Benzodiazepines Overview

Benzodiazepines are a class of drugs with a myriad of indications. They are commonly used as first-line agents for acute status epilepticus and as second-line agents in eclamptic seizures. Other uses include as treatment for acute anxiety and alcohol detoxification. These drugs are recognized by the "-pam" suffix, as common drugs are diazepam, lorazepam, triazolam, temazepam, oxazepam, midazolam, and chlordiazepoxide. These drugs exert their action by binding to the BZD site on the GABAA Cl- channels, leading to increased frequency of the Cl- channel opening. This leads to neuronal membrane hyperpolarization and, consequentially, decreased CNS excitability. Side effects of these drugs include decreased REM sleep, CNS depression, and dependence. Benzodiazepines have the potential for overdose but can be treated by the antidote flumazenil.

PLAY PICMONIC

Indications

First Line for Status Epilepticus

First-place Statue-Caesar

Benzodiazepines are first-line drugs for the treatment of acute status epilepticus, as they are fast-acting, strong, and potent anticonvulsant drugs.

Anesthesia Induction

A-nest Induction-duck

Midazolam is an intravenously administered benzodiazepine used to help induce anesthesia. While this drug has no anesthetic properties, it is helpful because it allows patients to relax and causes anterograde amnesia.

Anxiety

Anxiety-bag

Many times, benzodiazepine drugs are used as acute anxiolytics. These drugs have a rapid onset and provide moderate relief but are not used long-term due to the risk of dependence.

Eclampsia

E-clamp on pregnant-woman

Benzodiazepines are used to treat women suffering from eclampsia as a second-line medication if magnesium sulfate ($MgSO_4$) is ineffective or contraindicated. Eclampsia is a life-threatening complication of pregnancy characterized by hypertension, proteinuria, and tonic-clonic seizures.

Detoxification

D-tux Detoxifying

These medications are useful in treating patients who are undergoing alcohol detoxification in order to prevent withdrawal symptoms. Patients undergoing alcohol withdrawal are at risk for delirium tremens and seizures, which can be treated by benzodiazepines such as diazepam and chlordiazepoxide.

Mechanism of Action

'-zepam' and '-zolam' Suffix

Z-Pam Anderson and Z-lamb

Benzodiazepines are recognizable because of the '-zepam' and '-zolam' suffix in most drug names. Common benzodiazepine drugs are diazepam, lorazepam, triazolam, temazepam, oxazepam, midazolam. Chlordiazepoxide is a benzodiazepine which does not have this trait in its name.

Increase Frequency of Cl- Channel Opening

Up-arrow Revolving-door Chlorine-dispenser Channel

These drugs act by binding to a specific site on the GABAA Cl- receptor complex. This binding leads to Cl- channel opening with increased frequency, yielding a higher chloride conductance. This causes neuronal membrane hyperpolarization and decreased CNS excitation.

Side Effects

Decrease REM Sleep

Down-arrow Sleeping Rum

Benzodiazepines decrease REM sleep, and many patients complain of less restful sleep. Though patients sleep longer while on benzodiazepines, the amount of REM sleep decreases overall and causes increased latency to REM sleep.

CNS Depression

Deflated CNS-brain

Patients taking these medications can have symptoms of CNS depression. Furthermore, when combined with alcohol, profound CNS depression can occur with these drugs. Alcohol binds to GABAA, as do benzodiazepines, explaining these additive effects.

Dependence

Dependence Ball-and-chain

Patients may exhibit dependence when using benzodiazepines. This side effect may manifest as an inability to cope without the drug, tolerance to its effects, or withdrawal symptoms when not taking it.

Antidote

Flumazenil for Overdose

Flute-mace-nail

Flumazenil is the antidote for benzodiazepine overdose. It acts as a competitive inhibitor to benzodiazepines on the BZD site of the GABA receptor.