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Review

Percutaneous endoscopic gastrostomy. Indications, care and complications☆

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ABSTRACT

Percutaneous endoscopic gastrostomy (PEG) is an effective and safe method for nutritional support in patients with malnutrition and impossibility of oral intake with an estimated survival higher than the months that require enteral nutrition beyond four weeks. The main indications include neoplasms of the upper air-digestive tract and neurological diseases, with dementia currently considered a controversial indication. Anatomical alterations and infectious diseases are the most frequent contraindications. There are different endoscopic techniques; the most widely used being the "pull" method, with a low mortality. Complications are more frequent in patients with multiple pathologies and the elderly. Wound infection, extraction of the tube, tube blockage and bronchoaspiratory pneumonia are the most prevalent complications. Adequate prior preparation of the patient and exhaustive maintenance of the tube can reduce the appearance of these.

Gastrostomía endoscópica percutánea. Indicaciones, cuidados y complicaciones

Palabras clave:
Gastrostomía endoscópica percutánea
Nutrición enteral
Demencia

RESUMEN

La gastrostomía endoscópica percutánea resulta un método eficaz y seguro para el soporte nutricional en pacientes con desnutrición e imposibilidad para la ingesta oral, con una supervivencia estimada superior a 2 meses que requieran nutrición enteral más allá de 4 semanas. Las principales indicaciones incluyen las neoplasias de tracto aéreo-digestivo superior y las enfermedades neurológicas, considerándose actualmente la demencia una indicación discutida. Las alteraciones anatómicas y los procesos infecciosos suponen las contraindicaciones más frecuentes. Existen distintas técnicas endoscópicas, siendo el método por tracción el más utilizado, teniendo en común todas ellas una baja mortalidad. Las complicaciones ocurren con mayor frecuencia en pacientes pluripatológicos y de edad avanzada, siendo las más prevalentes la infección de la herida, la extracción y obstrucción de la sonda y la neumonía broncoaspirativa. Una adecuada preparación previa del paciente y un exhaustivo cuidado y mantenimiento de la sonda pueden reducir la aparición de estas.

Abbreviations: AGS, American Geriatrics Society; ESPEN, European Society of Clinical Nutrition and Metabolism; MARSA, methicillin-resistant staphylococcus aureus; EN, enteral nutrition; PEG, percutaneous endoscopic gastrostomy; NGI, nasogastric intubation; CT, computed tomography scan; ICU, intensive care unit.

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Introduction

Enteral nutrition (EN) is the artificial nutritional support method of choice for malnourished patients or those at risk of malnutrition because it is more physiological, safe and cost-effective than parenteral nutrition and its only requirement is that the digestive tract be functioning normally.[1] Percutaneous endoscopic gastrostomy (PEG) is an endoscopic procedure whereby a plastic prosthesis is placed to administer EN through the creation of a gastrocutaneous fistula. It was first described in 1980 by Ponsky and Gauderer[2] as a less invasive alternative to surgical gastrostomy. Years later the option to radiographically perform it emerged, with success and complications rates similar to those of the endoscopic technique.[3] It is a safe and effective method to ensure nutrients are administered into the digestive tract of patients who have difficulty in orally consuming foods and fluids,[4] presenting some advantages over nasogastric intubation (NGI).[5]

Indications

Administering nutrition through a PEG tube is carried out in those patients who require EN for more than four weeks, either temporarily in reversible diseases, or definitively in irreversible diseases, whose life expectancy is longer than two months and who have a preserved mental state[6] (Table 1). NGI feeding is usually reserved for cases requiring EN for a short period of time (less than 30 days) and when the patient's airway protective reflexes are intact.[7] Despite these general recommendations, the decision to place a PEG tube should be made on a per case basis and consider both the patient and their family's needs, preferences and expectations.

The high prevalence of oropharyngeal dysphagia and alterations in the feeding of patients with advanced dementia make this one of the main reasons for placing a PEG tube.[6] However, its effectiveness in these cases is not clear, and may even be considered futile and ethically unacceptable. It has been shown that PEG tube feeding in patients with advanced dementia does not improve survival, nutritional status or quality of life, nor does it decrease incidence rates of pneumonia due to bronchoaspiration or pressure ulcers.[8–10] On the basis of these data, some scientific communities, such as the American Geriatrics Society or the European Society of Clinical Nutrition and Metabolism, advise against its use in patients with advanced dementia in favour of careful oral feeding,[11,12] recommendations that are unknown to one out of every three doctors who deal with these patients.[13]

Patients with pharyngeal or oesophageal neoplasms with obstruction and dysphagia may benefit from this technique. Some studies have shown a clinical benefit of placing PEG prophylactically compared to placing it after the onset of symptoms,[14] although the available scientific evidence does not state an ideal time to place it.[15]

Table 1
Main indications for the placement of a percutaneous endoscopic gastrostomy tube.

