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Motor Dysfunctions of the Stomach

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Motor dysfunctions of the stomach include conditions which present acute, recurrent, or chronic symptoms relating to stasis or rapid transit of stomach contents in the absence of any obstruction (Camilleri, 1998). Commonly recognized disorders of gastric motility include 1) delaying disorders such as gastroparesis and gastric retention, and 2) rapid disorders such as dumping syndrome and tachygastria. These motor dysfunctions can cause severe alarm and discomfort for the older adult, and may seriously interfere with normal digestion and passage of food from the stomach to the small intestine.

DEFINITIONS

Gastroparesis has been defined by Dorland's Illustrated Medical Dictionary as "paralysis of the stomach" (1994, p. 1628). Gastroparesis occurs when the stomach fails to empty normally because of decreased gastric motility. When the stomach fails to contract at its normal pace and move food into the small bowel, ingested substances remain in the stomach for a prolonged period of time. Typical symptoms of gastroparesis include nausea, vomiting, early satiety, anorexia, abdominal bloating, and abdominal discomfort (NIDDK/NIH, 1999). In older adults for whom stasis and vomiting are

significant problems, there may be considerable weight loss and disturbances of mineral and vitamin stores.

Gastric retention is the term commonly used to describe an acute or chronic condition where there is delayed emptying of solid or liquid contents from the stomach into the small intestine. The terms gastric retention and gastroparesis may sometimes be used interchangeably, although gastric retention refers to holding of solids and liquids in the stomach, whereas gastroparesis refers to absent or slow muscle contractions leading to the retention of contents in the stomach (See Table 4.1).

In contrast to slow gastric motility, abnormally fast stomach emptying occurs in dumping syndrome. Dumping syndrome is the sudden massive emptying of highly acidic and hyperosmotic gastric secretions into the duodenum and jejunum (Porth, 1998). This increased stomach motility is most often associated with surgical procedures of the stomach such as gastrojejunostomy and partial gastrectomy. Symptoms include nausea, weakness, sweating, palpitation, varying degrees of syncope, often a sensation of warmth, and sometimes diarrhea, occurring after ingestion of food (Dorland's Illustrated Medical Dictionary, 1994).

Tachygastria is an abnormally fast rhythm of the stomach, in which coordination of rhythmic contractions in the stomach is lost. Food enters the small intestine in fits and starts, instead of in a smooth, controlled way. This can lead to fluctuations in blood glucose, which can aggravate impaired gastric motility and emptying (D'Arrigo, 1999).

ETIOLOGY

The major causes of gastroparesis are diabetes, postviral syndromes, surgery on the vagus nerve or stomach, medications (particularly anticholinergics

TABLE 4.1 Comparison of Signs and Symptoms of Gastric Motility Disorders

Gastroparesis	Dumping Syndrome
Nausea	Nausea
Vomiting	Weakness
Early Satiety	Diaphoresis
Anorexia	Palpitations
Abdominal Bloating	Syncope
Abdominal Discomfort	Flushing
	Diarrhea

and narcotics, which slow stomach contractions), smooth muscle disorders such as amyloidosis and scleroderma, nervous system diseases such as Parkinson's disease, and metabolic disorders such as hypothyroidism. Gastroparesis is most often a complication of Type 1 diabetes (at least 20 percent of people with Type 1 diabetes will develop gastroparesis).

Dumping syndrome and accelerated gastric emptying are most commonly caused by gastric surgical procedures such as a partial or total gastrectomy, pyloroplasty, or gastrojejunostomy (Birrer, 2002). Rapid gastric emptying results from impaired relaxation of the stomach upon ingestion of food. Postprandial intragastric pressure is relatively high and results in active propulsion of liquid foods from the stomach. A high caloric (usually carbohydrate) content of the liquid phase of the meal evokes a rapid insulin response with secondary hypoglycemia (Camilleri, 1998). See Table 4.2.

PHYSIOLOGY

A review of normal gastric motility as described by Camilleri (1998) is helpful in understanding the pathology of G.I. motor dysfunctions. Changes in the speed of stomach motility can be described as either fasting or postprandial. During the fasting period a cyclic motor phenomenon called the interdigestive migrating motor complex occurs in three phases. During Phase I the stomach moves approximately once every 60–90 minutes fol-

