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AN OVERVIEW OF DISSOCIATIVE ANESTHESIA

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ABSTRACT

Dissociative anaesthetic is other name for the drug Ketamine. Apart from anaesthetic, ketamine has wide range of applications. Ketamine is initially used as anaesthetic but later it is also used for analgesia and other pharmacological effects like dementia, Alzheimer's disease, cognitive function, bronchodilation, depression. It works by blocking NMDA (N- methyl D- aspartate) receptors and also inhibits sodium and potassium channels, opioid receptors, serotonin reuptake. Ketamine is also used in obese people instead of opioids. As the use of ketamine is being increased, the usage of opioid is decreased. It is the only intravenously administered general anaesthetic which is having other pharmacological effects. Ketamine has also role in treating depression. Ketamine at sub-anaesthetic doses (0.25 mg/kg) can be safely used as adjunct analgesic to the women to treat postsurgical pain or post-operative pain for the first 24-48 hrs after the caesarean section.This article attempts to review about the dosage, route of administration, mechanism of action, pharmacokinetics, applications or uses, side effects, contraindications, interactions of the ketamine.

KEYWORDS: Dissociative anaesthetic, Ketamine, N-Methyl D-Aspartate receptors.

INTRODUCTION

Dissociative anaesthetic is other name for the drug Ketamine. It has been used in clinical practice since 1970.[1] It is the drug which is administered intravenously and also with various pharmacological effects like anaesthesia, analgesia, depression, cognitive function, disorders of the immune system. Now a days, the role of Ketamine has been increased in clinical practice in treating various conditions.[2,3]

CATEGORY

NMDA (N-methyl-D-aspartate) receptor antagonist, General anaesthetic.

BRAND NAMES

It is available in various brands. Some of them are Anaket, Anasket, Anesketin, Brevinase, Katalar, Keta, Ketalar, Ketalin, Ketalor, Ketamav, Ketamax, Ketamil, Ketanarkon, Ketanest, Ketanest-S, Ketaset, Ketavet, Ketmine HCl, Ketolar, Ktmin, Narkamon, Pan-Ketamine, Tekam, Vetus Ketha-Thesia.[4]

ROUTE OF ADMINISTRATION

Clinically, it is administered through intravenous route, intramuscular routes. It is also administered intrathecally for analgesia. Oral and rectal routes are also used.

If the ketamine is used recreationally or experimentally, the most preferred route is intranasal route. Intramuscular, subcutaneous, intravenous routes are used for long term users.[4]

DOSAGE[4]

Surgical anaesthesia

- IV (Intravenous) - 1 to 4.5 mg/kg. It generally produces surgical anaesthesia within 30 seconds lasting for 5-10 minutes.
- IM (Intramuscular) - 6.5-13 mg/kg. It generally produces surgical anaesthesia within 3 to 4 minutes lasting for 12 to 25 minutes.

Analgesia: 0.2-0.75 mg/kg intravenously.

Subanaesthetic doses inducing psychotropic effects: 0.1 to 1.0 mg/kg IV, 25 to 200 mg IM.

Recreational users (snorting the powder): 60 and 250 mg.

MECHANISM OF ACTION

It mainly acts by inhibiting the NMDA receptors for producing anaesthetic effects. It also inhibits voltage gated sodium and potassium channels and inhibits dopamine reuptake. It also interacts with opioid receptors, nitric oxide pathway and adrenoreceptors for analgesic effects.[5]

PHARMACOKINETICS

Absorption: It is rapidly absorbed through intramuscular, intravenous and intranasal routes because of its high lipid solubility.

Distribution

Because of its high lipid solubility and low plasma protein binding, it easily crosses the blood brain barrier. The volume of distribution ranges from 1.5 to 3.2 l/kg.

Metabolism

The metabolism occurs in liver. It occurs through the pathway N-demethylation to norketamine.

Excretion

It is excreted renally. The elimination half-life is found to be 100-200 minutes.[3,4,5]

USES/APPLICATIONS[1,3]

Since 1970, Ketamine is used for anaesthesia, sedation. Apart from anaesthetic, it is used in following various clinical conditions.

1. Chronic pain or analgesia

Ketamine at sub-anaesthetic doses (0.25 mg/kg) can be safely used as adjunct analgesic to treat postsurgical pain or post-operative pain. Ketamine is used instead of administering opioids or non-steroidal anti-inflammatory drugs for relieving postsurgical pain.

2. Depression

Ketamine shows antidepressant effects and hence used in treating major depressive disorder and treatment resistant depression. It is used to treat both unipolar and bipolar disorders.

3. Dementia and Alzheimer's disease

In alzheimer's disease, we observe the glutamatergic hyperactivity receptors which resuls in excess glutamate in synaptic cleft. As ketamine is NMDA antagonist, it can used in treating Alzheimer's disease by inhibiting the activity glutamate receptors.

4. Cognitive function

Generally, cognitive impairment is observed during the short term use or single infusion of ketamine. But after the cessation of use of ketamine, it reverts to the healthy state of memory.

5. Bronchodilation

Because of bronchodilating property and high oxygen content of ketamine, it is used in treating reactive airway disease, bronchospasms and especially in intensive care units and operation theatres.

6. In low doses (IV 0.6 mg/kg) in combination with IV diazepam as an IV supplement, it is used in local and regional anaesthesia techniques including spinal anaesthesia in adults and children.

SIDE EFFECTS[2]

- Bluish lips or skin.
- Blurred vision.
- Cough.
- Troubled breathing
- Painful urination
- Chest pain or discomfort.
- Confusion as to time, place, or person.
- Visual hallucinations
- Vivid dreams
- Convulsion
- Laziness.
- Expanded heart rate.
- Respiratory depression

CONTRAINDICATIONS[16]

In following conditions, ketamine is used cautiously

- Hypersensitivity to ketamine
- HTN
- Stroke
- Intracranial haemorrhage
- In Patients less than 3yrs of age
- CHF, CAD
- Elevated intracranial pressure
- Elevated intraocular pressure
- Psychosis

- Hepatic impairment
- Acute alcoholism or chronic alcohol use
- Pregnancy (3rd trimester)

INTERACTIONS

Ketamine can cause interactions with drugs which cause CNS depression and the drugs which inhibit CYP 450 enzyme because the ketamine is metabolised by the enzymes from CYP 450. It is better to use avoid ketamine or use another alternative when it has to be administered with the drugs like cocaine, codeine, ethanol, hydrocodone, promethazine, trimethobenzamide. Serious interactions of ketamine can occur when administered with epinephrine, fentanyl, memantine, phenylephrine, phenelzine, selegiline, sodium oxybate.[16]

CONCLUSION

Ketamine in sub-anaesthetic doses can be used in various conditions. By considering the patient condition, interactions and contraindications, ketamine can be given safely to the patients in suitable doses. Ketamine can be used as adjuvant analgesic in preoperative procedures.

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