



By: Baharak Moshiree MD MSc, Mackenzie Jarvis PA-C, DMs, Atrium Health, Wake Forest, Digestive Health-Morehead Medical Plaza; Marissa Lombardi, International Foundation for Gastrointestinal Disorders, Mt. Pleasant, SC



International Foundation for Gastrointestinal Disorders (www.iffgd.org)

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Gastroparesis (GP) is a condition of slowed stomach emptying with no intestinal blockage. Healthcare providers often refer to this as delayed gastric emptying. This is referred to as a motility disorder where the stomach does not empty food as quickly as it should. The results are often symptoms of nausea, vomiting, fullness, abdominal pain and weight loss amongst others. Motility describes the movement of food and fluids through the gastrointestinal (GI) tract. GP has a significant impact on GI tract motility and is a debilitating condition. The resulting symptoms with GP can vary from mild to severe and in some patients can be life-threatening due to secondary conditions such as malnutrition. There are three specific groups of gastroparesis causes but many rare causes also exist: idiopathic, diabetic, and post-surgical.

Gastroparesis Symptoms

- **Abdominal pain** – dull to sharp pain in the upper stomach area that occurs inside the belly, often in the stomach or intestines.
- **Nausea** – a feeling of sickness felt in the abdomen, stomach, chest, or head with feeling the need to vomit.
- **Vomiting** – bringing food back up from the stomach into the mouth.
- **Early satiety** – feeling full after only a small amount of food.
- **Reflux** – a burning feeling in the esophagus. The esophagus is the tube that connects the mouth and stomach.
- **Regurgitation** – bringing contents up through the esophagus from the stomach.
- **Loosing weight without intentionally trying to.**

GP symptoms can also lead to further health issues that lessen overall quality of life. People that experience nausea, abdominal pain, and early fullness are more likely to develop malnutrition. Malnutrition is when the body does not absorb enough nutrients including vitamins. Any combination of GP symptoms can have an impact on a patient's quality of life and lead to depression, difficulty sleeping, and impaired digestion due to a decreased ability and to eat.

Gastroparesis affects about 38 women and 10 men per 100,000 people.

Three Subsets of Gastroparesis

1. Idiopathic Gastroparesis

This is the most common subset of gastroparesis. The term *idiopathic* simply means that there is no known cause of the disease. An average of 30% to 50% of patients with gastroparesis have a diagnosis of idiopathic gastroparesis. Certain infections such as viral infections, especially in kids, have been related to idiopathic causes of GP. Certain drugs can delay stomach emptying and are discussed in the treatment section below. Sometimes the potential cause is not found. Although there are many potential causes of idiopathic GP, more research is needed to verify if these are true causes or risk factors for developing GP.

Gastroparesis caused by infection

In many people, viral infections are a cause. These are called viral gastroenteritis, which are viruses affecting the GI system. This can be due to any viruses that cause GI symptoms- even COVID-19. Others are norovirus and rotavirus infections which commonly effect children. Some people who develop GP from viruses may feel relief of symptoms months or years later.

Gastroparesis caused by neurologic conditions
Other causes of GP are neurologic. Neurological conditions such as Parkinson's impact GP by affecting the nerves that supply the stomach. Multiple sclerosis (MS) is another neurologic condition where patients often develop GP. Connective tissue diseases like lupus and scleroderma can also lead to GP. This due to smooth muscles in the stomach weakening as a result of the disease process. These conditions cause smooth muscles to break down in the body including the GI tract. Smooth muscles are located throughout the body and contract, or put pressure on, internal organs and blood vessels.

Learn from other IFFGD Fact Sheets!

401 - Parkinson's Disease and GI Dysmotility
410 - Cystic Fibrosis and Gastroparesis

2. Diabetic Gastroparesis

Diabetes mellitus is a disorder in which the body does not produce enough or respond normally to insulin. Insulin is a hormone released by the pancreas that regulates blood sugar. This condition causes higher than normal levels of sugar in the blood. **Diabetic** GP occurs when slow emptying of the stomach occurs in people with diabetes.

About 25% of GP patients are diagnosed with diabetic gastroparesis. This can affect people with either type 1 or type 2 diabetes. In patients who develop diabetic GP, symptoms usually continue, even if sugar levels become controlled. Diabetic GP occurs in a similar way as diabetic neuropathy, such as what commonly occurs in the feet of those with diabetes. Nerve damage occurs overtime as a result of uncontrolled sugar levels in the body. In diabetic foot neuropathy this impacts the long nerves that extend to the feet. For diabetic GP, this nerve damage occurs in the nerves that go into and surround the stomach.