TABLE 4.2 Etiology of Gastric Motility Disorders

Causes of Gastroparesis	Causes of Dumping Syndrome
Diabetes	Gastric Surgical Procedures:
Postviral syndromes	Partial gastrectomy
Surgery on vagus nerve	Total gastrectomy
Medications	Pyloroplasty
(anticholinergics, narcotics)	Gastrojejunostomy
Smooth muscle disorders	
(amyloidosis, scleroderma)	
Neural disease	
(Parkinson's)	
Metabolic disorders	
(Hypothyroidism)	
Paraneoplastic syndrome	

lowed by a period of quiescence. Phase II is characterized by a period of intermittent pressure activity. The stomach is most active during Phase III when contractions occur approximately three times per minute. Following the eating of food the fasting cyclic activity is replaced by irregular, fairly frequent contractions in the stomach region. The caloric content of the meal is the major determinant of the duration and pattern of these contractions. Solids and liquids exit the stomach at different rates. The healthy stomach will empty nonnutrient liquids with a half-emptying time of 20 minutes or less. Solids are initially retained selectively within the stomach until particles are digested to a size smaller than 2 mm, at which point they are emptied in a linear fashion from the stomach. Thus, there is an initial lag period for emptying of solids, followed by a more linear, postlag gastric emptying phase. The motor function of the stomach is controlled by contraction of smooth muscle cells and their integration and modulation by enteric and extrinsic nerves. Derangement of any of these intrinsic or extrinsic control mechanisms may lead to altered gut motor function.

PATHOPHYSIOLOGY

Gastroparesis. Diseases or conditions which interfere with the intrinsic or extrinsic nervous system will impact the ability of the stomach to contract in a normal fashion, thus slowing the migrating motor complex. The enteric nervous system, which comprises approximately 100 million neurons in ganglionated plexi, is organized in intricate excitatory and inhibitory programmed circuits. Disorders of the enteric nervous system are usually the result of a degenerative, immune, or inflammatory process. Virally induced gastroparesis may be the result of cytomegalovirus or Epstein-Barr virus. Degenerative disorders may infiltrate the myenteric plexus with inflammatory cells, including eosinophils. The extrinsic neural control of the gut is subdivided into the craniosacral parasympathetic outflow and the thoracolumbar sympathetic supply. Disruption of these autonomic nerves will strongly affect G.I. motility. Extrinsic neuropathic processes include vagotomy, diabetes, amyloidosis, and a paraneoplastic syndrome usually associated with small-cell carcinoma of the lung. Extrinsic neural processes can also be affected by medications, such as alpha-adrenergic agonists and anticholinergics, which decrease or halt stomach contractions and mobility. Disturbances of smooth muscle, such as systemic sclerosis and amyloidosis, may result in significant disorders of gastric emptying. Thus, although the stomach muscle may be enervated, it is unable to respond to sensory stimuli.

When symptoms of gastroparesis occur, treatment should be sought because food that stays in the stomach too long can ferment, causing bacterial growth, or may harden into a solid lump, called a bezoar. Slow digestion of food will affect diabetics insofar as diabetic medications may hit their peak effectiveness too soon, wearing off by the time the food is finally digested and causing high blood sugar levels (Roberts, 2001). (See Table 4.3).

Dumping syndrome. Often following stomach surgery for obesity or peptic ulcer, dumping syndrome "is believed to be caused by the rapid entry of hyperosmolar liquids into the intestine and is characterized by symptoms such as nausea, vomiting, diarrhea, diaphoresis, palpitations, tachycardia, lightheadedness, and flushing that occur while eating or shortly after" (Porth, 1998, p. 728). It is often followed in about 2 hours by an episode of hypoglycemia, resulting from the rapid absorption of glucose, which acts as a stimulus for insulin release by the B cells of the pancreas. With treatment however, the symptoms of dumping syndrome subside over time.

Overall for both gastroparesis and dumping syndrome the role of glucose plays an important role. The research of Rayner, Samsom, Jones, and Horowitz (2001) indicates that acute hyperglycemia induced by an intravenous glucose infusion slows the emptying of nutrient-containing liquid and solid meals. Conversely, gastric emptying of both solids and liquids is accelerated during insulin-induced hypoglycemia.

GENERAL NURSING CARE

Gastroparesis. Nursing diagnoses for the patient with gastroparesis include: knowledge deficit related to the disease process, chronic pain related to

TABLE 4.3 Possible Complications of Gastroparesis

Complication	Description and Treatment
Bezoars	Food hardened into solid lumps due to stomach stasis. May cause massive infection when untreated or not resolved. Treatment: antibiotics (Erythromycin) and/or removal by endoscopy or surgery.
Hyperglycemia in diabetics	Slow digestion of food may precipitate high blood sugar because diabetic medications may peak too soon. Treatment: smaller and more frequent doses of insulin.

gastric immobility, altered nutrition and altered fluids related to gastric immobility, effective management of therapeutic regime for individual and family, and potential for infection related to withholding of stomach contents.

