in high doses. Thus caution must be exercised when dealing with animals in respiratory or cardiac failure. Animals in hypotensive shock should not receive tranquilizers or narcotics unless careful monitoring is combined with the use of intravenous fluids.

1-Anticholinergic agents

Anticholinergic agents antagonize the muscarinic effects of acetylcholine and historically have been used in premedication regimens to prevent the unwanted effects of stimulation of the parasympathetic nervous system by anesthetic agents or surgery.

Aims of premedication with an anticholinergics are as follows:-
1-Reduction of salivary and bronchial secretions.
2-Blockage of the effects of vagal stimulation.
3-Stabilization of heart rate by counteracting vagal tone, thereby increasing heart rate.
Other uses

-Antidote for organophosphate intoxication.

-Antispasmodic to control diarrhea.

Precautions of anticholinergic drugs

-In animals with cardiac disease associated with arrhythmias and/or tachycardia.

-In animals with un compensating respiratory disease or distress.

-In constipated animals because of the drug's anti peristaltic action.

-In animals with severe renal dysfunction.

Atropine

-In dog and cat, 0.02-0.04mg/kg, IM., SC. and IV.

-In horse, 0.002 - 0.01 mg/kg IV. Its depress gastrointestinal motility and increase the risk of abdominal discomfort or colic, so only administer when bradycardia or vagal reflexes are a problem.

-In cattle, 0.06 - 0.1 mg/kg IV. Anticholinergics are usually not administered to cattle prior to induction of anesthesia as they do not consistently decrease salivary secretions unless used in high doses and repeated frequently. The production of excessively thick mucus from the trachea and bronchi may be lead to chock formation.

2- Alpha-2 adrenoreceptor agonists

Alpha-2 adrenoreceptor agonists are potent sedative and analgesic drugs. Premedication with alpha-2 agonists has a significant influence on the characteristics of the ensuing anesthesia.

Pharmacological effects
-Cardiovascular system: its produces a biphasic effect on blood pressure (initial increase followed by a return to normal or slightly below normal values). Heart rate is decreased throughout the period of alpha-2 agonist administration with reduction in cardiac output.
-Respiratory system: Minimal effects on the respiratory system are seen in healthy animals. Arterial oxygen and carbon dioxide tensions (concentrations) remain within normal limits.
-Renal system: Urine production is increased due to a reduction in vasopressin and renin secretion.
-Pancreas: Endogenous insulin secretion is reduced, leading to a transient hyperglycemia.
-Liver: Both hepatic blood flow and the rate of metabolism of other drugs by the liver are reduced.
-Body temperature: peripheral vasoconstriction tends to reduce peripheral heat loss Although Alpha-2 adrenoreceptor agonists has a direct depressant effect on the thermoregulatory centre.
-Emesis: Vomiting is frequently seen in cats and dogs after administration. Alpha-2 agonists are contraindicated in animals with a suspected esophageal foreign body where emesis may result in further tissue damage.

-Genital system(uterus): uterine stimulation may be lead to abortion in very early and late pregnancy.
-Reversal of alpha-2 agonists with administration of Yohimbine and Atipamezole.

Xylazine
-It can given IV., IM., SC.
-Horses, dogs and cats require 10 times needed in cattle.
-Horse stay standing after administration while in cow and small ruminant may be recumbent
-In dog and cat :0.5-2mg/kg
-Ruminants: 0.05-0.1 mg/kg
-Horse: 0.5-1 mg/kg

3-Phenothiazines

Phenothiazines are dopamine receptor antagonists, having calming, anti-psychotic, mood- altering effects and didn't have analgesic effect. Acepromazine is the phenothiazine most commonly used for premedication in small animal practice.

pharmacological effects
-Cardiovascular system: peripheral vasodilatation, fall in arterial blood pressure (animals with shock or cardiovascular disease this vasodilatation can be disastrous, leading to cardiovascular collapse) and anti-arrhythmic
-Respiratory system: little effect on respiratory function.
-Body temperature: fall in body temperature due to a resetting of thermoregulatory mechanisms, combined with increased heat loss from the periphery due to peripheral vasodilatation.
Other
- Anti-emetic action and weak anti-histamine effects.
- The penis in the male animals protrude out of the sheathes.
- The eyes can appear glazed and the nictitating membrane often protrudes. Some animals lie down.

