



A REVIEW: ANTI-ULCER POTENTIAL

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ABSTRACT:

Peptic ulcer occurs due to an imbalance between the aggressive (acid, pepsin and *Helicobacter pylori*) and the defensive (gastric mucus and bicarbonate secretion, prostaglandins, innate resistance of the mucosal cells) factors. Gastric ulcers are usually single and less than 2 cm in diameter. A minority of patients with gastric ulcers exhibit acid hyper secretion. In these persons, the ulcers are usually near the pylorus and are considered variants of duodenal ulcers. Several minutes after food enters the stomach, gentle, rippling, peristaltic movements called mixing waves pass over the stomach every 15 to 25 seconds. These waves macerate food, mix it with secretions of gastric glands and reduce it to a soupy liquid called chyme. Proton pumps powered by H⁺ / K⁺ ATPase actively transport H⁺ into the lumen while bringing potassium ions (K⁺) into the cells. At the same time Cl⁻ and K⁺ diffuse out through Cl⁻ and K⁺ channels in the apical membrane. One of the most interesting substances that has been obtained from chilly peppers and present in spicy plants such as ginger or black pepper is capsaicin. This substance acts on sensory neurons to stimulate their membrane receptors, predominantly vanilloid (VR)-1 receptors, and release various kinins such as substance P. Chamomile also may be effective in relieving inflamed or irritated mucous membranes of the digestive tract and in promoting digestion. The plant part of *C. sativus* like Ripe raw fruits are said to cure spure and in Indo-China cook immature fruits are given to children to treat dysentery. The seed is cooling, diuretic, tonic and anthelmintic. Seeds are used as taeniicide. The leaf juice is used to treat dyspepsia in children. Leaves along with cumin seeds are administered for throat infection. A decoction of root is diuretic.

Keywords: Gastric ulcers, Peptic ulcer, *C. sativus*, Anti-ulcer.

1. INTRODUCTION:

Peptic ulcer disease is one of the most common gastrointestinal disorders, which causes a high rate of morbidity particularly in the population of non-industrialized countries.⁴ Peptic ulcer occurs due to an imbalance between the aggressive (acid, pepsin and *Helicobacter pylori*) and the defensive (gastric mucus and bicarbonate secretion, prostaglandins, innate resistance of the mucosal cells) factors.⁵

Peptic ulcers are an inflammation of the stomach or duodenal lining. Once believed to be caused by spicy food and stress, these have been found merely to be aggravating factor, and the real causes have been found by research to include bacterial infection (*Helicobacter pylori*) or reaction to various medications, particularly NSAIDs.

Treatment used to involved bed rest and antacids, modern treatment involves killing the *H. pylori*

bacteria or removing the underlying NSAID Smedication.⁶

Peptic ulcer and related acid peptic diseases affect up to 10 percent of the population with sufficient severity to prompt victims to seek medical attention. The most significant disorders requiring medical attention are peptic ulcer and gastro esophageal reflux disease.¹²

Peptic ulcers are relapsing lesions that are most often diagnosed in middle-aged to older adults, but they may first become evident in young adult life. They often appear without obvious precipitating conditions and may then, after a period of weeks to months of active disease, heal with or without therapy. Even with healing, however, the tendency to develop peptic ulcers remains, in part because of recurrent infections with *H. Pylori*. Although it is difficult to obtain estimates of the prevalence of

active disease, autopsy studies and population surveys indicate a prevalence of 6% to 14% for men and 2% to 6% for women. The male to female ratio for duodenal ulcers is about 3:1, and for gastric ulcers about 1.5 to 2.1.^{13,14}

1.2 Types of Peptic Ulcer:

1.2.1 Gastric ulcer

1.2.2 Duodenal ulcer

1.2.1 Gastric Ulcer:

Gastric ulcers are usually single and less than 2 cm in diameter. Ulcers on the lesser curvature are commonly associated with chronic gastritis, whereas those on the greater curvature are often related to non steroidal anti-inflammatory drugs. The edges tend to be sharply punched out, with overhanging margins. Deeply penetrating ulcers produce a serosal exudate that may cause adherence of the stomach to the surrounding structures. Scarring of ulcers in the prepyloric region may be severe enough to produce pyloric stenosis.