Nursing care centers upon the understanding of the older adult regarding his/her disease process. Discomfort related to gas and bloating is most upsetting to the patient and can be managed with medications and food selection. For acute and severe gastric immobility it may be necessary to supplement the client's diet with tube feedings or TPN to maintain nutritional and fluid stability. In less severe and chronic cases, manipulation of the diet into 6 small feedings is helpful to ensure adequate intake. As stasis of stomach contents can ultimately lead to the formation of bezoars, for which antibiotic therapy is necessary, or even extraction by endoscopy, watching for signs and symptoms of infection, and treating the possible side effects of antibiotic therapy (stomach upset, diarrhea) may be necessary. Because the condition may be chronic, understanding the therapeutic regimen and following it is imperative for clients and the nurse assists clients in implementing gastro interventions for their holistic health. If the client is diabetic, the regimen must include alterations in diet and insulin therapy.

Dumping syndrome. Nursing diagnoses for the older adult with dumping syndrome include: knowledge deficit related to the disease process, altered nutrition related to increased gastric mobility, and diarrhea related to rapid gastric emptying. Nursing care centers on educating the client regarding the cause of the dumping syndrome and how to prevent it. Diet therapy is essential in preventing the symptoms of hypoglycemia, and medications taken to thicken oral liquids (thereby holding them longer in the stomach), may be helpful to clients. If patients are experiencing severe diarrhea, interventions may include the decreasing of oral fluids and the taking of antidiarrhea medications.

INTERVENTIONS, TREATMENTS, ALTERNATIVE TREATMENTS

Gastroparesis. Three questions should be considered in the management of the older patient with gastroparesis: Is the condition acute or chronic? Does the patient have a systemic disorder such as neuropathy or myopathy? What is the patient's state of hydration and nutrition? The principal methods of management include correction of dehydration and nutritional deficiencies, the use of prokinetic and antiemetic medications, and the suppression of bacterial overgrowth. Decompression of the stomach and surgery are necessary only in patients with severe motility problems (Camilleri, 1998).

Correction of dehydration, and electrolyte and nutritional depletion, is particularly important during acute exacerbations of gastroparesis. Nutrition is tailored to each patient according to individual depletions in trace elements and dietary constituents. Dietary measures include low-fiber and low-fat caloric supplements that contain iron, folate, calcium, and vitamins D, K, and B_{12} (Camilleri, 1998). Patients who have intense symptoms of nausea and vomiting, such as often seen in severe diabetics, may have need of parenteral or enteral nutrition. If a feeding tube is necessary, a jejunostomy tube is recommended as nutrients are placed directly in the small intestine, bypassing the stomach altogether. In patients who tolerate oral feedings, fatty and high-fiber foods should be avoided, and six small meals should be eaten each day rather than three (NIDDK/NIH, 1999). Liquid meals are recommended, especially if blood glucose levels are unstable. (See Table 4.4).

Prokinetic medications, like metaclopramide (Reglan) in doses of 10 to 20 mg given up to four times a day, is being used to increase the sensitivity to acetylcholine, resulting in increased motility of the upper GI tract and relaxation of the pyloric sphincter. This increases gastric emptying time and improves the gastroparesis condition.

Erythromycin, a macrolide antibiotic that stimulates motilin receptors partly through a cholinergic mechanism, results in the dumping of nondi-

TABLE 4.4 Management of Gastroparesis

Correct Dehydration, Electrolyte, or Nutritional Depletion	1. Low-fiber, low-fat caloric supplements 2. 6 small meals per day rather than 3 3. Liquid meals if blood glucose levels are unstable 4. Parenteral or enteral nutritional support
Medications	1. G.I. motility drugs to promote movement and emptying of stomach Metoclopramide (Reglan) 2. Antibiotics to clear and prevent bezoars Erythromycin 3. Antiemetics to reduce nausea & vomiting
Decompression and/or Gastric Surgery	1. Nasogastric intubations—relieves abdominal distention and bloating, removes stagnant gastric fluids 2. Venting enterostomy—relieves abdominal distention and bloating 3. Partial or complete gastrectomy—to remove sections of stomach with permanent stasis following gastric surgery

gestible and digestible solids from the stomach. Erythromycin lactobionate at a dosage of 3 to 6 mg/kg every eight hours clears bezoars from the stomach in patients with diabetic gastroparesis (Camilleri). However, the effect of oral erythromycin appears to be restricted by tachyphylaxis, and this treatment is considered ineffective after two weeks. Bezoars not responsive to antibiotic therapy may necessitate removal through endoscopy.