Neurological diseases
Cerebrovascular disease
Parkinson's disease
Amyotrophic lateral sclerosis
Dementia[a]
Multiple sclerosis
Brain tumour
Cerebral palsy
Neoplasms
Cancer of the head and neck
Oesophageal cancer
Others
Facial trauma
Large burns
Chronic inflammatory bowel disease
Cystic fibrosis
Gastric decompression
Anorexia nervosa
Serious malnutrition
Hyperemesis gravidarum
Drug Administration (*Duodopa*®)

[a] Available scientific evidence rejects its indication. However, it could be considered if, after having been given clear information about its scarce benefit, the patient – with full mental faculties – expresses their desire to receive nutritional support, or if they are not able to decide for themselves, their family or legal representative express that desire.

Contraindications

There are few absolute contraindications for the placement of a PEG tube; those that do exist are essentially determined by anatomical alterations that frustrate transillumination and prevent access to the gastric anterior side, such as colonic or hepatic interpositions, morbid obesity or previous total gastrectomy[6,7] (Table 2). A history of previous gastric surgery supposes a failure rate of the technique of 28%.[16] Active infectious processes or those associated with a high risk of haemorrhage during and after the procedure (severe coagulopathy, portal hypertension with significant gastric varices) also contraindicate the procedure.[6] The presence of oropharyngeal or oesophageal stenoses the hinder the path of conventional endoscopes are considered relative contraindications, as well as pharyngeal or oesophageal neoplasms because of the risk of harvesting and dissemination of malignant cells. In these cases, the use of gastropexy can be used to place the gastrostomy catheter, leaving the surgical and radiological alternatives as second options[17] if the endoscopic technique fails.

Preparing the patient

The patient should fast for 6–8 h before the intervention to minimise the risk of bronchoaspiration. A previous study with blood count and coagulation, and a signed informed consent by the patient or their legal representative are required.

Ensuring that there is no thrombocytopaenia (less than 50,000 platelets) or coagulopathy is essential, in order to avoid bleeding complications. PEG is considered a high-risk technique in terms of haemorrhaging, which is why proper management of antiplatelet

Table 2
Contraindications for the placement of a percutaneous endoscopic gastrostomy tube.

Absolute
Stomach inaccessible percutaneously
Total gastrectomy
Haemodynamic instability
Interposition of organs
Very short life expectancy
Active gastric disease
Sepsis
Peritonitis
Infection of the abdominal wall at the location of tube placement
Coagulopathy
Gastric varices
Morbid obesity
Peritoneal carcinomatosis
Relative
Difficulty inserting the endoscope through the mouth
Neoplasms of the oropharynx or oesophagus
Anatomical alterations after surgery (partial gastrectomy)
Pregnancy
Non-morbid obesity (BMI < 40)
Ascites

Table 3
Differential characteristics of the two most frequently used techniques.

	Traction method	Gastropexy method
Technique	More simple	More complicated
Duration of the technique	Shorter	Longer
Costs	Cheaper	More expensive
Indications	In most cases it is the technique of choice	Benign or tumoural oropharyngeal or oesophageal stenoses
Complications	Lower risk of bleeding	Lower risk of peritonitis and stoma infection, prevents tumour harvesting

drugs and anticoagulants is necessary[18,19] (very frequently prescribed in patients with PEG indication), in addition to assessing the thrombotic risk according to the comorbidity of the patient. In those who have high thrombotic risk, bridging therapy with heparin is recommended after the suspension of acenocoumarol five days before, or suspending new oral anticoagulants at least two days prior. During the first 6–12 months after cardiac revascularisation, discontinuing antiaggregants (clopidogrel, prasugrel, ticagrelor), is not advisable: postponing the placement of the PEG tube and using other less invasive nutritional support is recommended. However, a recent meta-analysis found that there is no increased risk of haemorrhage with clopidogrel, even when taken together with acetylsalicylic acid.[19] In patients with low thrombotic risk, bridging therapy with heparin is not necessary, and antiplatelet agents can be discontinued, while maintaining acetylsalicylic acid.[18]

On the other hand, prophylaxis with antibiotics before the placement of the tube effectively reduces the incidence of stoma infection.[20] Parenteral administration in a single dose one hour before the amoxicillin-clavulanate 1 g or cephalosporins (cefazolin 1–2 g, 1.5 g cefuroxime, ceftriaxone 1–2 g) technique is equally effective; the amoxicillin-clavulanic technique is recommended due to the increased risk of *Clostridium difficile* infection that leads to the administration of a single dose of cephalosporins.[21] Should the patient be allergic to penicillin, use ciprofloxacin 400 mg or clindamycin 900 mg in monodosis.

