

# Research and Reviews: Journal of Medical and Health Sciences

## BRIEF REVIEW ON ANAESTHETIC DRUGS

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### Review Article

Received: 10/05/2015  
Accepted: 24/05/2015  
Published: 02/06/2015

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Keywords: Anaesthesia; anaesthetic; Brain; Bupivacaine; Benzodiazepines; General anaesthetics

### INTRODUCTION

An anesthetic is a drug that gives rise to anesthesia (temporary stage of unconsciousness). Anesthetic can also be defined as any agent that produces a local or general loss of sensation, including pain. Anesthetics achieve this consequence by acting on the brain, central nervous system (CNS) peripheral nervous system (PNS) to prevent responses to sensory stimulation. The unresponsive state thus induced is known as anesthesia [1-5].

#### Types of anesthetics

Generally anesthetics are classified in two categories namely

1. Local anesthesia
2. General anesthesia.

#### Local anesthetics

Local anesthesia induces loss of sensation by reversibly blocking transmission of nerve impulses along the nerves in a small part of the body which is to be operated. Local anesthesia's numbs part of the body without loss of consciousness where the patient is awake and alert [6-8].

#### Local anesthetics are classified as:

In general so many local anesthetics are in practice. Some of them are briefly explained below. Based on their efficiency and side effects these anesthetics are elucidated [8-10].

#### Bupivacaine

Bupivacaine is a local anesthetic drug that blocks the conduction of nerve impulses which sends pain signals to brain. Bupivacaine reduces the flow of sodium in and out nerves. This blockage leads first to a loss of sensation of pain, then temperature, touch, deep pressure. it is used as a local (in only one area) anesthetic.

Bupivacaine is used as an anesthetic to produce numbness during labor, surgery, dental or certain medical procedures [10-14].

#### Side effects of Bupivacaine:

Some of the side effects are listed below which can lead to medical emergency. So it is better to get medical help whenever you feel discomfort.

Feeling anxious, bewildered or like you might pass out; problems with speech or vision; convulsions; weak pulse; Back pain; weak or shallow breathing; fast heart rate [15-16].

### ***Cocaine***

Cocaine is a powerful addictive stimulant drug made from the leaves of the coca plant. Cocaine in olden days was used as numbing agent to reduce the pain in nose and mouth surgery. Currently it is used for nasal, eye and lacrimal duct surgery. In this case dissolved cocaine is soaked into a ball of cotton wool, which is placed in the nostril for the 8–15 minutes immediately before performing the procedure. [17-23]

### ***Side effects of cocaine***

Excessive exposure to cocaine leads to addiction and adversely fatal effects. Cocaine affects the body in a variety of ways. It narrows blood vessels, dilates pupils, increases body temperature, heart rate, and blood pressure, headaches and gastrointestinal complications such as abdominal pain and nausea [23-29]. Most seriously, people who get addicted to cocaine can suffer heart attacks or strokes, which may lead to sudden death. These deaths are often a result of the cardiac arrest followed by an arrest of breathing [30-36].

### ***Levobupivacaine***

Levobupivacaine is recently introduced amino amide local anesthetic that is same with respect to structure of bupivacaine. Frequent Studies have indicated that levobupivacaine is well tolerated and has an efficacy reciprocal to bupivacaine for both anesthesia and analgesia. Levobupivacaine is associated less with central nervous system and cardiac toxicity in proportion to bupivacaine when equal concentrations were compared [37,38].

### ***Side effects of levobupivacaine***

Exposure to excessive quantities of bupivacaine mainly leads to adverse consequences in central nervous system (CNS) and cardiovascular effects. The effects may include CNS excitation (nervousness, dizziness, blurred vision, seizures, drowsiness, loss of consciousness and respiratory depression [39].

### ***Lidocaine***

Lidocaine is a local anesthetic used to induce anesthesia in a local region of the body to relieve from pain. Lidocaine alters signal conduction in neurons by blocking the fast voltage-gated Na<sup>+</sup> channels in the neuronal cell membrane which is responsible for signal propagation. These merely don't prevent signals send to the brain but before they begin it is prevented. Lidocaine is used to attain relieve from itching, burning, pain from skin inflammations. It is also injected as a dental anesthetic, or used as a local anesthetic for minor surgery [40-45].

### ***General anesthetic***

A general anesthetic is a drug that has the capacity to bring about a reversible loss of consciousness. Anesthetists administer these drugs to induce or maintain general anesthesia to facilitate surgery by relieving pain. Drugs used to induce anesthesia are given in vapors or gases (in inhalational form) or in injection (intravenously) [46].

General anesthetics are further classified into inhaled agents and intravenous agents (non-opioid) [47,48].

### ***Inhaled agents***

### ***Desflurane***

Desflurane is a halogenated drug, belongs to the group of medicines termed as general anesthetics is used to induce general anesthesia (loss of consciousness) before and during surgery to relieve from pain. Mostly desflurane is given to patient in vapor form by inhalation technique. It has low solubility levels in blood and tissues [49, 50].