For treatment of nausea and vomiting associated with gastroparesis, standard antiemetics can be used in combination with prokinetic agents for symptom relief. These include medications such as diphenhydramine (Benadryl) and trifluoperazine (Stelazine), or metaclopramide (Reglan).

Decompression may be used for patients whose gastroparesis is accompanied by severe pseudo-obstruction of the bowel. Venting enterostomy can assist in relieving abdominal distention and bloating. There are enteral tubes which function for both aspiration and feeding using the same apparatus. Access to the small intestine may also provide a way to deliver nutrients by the enteral route (Camilleri, 1998).

Surgical treatment should be considered whenever the motility disorder is localized to a portion of the gut that can be resected. For example, complete gastrectomy may be necessary for patients with complete stasis syndrome following gastric surgery (Camilleri, 1998).

If the cause of gastroparesis is related to diabetes, the primary treatment goal is to regain control of blood glucose levels. Treatments include insulin, oral medications, and dietary changes regarding calories as well as fat and fiber intake. Recommendations regarding insulin therapy include taking insulin more often, taking insulin after eating instead of before, checking blood levels frequently after eating, and administering insulin whenever necessary. Some physicians may recommend two injections of intermediate insulin every day, and also increase the number of injections of a fast-acting insulin as needed according to blood glucose levels obtained in frequent monitoring. Lispro insulin (Humalog), a newer insulin, is a quick-acting insulin that appears to be advantageous for people with gastroparesis. It starts working within 5 to 15 minutes after injection and peaks after 1 to 2 hours, thus lowering blood glucose levels after eating almost twice as fast as the slower-acting regular insulin (NIH, 1999).

Dumping syndrome. Management primarily includes patient education with regard to avoiding high-nutrient liquid drinks, and fluids with meals. Possibly guar gum or pectin may be given to retard liquid emptying. On rare occasions, medications such as subcutaneuous octreotide (Sandostatin) (50 to 100 mg) may be prescribed to be taken 15 minutes before meals (Camilleri, 1998). Octreotide is a potent growth hormone similar to somatostatin

and is currently being investigated for its usefulness in dealing with the effects of dumping syndrome (Mosby's Nursing Drug Reference, 2002). Dicyclomine hydrochloride (Bentyl), an antispasmodic, may also be prescribed to help delay gastric emptying time.

Dumping Syndrome treatment also consists of limiting the diet to small frequent feedings, which are taken without liquids and which are low in simple sugars, because they are the most osmotically active parts of the diet. The symptoms of Dumping Syndrome usually diminish with time, and may be dissipated within three months (Roberts, 2001). (See Table 4.5).

Alternative measures may be suggested as helpful in the treatment of gastroparesis or Dumping Syndrome, for example in promoting digestion, or relieving diarrhea. It is believed that yoga exercises can enhance digestion and help the pancreas and liver function more normally, thereby regulating blood sugar levels. Since almost 20% of persons with Type I diabetes may develop gastroparesis, these exercises may be of interest to clients as a complementary therapy. Yoga exercises that are helpful for gastric health are described by Dr. Monro and Dr. Nagendra in the popular alternative medicine book entitled *New Choices in Natural Healings* (Gottlieb, 1995). The following exercise would be easy to teach the older adult: Stand with your feet spread apart approximately to shoulder-width. Place your hands

TABLE 4.5 Management of Dumping Syndrome

Assess for signs of dumping syndrome	Early Symptoms (within 30 minute of eating): Flushing, diaphoresis, weakness, dizziness, faintness, abdominal pain and distention, increased bowel sounds, diarrhea, irregular pulse, hypotension Late Symptoms ($1\frac{1}{2}$ to 3 hours postprandial): Hypoglycemic-like reaction similar to the signs and symptoms listed above
Teach patient ways to prevent "dumping syndrome"	Eat small frequent meals Avoid simple carbohydrates (sugar) in diet Increase protein and fat (to tolerance) in diet Omit fluids with meals, take fluids 1 hour before or 2 hours after eating Eat slowly and chew food well Lie down 20 to 30 minutes after eating
Medications	Dicyclomine hydrochloride (Bentyl)—antispasmodic to delay emptying time Octreotide (Sandostatin)—investigational drug to retard liquid emptying

on your knees and bend forward. Exhale through your mouth until all your breath is gone. Now expand your chest, and tighten your abdominal muscles so that you form a hollow space in your abdomen. Remain in this position until you feel the need to breathe, then relax and inhale slowly. The next step is abdominal pumping. Release your stomach muscles back to their normal position, and then suck in the abdominal muscles again. Pump your abdomen in and out until you experience the need to breathe. Release slowly and breathe normally. Repeat the entire exercise three times.

