A Comprehensive review of pantoprazole – Treatment and Prevention to Peptic ulcers

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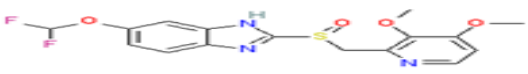
***Abstract*—pantoprazole is a proton pump inhibitor used in treatment of acute peptic ulcers. It is also used for the reflux oesophagitis and duodeneal ulcers. pantoprazole reduces the amount of acid your stomach makes. Since scientific data have highlighted that pantoprazole is taken to prevent and treat stomach ulcers and sometimes, pantoprazole is taken for a rare condition caused by a tumour in the pancreas or gut called zollinger – Ellison syndrome. This article aim is to provide an comprehensive review of pantoprazole and understanding it's mechanism of action and adverse effects and also used for the treatment and prevention of peptic ulcers.**

***Index Terms*—pentoprazole, peptic ulcer, proton pump inhibitor, Zollinger – Ellison syndrome.**

I. INTRODUCTION

Pantoprazole is a first-generation proton pump inhibitor. The IUPAC name for pantoprazole is 6-(difluoromethoxy)-2-[(3,4-dimethoxypyridin-2-yl) methylsulfinyl]-1H-benzimidazole (PPI) used for the management of gastroesophageal reflux disease (GERD), for gastric protection to prevent recurrence of stomach ulcers or gastric damage from chronic use of NSAIDs, and for the treatment of pathological hypersecretory conditions including Zollinger-Ellison (ZE) Syndrome. It can also be found in quadruple regimens for the treatment of *H. pylori* infections along with other antibiotics including amoxicillin, clarithromycin, and metronidazole, for example. Its efficacy is considered similar to other medications within the PPI class



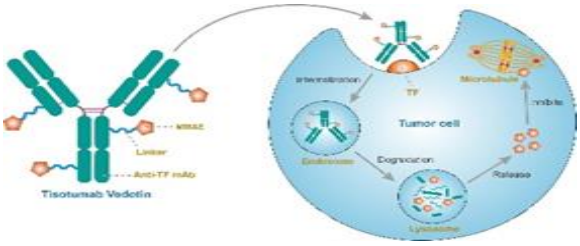
including omeprazole, esomeprazole, lansoprazole, dexlansoprazole, and rabeprazole.Pantoprazole exerts its stomach acid-suppressing effects by preventing the final step in gastric acid production by covalently binding to sulfhydryl groups of cysteines found on the (H+, K+)-ATPase enzyme at the secretory surface of gastric parietal cell. This effect leads to inhibition of both basal and stimulated gastric acid secretion, irrespective of the stimulus. As the binding of pantoprazole to the (H+, K+)-ATPase enzyme is irreversible and new enzyme needs to be expressed in order to resume acid secretion, pantoprazole's duration of antisecretory effect persists longer than 24 hours.Due to their good safety profile and as several PPIs are available over the counter without a prescription, their current use in North America is widespread. Long term use of PPIs such as pantoprazole have been associated with possible adverse effects, however, including increased susceptibility to bacterial infections (including gastrointestinal C. difficile*)*, reduced absorption of micronutrients including iron and B12, and an increased risk of developing hypomagnesemia and hypocalcemia which may contribute to osteoporosis and bone fractures later in life.

PPIs such as pantoprazole have also been shown to inhibit the activity of dimethylarginine dimethylaminohydrolase (DDAH), an enzyme necessary for cardiovascular health. DDAH inhibition causes a consequent accumulation of the nitric oxide synthase inhibitor asymmetric dimethylarginie (ADMA), which is thought to cause the association of PPIs with increased risk of cardiovascular events in patients with unstable coronary syndromes.

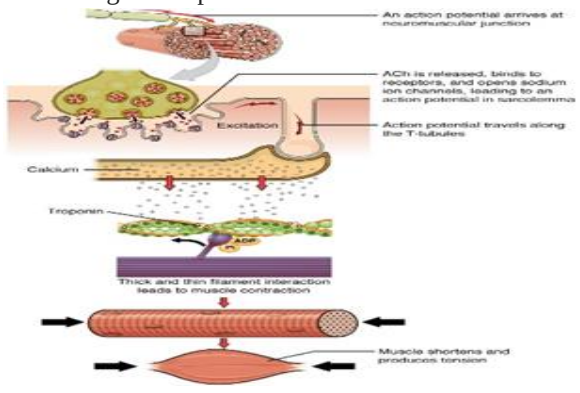
Pantoprazole doses should be slowly lowered, or tapered, before discontinuing as rapid discontinuation of PPIs such as pantoprazole may cause a rebound effect and a short-term increase in hypersecretion.

II. MECHANISM OF ACTION

The mechanism of action of pantoprazole is to inhibit the final step in gastric acid production. In the gastric parietal cell of the stomach, pantoprazole covalently binds to the H+/K+ ATP pump to inhibit gastric acid and basal acid secretion. The covalent binding prevents acid secretion for up to 24 hours and longer.



