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The Diagnostic Criteria, Management and Possible Causes of Post- gastrectomy Gastroparesis: A Review

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Abstract

Gastrectomy is considered to be the standard treatment for Gastric Cancer. With advancements in technology, the surgery has definitely undergone modifications to reduce postoperative complications, but gastroparesis persists as one of the common post gastrojejunostomy complications. The goal of this study was to summarize the features and factors related to gastroparesis after gastric surgeries. A review on gastroparesis after abdominal surgeries was conducted. After a comprehensive literature review on postoperative gastroparesis, we have established an accurate understanding on how to diagnose and manage this happening complication, and the factors that could lead to postoperative gastroparesis after a gastrojejunostomy. We came to the conclusion that postoperative gastroparesis is commonly seen with abdominal surgeries followed by the Roux-en-Y reconstruction method. The mechanism and aetiology of this complication remain ambiguous.

Keywords: Gastrectomy; Gastrojejunostomy; Postoperative; Gastroparesis; Delayed gastric emptying; Abdominal surgery; Roux-en-Y

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Introduction

Gastroparesis is defined as a persistent heterogeneous defect in the gastric motility. Gastroparesis was an unfamiliar disability; it has become an increasingly reported disease in the past two to three decades [1]. It is characterized by the delayed gastric emptying after intake of solid food in the absence of a gastrointestinal obstruction. The symptoms can be mild or severe and they are mostly nausea, vomiting, epigastric pain, early satiety, fullness, anorexia, and/or weight loss [2]. Gastroparesis severely affects the patients' nutrition, health, social interactions and even the duration of hospital stay [1]. The most common aetiologies include diabetes, post-surgical and idiopathic. Some studies suggest there are many other aetiologies for gastroparesis but in a large number of patients the cause is still unknown [3]. Gastric carcinoma is an internationally well-known disease. Gastrectomy has been established as the standardized management for gastric cancer [4,5]. An extended period of stasis followed by uncomplicated abdominal surgeries is not conventional. On routine, a post gastrectomy patient will have tolerated oral solid intake on postoperative day 10-14. However, in some cases the gastric motility function can be delayed. A situation as such is termed as postoperative gastroparesis syndrome (PGS) or delayed gastric emptying (DGE).

Postoperative Gastroparesis is defined as a complex disorder characterized by post-prandial nausea or vomiting, and gastric atony without the presence of a mechanical gastric outlet obstruction [3]. Postoperative Gastroparesis after gastric surgeries has been previously reported, with an incidence of approximately 5-25% [6]. It is also a frequent complication of pylorus-preserving pancreatoduodenectomy (PPPD), and the complication occurs in the early postoperative period in 20-50% of patients [7]. Abdominal surgeries are a common trigger for gastroparesis. Abdominal surgeries, especially partial gastrectomy and pylorus preserving pancreatoduodenectomy, account for 13% of the aetiologies, also, the third most common causes for gastroparesis [8]. The complication usually occurs when the patients start the solid diet intake or when there is a change in the form of food [9]. The feeling of nausea followed by constant vomiting, can build an impairing state of mind in the patient. Drug therapy is commonly known to be futile and occasionally gastric reoperations are nugatory [10]. Up till date the cause, as well as, the mechanism of postoperative gastroparesis remains unidentified and ambiguous

[2]. During the past few years there has been a gradual increase in the incidence of the disease, seriously interfering with the postoperative recovery of surgical patients, with enormous mental, psychological and economic pressure on the patients. As the complication is not targeted to better treatment, it leads to a lengthened therapy, thus a slow recovery [11].

Some of the common parameters taken into considerations for assessing postoperative gastroparesis include the clinical condition of the patient, the comorbidities, diagnostic evaluation, duration of hospital stay, specific treatment, whether enteral or parenteral nutritional support was opted and interventional treatment [3]. The period of nasogastric drainage or the necessity of reinserting drainage tube, and the postsurgical day on which the patient could ingest oral solid food after the surgery are used to categorize the grade of stasis. According to current postoperative managements, the perioperative inserted nasogastric tube should be removed as soon as possible after surgery. Any nasogastric intubation lasting longer than three postoperative days should be considered as gastroparesis. Although, definitions from the early 1990s state that keeping the patient with a nasogastric tube for ten days postsurgical suggest gastroparesis, these definitions are nowadays redundant [12]. Therefore, postoperative gastroparesis should be considered on the need of a nasogastric tube longer than three days or the need for reinserting the nasogastric drainage tube on persistent vomiting beyond the third postsurgical day. The potential to be able to withstand solid diet is distinct goal in the management of patients after abdominal surgeries. Patient can be started on a liquid diet once the patient has passed out gas, which is usually on the first or second postoperative day, or after removal of the nasogastric drainage tube. As per clinical pathways, patients should be able to start a solid diet by a week after surgery. Therefore, the presence of gastroparesis is considered if patient is unable to digest a solid diet by postoperative day seven. According to the International Study Group of Pancreatic Surgery (ISGPS), postoperative gastroparesis can be divided into 3 grades, as such the mild form being grade A, moderate, grade B and the severe form classified as grade C, distinguished by their clinical impression [3]. For instance, postoperative gastroparesis Grade A does not usually involve change in management. It is commonly associated with just a few disturbances in reaction to intake of solid food, which might necessitate the reinsertion of nasogastric tube for a brief period. However, Grade B might involve treatment with prokinetic drugs, parenteral or enteral nutritional support and usually a prolonged reinsertion of the nasogastric tube is needed, while Grade C requires a major change in the management and treatment of the associated complications such as, pancreatic fistula or intra-abdominal abscesses. Consequently, additional diagnostic workup, radiological or surgical interventions are commonly essential [3].