#### ***Side Effects of desflurane***

As all drugs or medicines have some side effects, so it is necessary to take desflurane dose in appropriate amount to avoid any side effects. Excess exposure to desflurane causes some side effects which are listed below.

Runny nose; tender, swollen glands in the neck; tightness in the chest; trouble breathing; trouble swallowing; voice changes; etc. [51].

### ***Isoflurane***

ISOFLURANE is a halogenated, non-inflammable, vaporizing anesthetic drug which induces and maintains general anesthesia by depression of the central nervous system (CNS) and results in loss of consciousness. Isoflurane comes under group of medicines known as general anesthetic. It is an inhalation anesthetic having a mildly pungent, musty, ethereal odor [52].

#### ***Side effects of isoflurane***

As all drugs or medicines have some side effects, so it is necessary to take desflurane dose in appropriate amount to avoid any side effects. Excess exposure to desflurane causes some side effects which are listed below [53].

Excess use of isoflurane in individuals may give rise to some side effects such as in infants and young children may lead to significant neurodegeneration; respiratory depression, hypotension and arrhythmias. Shivering, nausea, vomiting and ileus have been observed in the postoperative period [54].

### ***Nitrous oxide***

Nitrous oxide is commonly known as laughing gas, N<sub>2</sub>O. It is used in surgery and dentistry for its anesthetic and analgesic effects. Nitrous oxide is in a volatile form and administered by inhalation [55]. As a general anesthetic, it is very weak to induce anesthesia so it is not used as a single agent. So it is used in combination with other general inhalational gases. It is mostly used in pediatric dental procedures [56-58].

#### ***Side effects of Nitrous oxide***

Excess use of nitrous oxide in individuals may give rise to some side effects such as the incidence of nausea and vomiting increases with the duration of anesthesia. The gas is a powerful analgesic in concentrations above 20%. It decreases myocardial contractility in vitro; It expands air-filled cavities because it is 40 times as soluble as nitrogen it can also cause the expansion of gas-containing bowel [59-60].

### ***Intravenous agents (non-opioids)***

There are many drugs that can be used intravenously to produce anesthesia. These non-opioid drugs are administered into the veins to induce anesthesia [61].

### ***Benzodiazepines***

Benzodiazepines are intravenous (non-opioids) class of drugs primarily used for inducing general anesthesia. The exact mechanism of action of benzodiazepines is not clear, but they appear to work by affecting neurotransmitters in the brain. It suppresses the activity of nerves. Benzodiazepine slows down the activity of the central nervous system and the information processing (messages) travelling between the brain and the body [62].

### ***Diazepam***

Diazepam is intravenous non-opioid substance belongs to a class of medicines termed as benzodiazepines. It is a medicine which helps to treat feelings of anxiety by making people feel less agitated and less tense.

It is given intravenously for short period of time but effect of these drug prolong to few hours or days. It makes subject to feel sleepy [63].

### ***Side effects of diazepam***

Excess exposure of nitrous oxide in individuals may give rise to some side effects such as memory problems; drowsiness; tired feeling blurred vision; double vision; new or worsening seizures; etc. [64].

### ***Ketamine***

Ketamine is a drug used mainly for inducing and maintaining anesthesia. It is provided to the patient intravenously. It works in the brain to inhibit painful sensations. It acts on central nervous system by suppressing transmission of signals. Ketamine is used to put you to sleep for surgery to avoid pain and discomfort which may occur during surgical procedure. Ketamine does not produce muscular relaxation [65-73].

### ***Side effects of ketamine***

Excess of ketamine use leads to some possible common side effects which are mentioned below Severe allergic reactions (rash; hives; itching; abnormal breathing; tightness in the chest;); behavior changes; confusion; difficult, frequent, or painful urination; double vision; fainting; fast, slow, or irregular heartbeat; hallucinations; drowsiness; It also tends to raise heart rate and intracranial and intraocular pressure etc. [73-79].

### ***Midazolam***

Midazolam is a benzodiazepine sedative drug used to induce general anesthesia for the person who is undergoing a minor surgery, dental procedures. Midazolam is intravenously administered for induction of general anesthesia prior to administration of other anesthetic agents [80-82].

It acts on central nervous system as depressant and suppresses the signals from the brain to body by inducing general anesthesia to avoid pain and discomfort during surgery [83].

### ***Side effects of midazolam***

Long-term use of benzodiazepines can leads to long-lasting deficits of memory, blurred vision, abnormal blood pressure, asthma, nausea, vomiting, headache, etc. [85].

### ***Propofol***

Propofol is a non-opioid intravenous anesthetic agent used to induce general anesthesia. propofol is the generic name for Diprivan an injectable drug.

Propofol is used to put people to sleep before surgery to prevent pain and discomfort which may occur during surgical procedures. The deaths of two celebrities, Joan Rivers (comedian) and Michael Jackson (king of pop, an American singer), have been linked to misuse of propofol. So it is better to make use of Propofol health care workers who can determine your proper dosage <sup>[86-88]</sup>.