3. Post-surgical Gastroparesis

Post-surgical GP can occur when surgery changes the stomach. This can be through damage to nerves or the formation of scar tissue damage to the stomach. The vagus nerve, if damaged, is often believed to be the cause in patients who

Motility is defined as the movement of food through the body's GI tract.

Dysmotility occurs with a change in speed, coordination, and/or strength of contractions in the walls of digestive organs.

The **GI tract** includes all digestive organs from the mouth to the anus.

suffer from GP symptoms. The vagus nerve originates in the brain and extends to control major body organs such as the heart, lungs, upper GI tract, and other organs in the chest and abdomen.

Surgeries that cause some cases of GP include the following:

- **Nissen fundoplication** - This is a surgery for Gastroesophageal Reflux Disease (GERD) or hiatal hernia. A hiatal hernia is when the stomach which is normally located below the diaphragm, a muscle in the body to help with breathing, and in the abdomen migrates to above the diaphragm sharing the same space with the heart, lungs, and esophagus. This condition predisposes patients to have regurgitation of food or acid into the chest and sometimes pain in the abdomen or chest. The pain is most likely to occur when the hiatal hernia slides. A nissen fundoplication is a procedure where a surgeon takes the top portion of the stomach and wraps it around the bottom of the esophagus to create a tighter valve that prevents movement of acid and contents from the stomach into the chest.
- **Cholecystectomy** - This surgery refers to removing the gallbladder usually due to right upper abdominal pain or stones called gallstones that could accumulate in the gallbladder and cause infection or blockage. GP can occur as a result of this condition due to damage of the vagus nerve during surgery. The vagus nerve helps the gallbladder and stomach function. After damage to the vagus nerve upon removal of the gallbladder the damage can then lead to GP.

Risk Factors

Gender may play an important part in the risk of developing gastroparesis. Women are affected about four times more than men. It is believed that hormonal differences between genders may have an impact on developing GP. Hormones are substances that control tasks in the body. They act as messengers that travel in the bloodstream to tissues and organs of the body. Examples include progesterone and estrogen, hormones that are released by the body during menstruation (period) at different times of the cycle or with pregnancy. Progesterone, a smooth muscle gut relaxant, can accelerate gastric emptying. However, elevated estrogen levels have been shown to slow gastric emptying. Due to the fluctuation in hormones during the female menstruation cycle, it is thought that symptoms change depending on the hormone released.

Diagnosing Gastroparesis

Diagnosis of GP may begin with various tests. This will determine if there is anything preventing the stomach from emptying properly. These tests will find if the GP symptoms are caused by another condition. This may include imaging tests (such as CT scans or x-rays), and an upper endoscopy. An endoscope, a long flexible tube with a camera and light on the end, is used in an endoscopy. An endoscopy involves placing this tube in the mouth, down the esophagus, and into the stomach and duodenum. The duodenum is the first part of the small intestine. This tube has a camera and light on the end allowing the healthcare provider to see inside your GI tract and make sure an ulcer, cancer or other findings are not the reason for the symptoms noted above.

Your healthcare provider will decide what test is right for you. This decision is based off the severity of your symptoms, any medications you take, availability, and other conditions you have. The following tests are commonly used in the diagnosis of GP. Drugs (medications) that are being taken should also be reviewed prior to testing as some of them may interfere with test results.

- **Gastric emptying scintigraphy (GES)** – GES involves eating a meal with a small amount of radioactive substance. This allows images to be taken during digestion, determining the rate of

stomach emptying. Typically, the meal includes eggs, butter, jam and toast. People with allergies to those foods will have a modified meal which should contain the same contents and calories of the original standard meal. The meal should be completely ingested. The test can take between 2 and 4 hours to complete. The test will give the most accurate results if it is done for the full four hours.

- **Wireless motility capsule** – This is a piece of equipment in the form of a pill. This pill is swallowed and then travels through the GI tract. It will measure temperature, contractions of the entire gut as the pill moves down, and the pH levels (acidity and alkalinity) of the GI tract. This information is collected by wearing a receiver over 5 days that records the data. This test also measures the amount of time the GI tract takes as it moves contents through the gut.
- **Gastric emptying breath test (GEBT)** – This test is done using breath samples that are collected. To begin the test the patient eats a meal that contains a nonradioactive ingredient. This allows the food to be tracked and measured in your breath over a few hours. This test can be done in a doctor's office or at home and can show how quickly the stomach empties.