Diagnostic Criteria

With the obvious signs of abdominal distension, vomiting, the daily amount of fluid in the NG tube, the need of reinsertion of NG tube, radiological examination plays an important role in confirming the diagnosis of postoperative gastroparesis [12]. It helps in confirming the presence or absences of mechanical obstruction, anastomosis leakages or whether there are any factors causing the symptoms in the patient. Gastric Scintigraphy remains by far the gold standard method for diagnosis of gastroparesis [13]. It is believed to be the most cost-effective, uncomplicated, easily accessible technique for confirmation of gastroparesis. Customarily, in non-surgical patients gastric emptying of solids is preferable to assess the severity of the condition. In postoperative patients, radioisotope liquid meal is opted due to the inability of tolerating solid meal [14]. It is crucial to bear in mind that patient with diabetes should always have their blood glucose level measured. Any presence of hyperglycaemia must not be disregarded; blood glucose level should be maintained at a level less that 275 mg/dL [15].

There are many other procedures that can be carried out for assessing gastroparesis, such as wireless motility capsules [16] and 13C Breath testing [17], which have proven to be less invasive than Gastric Scintigraphy [18,19]. Nevertheless, there is no evidence of their applications in diagnosing postoperative gastroparesis, which makes Gastric Scintigraphy the most recommended test to confirm the diagnosis of postoperative gastroparesis [20].

Management

The management of postoperative gastroparesis undoubtedly depends on the degree of severity, but given that all three grades have common symptoms, the initial treatment is standardly the same.

Diet

The American Gastroenterological Association suggests that patients presenting with vomiting should be cross-examined for other conditions like regurgitation or bulimia [21]. Postoperative patients who are experiencing nausea, vomiting or abdominal bloating after oral intake will tend to be anxious, depressed or even nervous [22]. Therefore, dietary manipulation is an important factor in managing postoperative gastroparesis [23]. Liquid nutrition is preferred since gastric emptying is maintained for liquids and diets low in fat or fibres. Also, hypertonic food is usually unfavourable in these conditions [13].

Prokinetic Medications

Prokinetic is an important factor for enhancing gastrointestinal motility. The common prokinetic drugs in clinical practice are metoclopramide, domperidone and erythromycin [24,25]. Metoclopramide is the only FDA approved drug for gastroparesis therapy. It acts by blocking the dopamine D_2 and it stimulates 5-HT_4 receptor in order to escalate the production of acetylcholine [13,15,26]. Nonetheless, metoclopramide can also have some disadvantages. Patients suffering from postoperative gastroparesis are vulnerable to depression. Using Metoclopramide can worsen depression or even lead to other conditions like Tardive dyskinesia, Akathisia or even Parkinsonism, due to its BBB (blood brain barrier) crossing property [27,28].

Domperidone is opted when there is effect of metoclopramide on the symptoms or patients present with side effects of metoclopramide. Despite the fact that the domperidone is as efficacious as metoclopramide, there are not enough clinical trials thus limiting its use [29]. Domperidone can present with cardiac arrhythmias or even hyperprolactinemia.

Erythromycin is a motilin agonist which improves postoperative gastric emptying when used in small doses [30-32]. Erythromycin is chosen for patients who are unable to show improvement with metoclopramide and domperidone. Conversely, erythromycin cannot be used for more than four weeks, due to a decrease in its effect. An increase in dose can lead to abdominal pain or tachyphylaxis [33-36].

Surgical Treatment

Surgery has not been established the treatment of choice in postoperative gastroparesis [23], probably because it would mean making the patient undergoing surgery again. A meta-analysis has shown that there are not enough evidence supporting surgery as the treatment for gastroparesis [37]. However, if the symptoms aggravate or do not alleviate, surgery can be an option [38-41]. The most effective surgery for treating postoperative gastroparesis can be total gastrectomy followed by a Roux-en-Y reconstruction [13,41,42]. Roux-en-Y has furthermore shown to be accompanied by a postoperative complication of intussusception. Some studies suggest that total gastrectomy with Roux-en-Y esophagojejunostomy should be opted to prevent postoperative complications [43-45].

Traditional Chinese Medicine

There are many cases where patients do not respond to prokinetic medication for gastroparesis, and some may consider surgical treatment as expensive. In these particular cases, the patient can opt for Traditional Chinese Medicine therapy to treat the symptoms of gastroparesis. In cases of nausea and vomiting, the Xiao-Banxia-Tang can be prescribed, while ZhiZhu Wan is recommended for patients who experience bloating [15]. It should be noted that in TCM the treatment program for gastroparesis is to be chosen based on the presenting symptoms of the patient. The clinical guidelines for management of gastroparesis suggests acupuncture as a surrogate therapy, owing to the fact that it has shown to improve the rates of gastric emptying and it has shown a decrease in the presenting symptoms [46].