### ***Side effects of propofol***

Some common side effects of propofol are mild itching or rash; fast or slow heart rate; slight burning or stinging around the IV needle and some severe bad effects are a light-headed feeling (like you might pass out) even after feeling awake; weak or shallow breathing; severe pain or discomfort where the injection is given <sup>[89-90]</sup>.

### ***Etomidate***

Etomidate is a non-opioid intravenous agent used to Induce general anesthesia and with other medications to provide anesthesia during short surgeries.

Etomidate is a hypnotic agent and intravenously given to induce or maintain sleep during and after surgery.it was one of the most frequently used sedative hypnotic agents for maintaining sedative consciousness <sup>[91]</sup>.

### ***Side effects of etomidate***

Pain at the injection site; eye movement; skeletal muscle movements (e.g. myoclonic) <sup>[92]</sup>.

### ***Intravenous opioids***

Intravenous Opioids are routinely used to deal with moderate to severe pain occurred during surgical or other medical procedures. Opioids are the world's oldest known drugs in practice which functions by binding to opioid receptors <sup>[93]</sup>.

### ***Buprenorphine***

Buprenorphine is a narcotic analgesic given intravenously to the patients to induce anesthesia to relieve from pain during surgery. It functions by suppressing the pain signals induced from brain to the body during surgery to decrease pain <sup>[94]</sup>.

### ***Side effects of buprenorphine***

These are the possible side effects of Buprenorphine Constipation; dizziness; drowsiness; headache; nausea; sweating; vomiting; Severe allergic reactions; difficulty in breathing; tightness in the chest; swelling of the mouth, face, lips, or tongue; anxiety; dark urine; abnormal heartbeat<sup>[95]</sup>.

### ***Morphine***

Morphine is an intravenous opioids anesthetic substance used to induce anesthesia to avoid pain and discomfort during surgical or medical procedures. Morphine is used as general anesthesia; a substance that puts you to sleep if you need to have a surgery to avoid pain. Morphine is one of the most potent pain relievers <sup>[96]</sup>.

### ***Side effects of morphine***

Like everything else, too much of morphine is not good.it has some side effects. It can cause constipation; slow heart rate; lead to cardiac arrest; sighing can cause blood pressure to fall; feel faint; things look blurred; shortness of breath <sup>[97]</sup>.

### ***Fentanyl***

Fentanyl is a narcotic opioid used to prevent pain raised during surgical procedure. It is a potent pain reliever administered intravenously to induce anesthesia [98].

#### ***Side effects of fentanyl***

Excess exposure to fentanyl cause some side effects such as respiratory depression, apnea, rigidity, and bradycardia; hypertension, hypotension, dizziness, blurred vision, nausea, emesis, diaphoresis, pruritus, urticarial, laryngospasm [99].

### ***Remifentanyl***

Remifentanyl is a narcotic opioid used to prevent pain raised during surgical procedure. It is a pain reliever administered intravenously to induce anesthesia. It is Unique, very short-acting opioid, rapidly cleared by blood and tissue esterase. Remifentanil provides fast, clear-headed recovery. Recovery with remifentanil is more rapid than with fentanyl [100].

#### ***Side effects of remifentanyl***

Hives, difficult breathing, swelling of your face, lips, tongue, or throat nausea, vomiting, shivering dizziness, vision problems, itching, sweating.

### ***Muscle relaxants***

Muscle relaxants are medicines that block transference of nerve impulses to the muscles referred as neuromuscular blocking agents. It is used during anesthesia administered to the patient intravenously but do not provide pain relief. It temporarily causes the paralysis of the affected skeletal muscles [101].

### ***Atracurium***

Atracurium is an intermediate-acting neuromuscular blocking agent. It functions by blocking the signals between your nerves and your muscles to facilitate medical procedure. It are given before general anesthesia to keep your body still during surgery. It is muscle relaxant in the category of non-depolarizing neuromuscular-blocking drugs administered intravenously to facilitate endotracheal intubation [102].

#### ***Side effects of atracurium***

The possible side effects of atracurium are Histamine release, reflex tachycardia; cutaneous flush Bronchospasm; and Laudanosine; etc [103].

### ***Cisatracurium***

Cisatracurium is an intermediate-acting neuromuscular blocking agent. It is muscle relaxant in the category of non-depolarizing neuromuscular-blocking drugs administered intravenously. It functions by blocking the signals between your nerves and your muscles to facilitate medical procedure. It is given before general anesthesia to keep your body still during surgery It induces muscle relaxation to facilitate endotracheal intubation, mechanical ventilation [104].

#### ***Side effects of Cisatracurium***

The possible side effects of cisatracurium are such as slow heart rate; dizziness; flushing (warmth, redness, or tingly feeling) [105].

## CONCLUSION

Anesthesia is a very safe and reliable technique to avoid pain and discomfort during and after surgery. There are many techniques for the application and delivery of anesthetics to induce anesthesia and most of them are effective and in practice safely. However, as we have learned, there are some risks and possible side effects. So it is better to have anesthesia and anesthetics under medical expert's supervision to avoid complications.

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