Treatment of Gastroparesis

Careful discussion between patients and their healthcare providers will help find the treatment options that are best for each person. Treatment may include one or more of the methods below but is not limited to these. Treatment of GP will vary from person to person and depends on the type they are diagnosed with.

- **Antiemetics** – These are drugs that block neurotransmitters in the body. This works to ease and/or prevent nausea and vomiting. Neurotransmitters are chemicals that travel through the nervous system and impact body functions. The brain, spinal cord, and nerves make up the nervous system which is a target for many neurotransmitters. These drugs are currently not approved by the FDA for treatment of GP, unless short-term use after surgery. A list of these medications is in the table below.

- **Proton Pump Inhibitors (PPI's)** – These drugs may be recommended for those who have heartburn or regurgitate their food or stomach contents. This condition is gastroesophageal reflux disease (GERD). PPI's affect the glands within the stomach to reduce the amount of acid they produce. By lowering the amount of acid, food is digested slower, causing the stomach to empty slower. However, for patients with GERD these are necessary medications.

- **Prokinetics** – These drugs may speed up the movement of food through the GI tract. This occurs by increasing the strength and number of muscle contractions. This type of drug may also be referred to as a pro-motility agent.

- **Metoclopramide** - The only Food and Drug Administration (FDA) approved treatment for GP is metoclopramide. Metoclopramide is now available in three forms, a pill to swallow, nasal spray, and a shot (given in the muscle). Drugs approved by the FDA have been deemed safe, with benefits outweigh possible risks. This is done after reviewing studies and tests that have been done on a drug. However, this drug also has a black box warning which highlights risk of tremors and what is called tardive dyskinesia- uncontrolled muscle movements of the face and upper limbs. This is similar to that seen in a patient with Parkinson's disease. For this reason, patients over age of 65 cannot be prescribed this medication for longer than 3 months.

A **black box warning** is a strict labeling requirement established by the FDA for medications that have known potential for serious and/or life-threatening adverse events.

- **Erythromycin and Azithromycin (Motilin Agonists)** – Both can speed up the movement by the use of a hormone called Motilin, which helps to increase contractions in the GI tract. These drugs are not approved by the FDA for use with GP but are used in adults and

Drug	Brand name examples
Antiemetics	
Ondansetron	Zuplenz®, Zofran®
Trimethobenzamide	Tigan®
Promethazine	Phenergan®
Prochlorperazine	Compazine®
Granisetron	Kytril®
Proton Pump Inhibitors	
Pantoprazole	Protonix®
Rabeprazole	AcipHex®
Omeprazole	Prilosec OTC®, Zegerid OTC®, OmePPI®
Prokinetics	
Metoclopramide	Reglan®, Metozolv ODT®, Gimoti®
Erythromycin	Erythrocin®, EryPed®
Azithromycin	Zithromax®, Z-Pak®
Domperidone	Motilium®
Prucalopride	Motegrity®
Tegaserod	Zelnorm®
Bethanechol	Duvoid®, Urecholine®, Myotonachol®

This table does not include all drugs available but can be used as a guide to help discuss treatment options with your healthcare provider.

pediatric patients with these conditions. As they are both antibiotics, caution should be used in long term use to prevent antibiotic resistance. Both drugs also can cause some cardiac arrhythmias. An arrhythmia occurs when the heart beats too fast, too slow, or out of rhythm.

- **Ghrelin Agonists** – This drug mimics ghrelin, a natural compound found in the stomach that improves gastric emptying, appetite and early fullness. In research, it is thought that low levels of ghrelin may contribute to weight loss. Ghrelin agonists are currently being researched and are not yet available on the market, such as Relamorelin.
- **Domperidone (Dopamine Receptor Antagonists)** – A drug that may improve stomach emptying, nausea, and vomiting in some patients by the use of blocking a neurotransmitter called Dopamine. This drug is not available in the U.S., unless approved for use through the FDA's expanded access program and application process given its risk of cardiac arrhythmia. There are possible serious side events with this drug.
- **Tegaserod and Prucalopride (Serotonin Receptor agonist)**- Both can be used to help speed up movement in the GI tract; however,

are only FDA approved for constipation. Tegaserod is approved for irritable bowel syndrome with constipation and Prucalopride is approved for chronic idiopathic constipation. Patients with GP have higher rates of constipation as well.