Insertion technique

This technique is performed in an endoscopy room with a team of three health professionals (usually two endoscopists and a nurse), with the patient in the supine position and under aseptic conditions. In addition to locoregional anaesthesia, sedative drugs are usually used. Sedation by the endoscopist is performed in a manner similar to other endoscopic procedures, and its safety and efficacy have been proven even in populations with high anaesthetic risk (ASA III and IV).[22]

There are basically three technical variants for the endoscopic placement of a gastrostomy tube (Table 3)[23–26]:

- *Pull, traction or Ponsky-Gauderer technique* (Fig. 1): is the method of choice, given its low technical difficulty and complication rate compared to other techniques.[6] At the point of maximum transillumination and imprinting on the gastric body, a trocar is introduced and through it, a thread – which is grabbed using with a polypectomy loop and extracted with the endoscope through the patient's mouth. On the outside the catheter is laced onto this thread, and by traction from the created stoma, a catheter with a rigid or flexible internal retainer is placed through it.
- *Push or Sacks–Vine technique:* similar procedure to the previous one, but with this method the catheter used is introduced by pushing from the oral cavity, attached to a long, semi-rigid and pointed tube, and by ensuring the guide remains taut, it is pushed through until it makes its way through the abdominal wall.
- *Introducer, gastropexy or Russell technique* (Fig. 2): three pexis are placed, bringing the gastric wall closer to the abdominal wall at 2 cm from the maximum transillumination point, and a trocar is inserted into the centre through which a guide is introduced and several dilators are passed. After this, a balloon catheter is inserted and the sheath dismantled. These types of catheters have double lumen, one to inflate the balloon and another for feeding. They are recommended for paediatric patients and for patients who have advanced cancer of the head and neck or oesophagus.

All gastrostomy tubes have an internal retainer and an external retainer. There are also gastrojejunostomy or J tubes, that have a gastric and jejunal lumen, which allow decompression of the gastric cavity or administration of drugs in addition to feeding the patient.[27]

Fig. 1. Placement of percutaneous endoscopic gastrostomy tube by traction method. (1) Identification of the point of maximum transillumination and imprint. (2) Incision in the superficial plane of that point. (3) Introduction of the trocar and through it, a thread. (4) Grabbing the thread with a polypectomy loop for extraction with the endoscope through the mouth. (5) Lacing the end of the tube with the thread. (6) Traction of the thread from the abdominal wall to place the catheter in the gastrocutaneous fistula created.

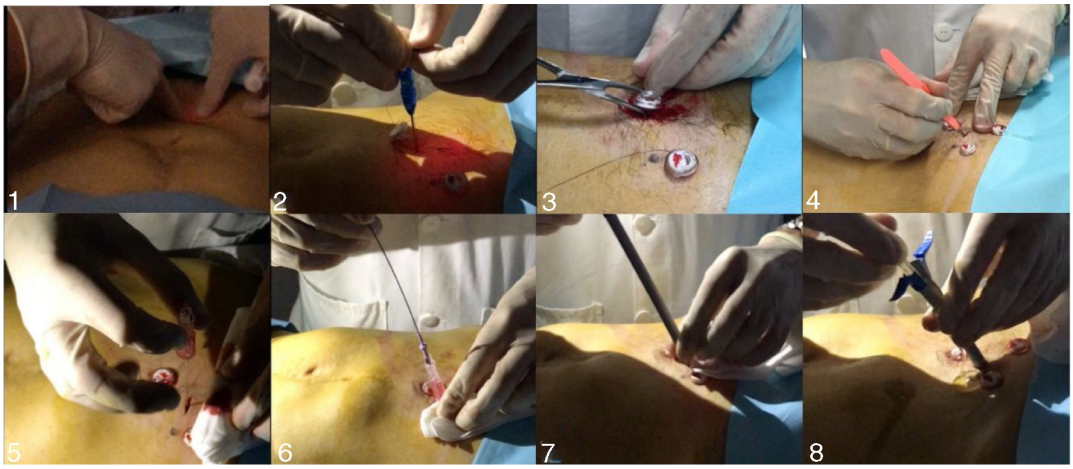

Fig. 2. Placement of percutaneous endoscopic gastrostomy tube by gastropexy method. (1) Identification of the point of maximum transillumination and imprint. (2) Placing three gastropexias at 1 cm from the maximum transillumination point. (3) Fixation of gastropexy once released. (4) Incision of the superficial plane. (5) Introduction of the trocar. (6) Placement of a guide through the trocar and its extraction. (7) Progressive dilatation with introducer of fistulous orifice. (8) Introduction of the catheter through the introducer with its removal.

Previous aspiration of secretions and disinfection of the oropharyngeal cavity is advised in order to reduce infectious complications; and performing a complete endoscopic examination to rule out obstruction of the digestive tract or other diseases that contraindicate the performance of the technique is recommended.