Physiological factors in Gastric Ulcers:

Gastric ulcers almost invariably arise in the setting of *H. pylori* gastritis or chemical gastritis that results in injury to epithelium. Most patients with gastric ulcers secrete less acid than do those with duodenal ulcers and even less than normal persons.

- The factors implicated include:
 - a) Back-diffusion of acid into the mucosa.
 - b) Decreased parietal cell mass, and
 - c) Abnormalities of the parietal cells themselves.

A minority of patients with gastric ulcers exhibit acid hyper secretion. In these persons, the ulcers are usually near the pylorus and are considered variants of duodenal ulcers. Interestingly, the intense gastric hyper secretion that occurs in the Zollinger-Ellison syndrome is associated with severe ulceration of the duodenum and even the jejunum but rarely with gastric ulcers.

1.2.2 Duodenal Ulcer:

Duodenal ulcers are ordinarily located on the anterior or posterior wall of the first part of the duodenum, within a short distance of the pylorus. The lesion is usually solitary, but it is not

uncommon to find paired ulcers on both walls, so called kissing ulcers.

➤ Physiological factors in Duodenal Ulcers:

- The maximal capacity for acid production by the stomach reflects total parietal cell mass. Both parietal cell mass and maximal acid secretion are increased up to twofold in patients with duodenal ulcers. However, there is a large overlap with normal values and only one third of these patients secrete excess acid.
- The pH of the duodenal bulb reflects the balance between the delivery of gastric juice and its neutralization by biliary, pancreatic and duodenal secretions. The production of duodenal ulcers requires an acidic pH in the bulb, that is, an excess of acid over neutralizing secretions. In ulcer patients, the duodenal pH after meal decreases to a lower level and remains depressed for a longer time than that in normal persons.
- Impaired mucosal defenses have been invoked as contributing to peptic ulceration. The mucosal factors, including the function of prostaglandins, may or may not be similar to those protecting the gastric mucosa.¹⁸

1.3 Stomach:

Stomach is a hollow organ situated just below the diaphragm on the left side in the abdominal cavity. When empty, its volume is 50ml and normally it can expand to accommodate 1 to 1.5 liters of solids and liquids. Gastric juice is the mixture of secretions from different glands of the stomach.

Its volume ranges from 1200 to 1500 ml/day. Gastric juice is highly acidic with pH of 0.9 to 1.2. The acidity of gastric juice is due the HCl. The specific gravity ranges from 1.002 to 1.004.

Composition: It contains 99.5% of water and 0.5% solids. The solids are organic and inorganic substances.

Organic substances:

Gastric enzymes: The enzymes present in gastric juice are pepsin, rennin, lipase and other enzymes.

Pepsin: This is the major protein splitting enzyme in the gastric juice. the precursor of pepsin is pepsinogen.

Rennin: It is a milk curdling enzyme.

Gastric Lipase: It is a weak lipid splitting enzyme.

Other Gastric Juice: The other enzymes of gastric juice are the gelatinase and urase.

Gastric Mucus: It is secreted by mucus neck cells of the gastric glands and surface mucus cells in fundus, body and others parts of stomach. It is like a flexible gel covering the gastric mucus membrane. Mucus is a glycoprotein.

Intrinsic Factor: This is necessary for absorption of the extrinsic factor.¹⁹

Inorganic substances:

The Inorganic substances present in the gastric juice are HCL, sodium, calcium, potassium, chloride, bicarbonate, phosphate and sulfate.²⁰

1.3.1 Layers of Stomach:

- a. Serosa
- b. Connective tissue layer
- c. Viseral peritoneum
- d. Muscularis
- e. Oblique muscle layer
- f. Circular muscle layer
- g. Longitudinal muscle layer
- h. Submucosa
- i. Muscularis
- j. Gastric surface
- k. Epithelium
- l. Gastric glands
- m. Gastric pits
- n. Mucosa

The stomach wall is composed of the same four basic layers as the rest of the GIT, with certain modifications. The surface of the mucosa is a layer of simple columnar epithelial cells called surface mucous cells.