Pantoprazole is metabolized in the liver by the cytochrome P450 system. Metabolism mainly consists of demethylation by CYP2C19 followed by sulfation. Another metabolic pathway is oxidation by CYP3A4. Pantoprazole metabolites are not thought to have any pharmacological significance. It is usually given with a prokinetic drug because of inactivity in the acidic environment of the stomach. Pantoprazole binds irreversibly to H+K+ATPase (proton pumps) to suppress the secretion of acid. Due to irreversible binding of the pumps, new pumps have to be made before acid production can be resumed. The drug's plasma half-life is about two hours. After administration, the time for the drug to reach peak plasma concentrations is 2 to 3 hours. The percentage of the drug that is protein bound is 98%.



III. PANTOPRAZOLE USES

Pantoprazole is used in the treatment of acidity, heartburn, gastroesophageal reflux disease (acid reflux) and peptic ulcer disease. Pantoprazole is used for short-term treatment of erosion and ulceration of the esophagus for adults and children five years of age and older caused by gastroesophageal reflux disease. It can be used as a maintenance therapy for long-term use after initial response is obtained, but there have not been any controlled studies about the use of pantoprazole past a duration of 12 months. Pantoprazole may also be used in combination with antibiotics to treat ulcers caused by Helicobacter pylori. It can also be used for long-term treatment of Zollinger-Ellison syndrome. It may be used to prevent gastric ulcers in those taking NSAIDs.

IV. SIDE EFFECTS OF PENTOPRAZOLE

Diarrhea, Flatulence, Headache, Nausea, Vomiting, Dizziness, Abdominal pain, Joint pain, Injection site reaction Common side effects include headaches, diarrhea, abdominal pain, and joint pain. More serious side effects may include severe allergic reactions, a type of chronic inflammation known as atrophic gastritis, Clostridioides difficile colitis, low magnesium, and vitamin B12 deficiency. Use in pregnancy appears to be safe. Pantoprazole is a proton pump inhibitor that decreases gastric acid secretion. It works by inactivating (H+/K+)-ATPase function in the stomach.

V. TREATMENT OF PEPTIC ULCER

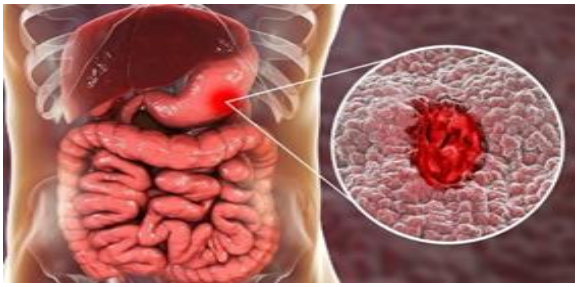
In patients with bleeding peptic ulcers, the use of high-dose pantoprazole (80 mg IV bolus followed by an infusion at a rate of 8 mg/hour for 72 hours) following successful endoscopic therapy was effective in reducing rebleeding, transfusion requirements, and hospital stay in a double-blind, placebo-controlled, prospective trial.[67]

initiation of IV pantoprazole in patients with a high risk of ulcer bleeding following urgent endoscopic therapy.[73] IV pantoprazole (80 mg bolus followed by 8 mg/hour for 3 days) demonstrated higher effectiveness (a 17% decrease in rebleeding) than no treatment. In addition, data from the USA and Canada suggest that administering high-dose IV PPI for 3 days in patients with bleeding ulcers after successful endoscopic hemostasis.

Zollinger-Ellison syndrome

The goals of treatment in patients with Zollinger-Ellison syndrome (ZES) are medical control of gastric

acid hypersecretion and surgical resection of the tumor. Inpatient care is aimed at first controlling the gastric acid hypersecretion. Once gastric acid hypersecretion is controlled, imaging studies should be obtained to localize the tumor and determine tumor extent.



If the patient is acutely ill, immediate control of gastric acid hypersecretion can be achieved with intravenous proton pump inhibitors. Previously, this was accomplished with histamine 2 (H2) receptor blockers. Intravenous pantoprazole was approved recently by the US Food and Drug Administration. Proton pump inhibitors are superior to H2 blockers for the control of gastric acid hypersecretion.

Patients who are candidates for surgical resection should be referred for resection of the tumor.

For patients with metastatic disease, chemotherapy, interferon, and octreotide may be helpful. The response to these agents in most studies has been low. Liver transplantation for hepatic metastasis also has been reported. For patients with a single confined liver metastatic lesion, surgical resection may be attempted

VI. PREVENTION OF PEPTIC ULCER

Pantoprazole 40 mg once daily was well tolerated and is more effective than placebo in the prevention of peptic ulcers in patients with rheumatic diseases who require continuous, long-term, treatment with NSAIDs.

Certain lifestyle choices and habits can reduce your risk of developing peptic ulcers. These include:

- not drinking more than two alcoholic beverages a day
- not mixing alcohol with medication
- washing your hands frequently to avoid infections
- limiting your use of ibuprofen, aspirin, and naproxen (Aleve)
- Maintaining a healthy lifestyle by quitting smoking cigarettes and other tobacco use and eating a balanced diet rich in fruits, vegetables, and whole grains will help you prevent developing a peptic ulcer.

VII. CONCLUSION

Pantoprazole is a fundamental proton pump inhibitor. It is used for the treatment of various types of stomach ulcers. Pantoprazole reduces the amount acid produced in the stomach. ongoing research provides pantoprazole mechanism of action and clinical uses and also this research gives the information about Zollinger- Ellison syndrome and treatment and prevention of peptic ulcers.

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