Acepromazine (ACP)
-It can be given IV.,IM. and orally
-Dogs and Cats 0.05 - 0.1 mg/kg .
-Horses and Cattle 0.02mg/kg

4-Benzodiazepines

Diazepam and Midazolam are the benzodiazepines used most commonly in small animal practice. They exert their main sedative effects through depression of the limbic system. Their action is thought to be through activation of a specific benzodiazepine receptor, part of the gamma amino butyric acid (GABA) receptor complex. These drugs do not have analgesic properties, except to reduce skeletal muscle spasm.

Pharmacological effects
-Cardiovascular and respiratory systems: Benzodiazepines have minor effects on both of these systems.
Others
-Anticonvulsant effects
-Reversal of benzodiazepines with flumazenil (0.01-0.03 mg/kg.IV.) .

Zolazepam
- It can given orally and IV
- 0.2-1 mg/kg B.W.

5-Opiods

Opioids are commonly incorporated into premedication regimens to provide analgesia and to improve the reliability and intensity of the sedation achieved following combination with the primary sedative drug. The choice of opioid will depend on the degree of analgesia needed, the speed of onset of the drug's action and the length of action required. Generally, longer-acting opioid agents, such as morphine, methadone, hydromorphone and buprenorphine, are used as premedicants.

Pharmacological effects
-Cardiovascular system**:** Opioids have few negative effects on hemodynamic. They can cause a reduction in heart rate through stimulation of the vagal nerve, which can be managed by co-administration of an anticholinergic.
-Respiratory system: do not cause clinically significant respiratory depression in animals at the dose rates normally used.
-Gastrointestinal system: induced vomiting and constipation.

Morphine
-It can given IV and SC.
-Not recommended for use in horses, cow, sheep, and goat.
-Dogs and cats: 0.1 to 0.5 mg/kg.

Pethidine
-Potency is one-tenth that of morphine.
-In dogs and cats 4-6 mg/kg
-In horses 1-2 mg/kg

Fentanyl
-Potent analgesic (approximately 100 times more potent than morphine).

Drug combinations

1-Acepromazine + opioid
2-Medetomidine + opioid
3-Medetomidine + benzodiazepine
4-Opioid + benzodiazepine

Monitoring of the premedicated animals

- Cardiovascular system: heart rate, heart rhythm and Pulsation (pulse oximetry, Electrocardiographic).
- Respiratory system: rate and depth of respiration.
- Body temperature.
- Blood glucose.
- Gas analyzers.

Neuroleptanalgesia

The concept of neuroleptanalgesia involves the combination of a neuroleptic agent (benzodiazepines, butyrophenones, phenothiazines) with a potent opioid analgesic. This technique can be used in two ways. At low doses, it is commonly used for sedation and premedication via the intramuscular route before general anesthesia and at high doses, usually given by intravenous injection, the combinations can be used to produce sufficient CNS depression to allow endotracheal intubation and moderate surgical stimulation. The excitatory effects of high doses of opioids make this technique unsuitable for healthy cats, although it has been used in severely debilitated cats. Neuroleptanalgesia is characterized by analgesia, suppression of motor activity, suppression of autonomic reflexes and behavioral indifference, but not 'true' unconsciousness. Neuroleptanalgesia combinations are not suitable for routine induction of anesthesia in healthy, young animals, because a true anesthetic state is not reached unless followed by another anesthetic agent (nitrous oxide, volatile or injectable anesthetic), or unduly high doses are used. However, in high-risk and debilitated patients, tranquillizer- opioid combinations can have a profound effect. The advantages of this technique are a wide safety margin and partial reversibility (by using opioid antagonists). The disadvantages are: possible occurrence of panting or marked respiratory depression (requiring artificial ventilation); occurrence of spontaneous movements; sensitivity to noise and light; and possible postoperative behavioral changes, especially when used as the sole anesthetic agents. Bradycardia related to the high dose of an opioid can be treated with parasympatholytic agents (atropine, glycopyrronium).