- **Bethanechol (Cholinesterase inhibitor and muscarinic agonist)** – This drug works on the lower esophageal sphincter (LES), helping it to contract. The LES is located at the bottom of the esophagus and closes to prevent stomach contents from coming back up into the esophagus. Possible side effects of this drug include diarrhea, abdominal cramping, and flushing (redness of the face and neck).
- **Botulinum Toxin** – Also commonly known as Botox, this treatment is injected into the pylorus of the stomach. The pylorus is the last part of the stomach that connects to the beginning of the small intestine. The injection of Botox into the pylorus muscle may improve gastric emptying for GP patients.
- **Lifestyle modifications** – If physically possible, it may be helpful to modify some habits after meals. Gentle physical activity such as walking after a meal may help with symptoms. Your healthcare provider may also recommend you avoid lying down for 2 hours after finishing a meal.
- **Dietary management** – Healthcare providers may recommend eating small meals as well as a low fiber or a low residue diet which are more easily digested in patients with GP. A licensed registered dietitian who specializes in GI illnesses can help create a diet high in nutrients. Usually, a low-fiber and fat diet is tolerated the most.
- **Nutritional deficiencies**- Treatment may include the identification of different vitamin and mineral deficiencies, by addressing supplements including iron, folate, B12, zinc.
- **Feeding tube** – In more severe cases of GP, a tube may be inserted in the stomach and small intestine with endoscopy, radiology team or surgeons. This tube is referred to as a Gastrojejunostomy (G/J tube). By inserting the tube into the small intestines, it can help bypass

the stomach in patients with delayed stomach emptying such as patients with GP. A 6 to 12-inch tube comes out of the stomach or small intestines to allow foods via nutritional formula as well as your medications to be fed through the tube. This is managed with the support of a healthcare provider and dietitian.

IFFGD's **Dietitian Listing** is a resource that allows you to search for a dietitian that is in your area or treats a specific condition.

- **Parenteral Nutrition** – In severe GP cases, when feeding by mouth and tube feeding is not possible, an intravenous (IV) catheter may be placed to provide nutrition while avoiding the GI tract. This is usually placed in the arm and is called a PICC line. An IV catheter is a small flexible tube that goes into a vein. Formula placed into the catheter is specially made to provide nutrients that the body does not need to digest. This allows nutrients to go directly into the blood and be absorbed by the body.
- **Surgery**
 - **Gastric Electrical Stimulation (GES)**- A small device that is implanted surgically under the skin to the lower region of the abdomen for a specific population of patients with GP that may be refractory, or non-responsive, to other GP therapies. GES has been shown to improve vomiting frequency and nausea; however, it does not improve gastric emptying.
 - **G-POEM** is gastric perioral endoscopic myotomy and is a surgery where the pyloric muscle is cut by a surgeon to enable opening of the pyloric muscle. This may help improve gastric emptying in a minority of patients. A surgeon or advanced endoscopist performs this procedure.

You should discuss all these possible options with a healthcare provider before considering them for treatment as many of them have side effects. Some medications may slow stomach emptying. Narcotics and opioids are known to worsen GP symptoms. These drugs slow the rate the stomach empties. A common type of diabetes medication, glucagon-like-

peptide agonists (dulaglutide, liraglutide, etc.), slows the movement of food through the GI tract and decreases appetite. It is important for healthcare providers and people with diabetic GP to thoroughly discuss these medications before they are considered for use.

Conclusion

Even though rare diseases like GP are more often diagnosed now than in years past, there is so much we still do not know about this condition. This is a complex condition with many GI symptoms and limited treatment options. The severity of symptoms can vary with the control of other health conditions. For example, in diabetics, having a high blood sugar can slow down the stomach itself. As a result, regulating one's blood sugar can help with the movement of the stomach (stomach motility). As research into GP continues, we will gain better understanding of this condition and improve our patient's outcomes. The ultimate goal is to develop a cure for GP. All research toward that cure should also improve patients' symptoms and enhance their quality of life.

About IFFGD

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IFFGD

537 Long Point Road, Suite 101
Mt Pleasant, SC 29464

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