To avoid dehydration during a bout of diarrhea, Dr. Lad (Gottlieb, 1995) suggests drinking water with honey, lime juice, and salt. He says to add one teaspoon of honey, one teaspoon of lime juice, and a pinch of salt to a pint of warm or room temperature water and sip it throughout the day.

HEALTH PROMOTION AND QUALITY OF LIFE ISSUES

For most patients gastroparesis and dumping syndrome are not life threatening. The good news with dumping syndrome is that it usually lasts only a few months at most! Depending on its causes, gastroparesis is usually a chronic condition that can be managed and allows the client an acceptable quality of life.

Health promotion efforts can only assist the client in maintaining a healthier lifestyle. A diet which is balanced yet within the parameters of the associated condition (i.e., low fiber for gastroparesis and low sugar for dumping syndrome) can assist in overall health and well-being. Vitamin supplements, such as one multivitamin a day at least, are recommended.

Exercise benefits the entire body especially aiding circulation and control of weight. Walking at least 15 minutes a day can improve appetite and relieve stress. Stress and anxiety only heighten feelings of discomfort in gastroparesis and may contribute to episodes of diarrhea in the client with dumping syndrome.

For the client with severe gastroparesis to the point of the entire stomach being paralyzed, surgical removal of the stomach may be necessary. Continual tube feedings may be required for nutritional support for which the question of quality of life may surface. It would seem that absent other complications or debilitating conditions, a client can experience an acceptable quality of life despite the need for continuous nutritional support. The client retains the right to refuse nutritional support, of course, and counseling must be given to ensure that the client realizes he/she is choosing death. With the caring support of health professionals, family, and friends,

it is hoped that the client would not experience the need for such a drastic measure. In addition to the above interventions, the client's level of depression must be assessed, and treated with antidepressants, if necessary.

The possibility of depression or despair, and feelings of hopelessness or discomfort indicate the need for therapy to bring meaning into the person's life. The client must come to accept the reason for the suffering and limitations brought about by this chronic condition. This presents a possibility for teaching centering, guided imagery, or relaxation techniques which promote peace and increase the client's sensitivity to spiritual realities. Perhaps if the client is religious, a leader or member of the religious community may help the client through prayer and spiritual support.

HOME MANAGEMENT AND SELF-CARE ISSUES

Home management centers upon proper diet, timing of meals, attention to portion size, and fluid regulation. Older adults and their families need to understand what foods are included within their recommended diets, such as low fiber or high protein. Printed dietary instructions would be helpful to most clients. Diabetics should consult with their nurse practitioner or physician regarding the regulation of insulin, since both hypoglycemia and hyperglycemia can occur with dumping syndrome and gastroparesis. Difficulty with self-care should not be an issue if the patient is otherwise independent in their activities of daily living and is mentally functional. However, if tube feedings are necessary for the patient with gastroparesis, the client and his/her significant others must be taught care of the feeding tube, skin care, management of the pump, and handling of the liquid nutrient in order to prevent occlusion of the tube, or infection.

FOLLOW-UP CARE

Follow-up care with the elderly client should include evaluation for possible weight loss and dehydration. It may be helpful to ask the client to keep a dietary journal, so that it is possible to discuss strengths and weaknesses regarding eating patterns and the responses encountered after eating certain foods or drinks. A hematocrit and electrolytes profile may be needed in the presence of severe nausea, vomiting, or diarrhea. Medication use should be evaluated and prescriptions renewed as necessary. In the client with dumping syndrome any episodes of hypoglycemic reactions should be

reviewed with the client, especially the factors preceding it, to determine if reinforcement of teaching is necessary. In general, all signs and symptoms experienced by the client should be discussed to regulate medication as needed and to provide psychological support and caring.

CONCLUSION

The older adult may find certain foods "difficult to digest" and may experience loss of appetite, or early satiety, or feel uncomfortable with bloating after eating. Gastroparesis, a sluggishness in the motility of stomach muscles causing food to remain longer in the stomach, may be the cause. Understanding the pathology can help the client alter his/her eating patterns, thus reducing some of the signs and symptoms. Although less common, dumping syndrome may be experienced in the older adult who has undergone gastric surgery. The best management for this syndrome is most commonly found in teaching the client to eat smaller, more frequent meals, and to omit fluids with meals.

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