Fentanyl

Fentanyl is an opioid receptor agonist with very high potency. This drug is indicated for the induction of anesthesia, management of chronic pain in patients who have become tolerant to weaker agents, and breakthrough pain in cancer patients. Side effects of this drug include CNS depression, respiratory depression, constipation, and miosis. This drug has high addictive potential, and thus patients should be assessed for addiction risk and counseled beforehand.

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Mechanism of Action

Opioid Receptor Agonist

Poppy-droid Receptor Dragonist

Fentanyl is a strong agonist at all opioid receptors, but acts most strongly on the mu subtype. On the presynaptic membranes of neurons, mu receptor stimulation inhibits the influx of calcium. This prevents calcium from binding to intracellular vesicles, preventing their exocytosis. Postsynaptically, receptor stimulation hyperpolarizes neurons by increasing potassium efflux. This means that the cells are much more resistant to activation.

High Potency

High Pot

Fentanyl is one of the strongest opioids available for use today. It is approximately 100 times as potent as morphine.

Indications

Anesthesia Induction

A-nest Induction-duck

One of fentanyl's most common uses is in the induction of anesthesia for surgeries or procedures. Sufficiently high doses of fentanyl, when administered intravenously, will induce total body sedation and anesthesia. Following this initial induction, the patient should be administered a secondary agent for maintenance of anesthesia.

Chronic Pain

Crone with Pain-bolts

Patients with chronic pain are often prescribed opioid analgesics. Over time, however, they will develop a tolerance to these drugs. When pain is not sufficiently controlled by first-line agents, patients may be prescribed fentanyl in the form of transdermal patches.

Breakthrough Pain

Breakthrough Pain-bolt

Breakthrough pain is a phenomenon that occurs in cancer patients. These patients often suffer from chronic pain controlled by opioids. Occasionally, these patients will suffer from acute pain exacerbations not relieved by their prescribed medications on a scheduled basis. For these patients, sublingual fentanyl patches or lozenges may be given for acute relief.

Side Effects

CNS Depression

Deflated CNS-brain

As fentanyl has an inhibitory effect on neurons, it may cause central depression and sedation. Patients should be advised against operating machinery or driving while under the effects of this drug.

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Respiratory Depression

Deflated Lungs

Respiratory depression is one of the most notorious side effects of fentanyl. Inhibition of neuronal firing in the respiratory center in the medulla leads to decreased respiratory drive. This can lead to potentially life threatening hypoxemia.

Constipation

Corked Con-toilet

Opioid receptor stimulation in the enteric plexuses leads to inhibition of motility. Patients who are prescribed opioids should be advised of this and concurrently prescribed a stool softener or laxative.

Miosis

Mice-eyes

Activation of opioid receptors in the eye can lead to excessive contraction of the sphincter pupillae muscles, leading to the classic “pinpoint pupils” seen in opioid-intoxicated patients. This is primarily due to kappa receptor activation.

Considerations

Addiction

Addict in Attic

Before starting a course of opioids, patients should be educated on the potential risks of long-term treatment. Over time, tolerance and addiction may develop. This consequence is potentially devastating, and should be avoided if possible.

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