Epithelial cells extends down into the lamina propria, where they form columns of secretory cells called gastric glands that line many narrow channels called gastric pits. Secretions from several gastric glands flow into each gastric pit and then into the lumen of the stomach. The gastric glands contain three types of exocrine gland cells that secrete their products into the stomach lumen:

- Mucous neck cells,
- Chief cells, and
- Parietal cells.

Both surface mucous cells and mucous neck cells secrete mucus. Parietal cells produce intrinsic

factor, which is needed for absorption of vitamin B12, and hydrochloric acid. The chief cells secrete pepsinogen and gastric lipase. The secretions of the mucous cells, chief cells, and parietal cells form gastric juice, which totals 2000 - 3000 ml per day. In addition, gastric glands include a type of enteroendocrine cells, which is located mainly in the pyloric antrum and secretes the hormone gastrin into the bloodstream.²³

1.4 Digestion Process:

1.4.1 Mechanical Digestion

1.4.2 Chemical Digestion

1.4.1 Mechanical Digestion:

Several minutes after food enters the stomach, gentle, rippling, peristaltic movements called mixing waves pass over the stomach every 15 to 25 seconds. These waves macerate food, mix it with secretions of gastric glands and reduce it to a soupy liquid called chyme. Few mixing waves are observed in the fundus, which primarily has a storage function.

As digestion proceeds in the stomach, more vigorous mixing waves begin at the body of the stomach and intensify as they reach the pylorus. The pyloric sphincter normally remains almost, but not completely closed. As food reaches the pylorus, each mixing wave forces several milliliters of chyme into the duodenum through the pyloric sphincter. Most of the chyme is forced back into the body of the stomach, where mixing continues. The next wave pushes the chyme forward again and forces a little more into the duodenum. These forward and backward movements of the gastric contents are responsible for most mixing in the body.

Foods may remain in the fundus for about an hour without becoming mixed with gastric juice. During this time, digestion by salivary amylase continues. Soon however the churning action mixes chyme with acidic gastric juice, inactivating salivary amylase and activating lingual lipase, which starts to digest triglycerides into fatty acids and diglycerides.

1.4.2 Chemical Digestion:

Even through parietal cells secrete hydrogen ions (H⁺) and chloride ions (Cl⁻) separately into the stomach lumen; the net effect is secretion of hydrochloric acid (HCl). Proton pumps powered by

H⁺ / K⁺ ATPase actively transport H⁺ into the lumen while bringing potassium ions (K⁺) into the cells. At the same time Cl⁻ and K⁺ diffuse out through Cl⁻ and K⁺ channels in the apical membrane. The enzyme carbonic anhydrase, which is especially plentiful in parietal cells, catalyzes the formation of carbonic acid from water and carbon dioxide. As carbonic acid dissociates, it provides a ready source of H⁺ for the proton pumps but also generates bicarbonate ions (HCO₃⁻). As HCO₃⁻ builds up in the cytosol, it exits the parietal cell in exchange for Cl⁻ via Cl⁻/HCO₃⁻ antiporters in the basolateral membrane. HCO₃⁻ diffuses into nearby blood capillaries. This “alkaline tide” of bicarbonate ions entering the bloodstream after a meal may be large enough to slightly elevate blood pH and make urine more alkaline.

2. NATURAL REMEDIES:

2.1 Bari ilayachi (Elettariacardamomum and Amomumsubulatum):

Both drugs has gastro protective effect may be due to a decrease in gastric motility.⁵³ They cause relaxation of circular muscles which may protect gastric mucosa through flattening of the folds. This will increase the mucosal area exposed to narcotizing agents and release the volume of gastric agents on rugal crest. Such action has been postulated to play a role in cytoprotective effect of prostaglandins.⁵¹

2.2 Black Berry:

One of the most interesting substances that has been obtained from chilly peppers and present in spicy plants such as ginger or black pepper is capsaicin. This substance acts on sensory neurons to stimulate their membrane receptors, predominantly vanilloid (VR)-1 receptors, and release various kinins such as substance P. When applied in large dose capsaicin destroys selectively C-fiber neuronal endings leading to inactivation of sensory nerves and the loss of all reflexes in which these nerves are involved. In smaller dose, capsaicin is the potent gastroprotective agent and stimulant of gastric microcirculation.⁵²