Gastric Electric Stimulation

The device for gastric electric stimulation was approved by the FDA for treatment of gastroparesis but initially was excluded for treatment of diabetic and idiopathic gastroparesis [47]. Advancing studies have shown this form of management is positive for both types [46]. Despite the fact that gastric electric stimulation has shown to have effects on gastrointestinal symptoms within 72 hours of initiating of treatment, which undeniable substantiates the rapid efficacy of gastric electric stimulation, there are not enough evidence to support this choice of treatment in postoperative gastroparesis [48]. The clinical guideline for treatment of gastroparesis also states that there are no guidelines for selecting patients to adapt this management [46,49].

Botulinum Toxin Injection

Botulinum Toxin Injection is known as to have a potential inhibitory action on the neuromuscular transmissions [41]. Few studies have shown to have an improvement on the pylorospasm symptom in gastroparesis [50,51], however the clinical guideline suggests that it should not be opted as a treatment for this complication [46].

Proposed Causes and Discussion

There are multiple proposed causes of gastroparesis among which 36% are idiopathic cases, diabetes forming 29% of them and 13% are postoperative cases [13]. Gastroparesis is considered to be a complicated state caused by a disorder of the gastric motility, due to the incoordination of the enteric neurons or the smooth muscle cells or even the autonomic nervous system, together with a reduced amount of pacemaker cells also known as the interstitial cells of Cajal [52-56]. It has been suggested postoperative gastroparesis can occur due to ischemia [57,58] or a reduced in gastric motility. Multiple comorbidities such as diabetes mellitus can be one of the factors leading to postoperative gastroparesis [8]. Some studies suggest that postoperative gastroparesis might be a result of the removal of the moitilin receptor during the surgery which leads to a lowered stimulation of the receptor [10]. The surgical method chosen for gastric cancer has a great impact on postoperative gastroparesis. It has been suggested that it can occur due to the removal of or a damage to the vagus nerve [58,59]. One of the studies proposes a retro-colic anastomosis as one of the factors leading to gastroparesis [50]. It was suggested that it could due to the presence of additional resistance to the gastric contents after a retro-colon gastrointestinal reconstruction.

Gastrectomy followed by one of three reconstruction techniques, Billroth I, Billroth II or Roux-en-Y gastrojejunostomy, is the standardized method. The majority of studies suggest that Roux-en-Y reconstruction has previously been proved to be the better reconstruction method than Billroth reconstructions after gastrectomy [60-63]. Nonetheless, it has been reported that Roux-en-Y reconstruction surgeries are commonly associated with Roux-en-Y stasis syndrome which is influenced easily by the length of the Roux Limb [64]. It has been suggested that incoordination of the efferent Limb might itself lead to stasis. It is believed that the idea length would be 25cm in order to prevent stasis [65]. Many patients undergoing distal gastrectomy with vagotomy or gastric bypass for obese patients followed by Roux-en-Y anastomosis reported to have suffered from postoperative gastroparesis [20,66-68]. Fewer studies suggest that a Billroth reconstruction method could also contribute to postoperative gastroparesis [64,68,69], contraindicating the other studies which state abdominal surgeries followed by a Billroth II surgery result in a lesser rate of postoperative gastroparesis [70]. It is assumed that the combination of the above-mentioned procedures

predisposes to slow emptying, because an extrinsic denervation decreases the ability of the stomach to digest solid, which may result in the formation of bezoars.

Conclusion

Postoperative causes represent the third most common aetiology of gastroparesis. Gastric Scintigraphy, the gold standard method, along with a nasogastric drainage and a tolerance to solid food are the main factors considered when diagnosing and grading postoperative gastroparesis. While there are no preferable method to prevent gastroparesis, the studies reviewed have suggested prokinetic as drug therapy. Re-surgical intervention, gastric electric stimulation and botulinum toxin injection can be considered as a management. TCM proves to be a satisfactory choice for treating the symptoms of postoperative gastroparesis. It has been reported in the past that most cases of postoperative gastroparesis were a result of previous thoracic or gastric surgeries with unintentional injury to vagus nerve or vagotomy in combination with gastric drainage for cases of peptic ulcer diseases. Vagal injury, both permanent or reversible, is a common complication after fundoplication or even sclerotherapy for management of achalasia Various studies have suggested that other than vagotomy, a reduced amount in pacemaker cells can also account for causes of postoperative gastroparesis. It is also believed that an inadequate blood supply of the anastomosis, inadequate nutritional supply or a delay in starting oral intake could also be relevant factors leading to postoperative gastroparesis. Postoperative gastroparesis remains the most commonly seen complication after distal gastrectomy followed by Roux-en-Y reconstruction method. However, there is no valid evidence for the mechanism which makes the exact cause of postoperative gastroparesis remain unclear.

Declarations

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