2.3 Chamomile (Matricaria Recutita):

Chamomile is an herb that has been used traditionally as a mild sedative to relieve anxiety

and in treating digestive disorders including peptic ulcers. Chamomile also may be effective in relieving inflamed or irritated mucous membranes of the digestive tract and in promoting digestion. Chamomile has a soothing action on the digestive system. Its gentle soothing action is beneficial in digestive disorders like indigestion, acidity and peptic ulcers. It is also high in the flavonoid apigenin-another flavonoid that has inhibited growth of *H. pylori* in test tubes.⁵³

2.4 Dong quai (Angelica sinensis):

Animal studies suggest that dong quai may soothe ulcers, but studies in people are needed before a definitive conclusion can be drawn.

3. DESCRIPTION OF PLANT:

Botanical name: *Cucumis sativus*.

Common name: English- Cucumber,

Hindi – Kheera,

Sanskrit – Trapusa,

Malayalam – Vellari.

Family: Cucurbitaceae.



Figure 1: Plant *Cucumissativus*.

Distribution: It is distributed throughout India growing wild in places, also cultivated.

3.2 Plant details⁵⁴:

C. sativus is a creeping vine that roots in the ground and grows up trellises or other supporting frames, wrapping around supports with thin, spiraling tendrils. The plant is hairy and the root system is extensive and superficial. Leaves are alternate and simple. Flowers are yellow regular and unisexual. The matured fruit is about 30 cm long, roughly cylindrical and often slightly curved. The skin of the fruit is usually green, but in some cultivars white, brown or yellow is also available. This plant is originally from India but now is grown commercially all over the world. The fruit of this plant is often used for eaten fresh and pickling.

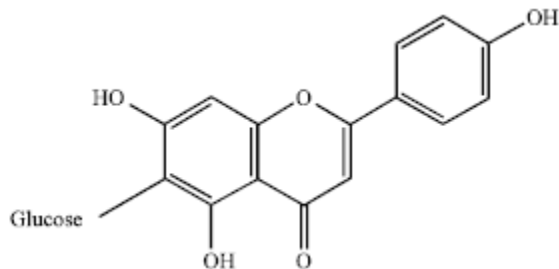


Figure 2: Structure of isovitexin

3.3. Chemical constituents:⁵⁵

Phytochemical screening of the fruit yielded alkaloids, glycosides, steroids, saponin, flavonoid, and tannin. It also contains dextrose (0.11 to 0.98%); saccharose (0.05 to 0.13%); fixed oil (0.11-0.98%). The seed contains fixed oil (Gurken oil) 25% consisting of oleic acid (58%), linolic acid (3.7%), palmitic acid (6.8%), stearic acid (3.7%); phytine; and lecithine. Pulp yields shikimate dehydrogenase.

3.4 Traditional uses⁵⁶

The fruit is demulcent, depurative, diuretic, emollient, purgative and resolvent. The fresh fruit is used internally for the treatment of blemished skin, heat rash etc., whilst it is used externally as a poultice for burns, sores, scalds, wounds and also as a cosmetic for softening, moisturizing and whitening the skin. Ripe raw fruits are said to cure spure and in Indo-China cook immature fruits are given to children to treat dysentery. The seed is cooling, diuretic, tonic and anthelmintic. Seeds are used as taeniicide. The leaf juice is used to treat dyspepsia in children. Leaves along with cumin

seeds are administered for throat infection. A decoction of root is diuretic.

Though some scientific studies have been carried out reveal its anti inflammatory activity, hypoglycaemic, antiulcer, antifungal, hypolipidemic and anti cancer.

4. CONCLUSION:

Peptic ulcer is defined as disruption of the mucosal integrity of the stomach and/ or duodenum leading to a local defect or excavation due to active inflammation. This intricate biologic system consist of mucus bicarbonate layer, surface epithelial cells and a rich sub mucosal micro-circulatory bed which provides bicarbonate ions to neutralize the acid generated by parietal cell secretion of hydrochloric acid

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