Post insertion catheter care

Stoma and catheter care prevents complications and prolongs their useful lives, optimising the benefits they provide to the patient.

Stoma and catheter care

The stoma should be cleaned daily during the first two weeks with mild soap and water, the area should be dried well and antiseptic solution must be applied. If peristomal inflammation does not appear, the patient can shower in a week.[6] The placement of gauze between the skin and the external retainer is not recommended, unless there is peristomal drainage.

The catheter and its components (retaining rings, plugs) should also be cleaned and dried daily with soap and water, and the correct inflation of the balloon should be periodically verified from the second week. To avoid ulcers by decubitus in the abdominal and gastric walls, the catheter should be rotated daily 360° in both directions and be pulled up and down 1–2 cm.[28]

Care during feeding and drug administration

Recent studies have shown that feeding can safely start 3–6 h after catheterisation: at this time it is well tolerated, associated rates of complications are not believed to increase, there are supposed shorter hospitalisations and costs are lower when compared to feeding after 24 h.[29] Adapted enteral formulas should be administered at room temperature, crushed food that may obstruct the tube and that do not guarantee an adequate nutritional contribution should be avoided.[6] The formula can be administered during the first few days with a continuous infusion pump, or intermittently starting with small volumes and normalising the corresponding amount over 2–3 days.[6] The use of specialised syringes for the administration of EN (ENFit®) according to ISO 80369-3 is recommended so as to prevent errors in the administration. The use of 30 ml or greater syringes prevent transmission of excessive pressure on tube components, minimising wear and breakages. The patient must remain semi-incorporated during the administration of nutrition and up to at least one hour afterwards, in order to facilitate gastric emptying and prevent gastroesophageal reflux and bronchoaspiration.

Following administration of nutritional formulas or diluted medications, or every 4–6 h for continuous infusion, instilling 20–50 ml of water to eliminate residues in the tube is necessary. The permeability of the tube is checked by aspiration of gastric contents; if there are residues exceeding 100 ml, reintroduce content and wait an hour before increasing the volume.

Replacing and removing the gastrostomy tube

A tube's useful life duration is approximately six months. However, if the recommendations outlined above are followed, this period can be extended to 12–18 months. The tube will be removed once the issue for which the catheter was indicated has been resolved and the gastrocutaneous fistula will seal in 24–72 h. However, in most cases the issue will persist or progress and periodic replacement will be necessary.

The first replacement can be performed percutaneously by traction of the tube, or endoscopically by grabbing the fastener in the stomach with a polypectomy loop. The removal of the tube by endoscopy is associated with higher rates of immediate complications, such that the percutaneous method is preferable, especially in the elderly and patients with oesophageal cancer or a history of head and neck surgery. Nonetheless, the endoscopic method is used in patients with a history of abdominal surgery, carriers of catheters with rigid internal fixation, or when the percutaneous method fails.[30] Once the old tube is removed, a balloon catheter is inserted through the stoma into the gastric cavity. These substitutions can be made by well-trained primary care personnel, thus reducing costs and transfers.[31]

Complications

Complications due to the endoscopic placement of a gastrostomy tube can be classified into minor or major depending on severity (Table 4).

It is considered a safe technique, with low complication rates that range between 13–43% and major complications that do not exceed 22%.[32] Complications mainly occur in elderly, multipathological, malnourished patients and those with a history of bronchospasms or infections.[28,33] Taking into account the fragility

Table 4
Complications of percutaneous endoscopic gastrostomy.

Minor
Granuloma
Hernia
Gastrocolocutaneous fistula
Wound infection
Obstruction of the catheter
Peristomal leak
Catheter comes out
Diarrhoea
Gastric outlet obstruction
Absence of stoma closure
Major
Ileo
Haemorrhage
Injury of internal organs
Necrotising fasciitis
Bronchopulmonary pneumonia
Buried bumper syndrome
Tumour harvesting
Volvulus

of the majority of patients who are going to undergo an endoscopic gastrostomy, the rate of complications is usually higher than that described in merely diagnostic explorations.[34] Identifying the complications in many of these patients can sometimes be challenging due to their inability to detect and communicate symptoms because of the advanced cognitive impairment they present.[28]

Furthermore, the technique has a very low mortality rate (0–2%), although this percentage increases at 30 days (6.7–26%), especially in patients with cardiovascular comorbidities.[35]

Infection of the opening

The stoma infection rate when placing the PEG tube is estimated in different groups to be between 5 and 25%[36]; this infection rates falls to 3% with the administration of prophylactic antibiotherapy. Clinical symptoms include the presence of erythema, puss oozing and exudate of the peristomal area, and even signs of systemic inflammation.

In most cases, the infection responds to the administration of cephalosporins or quinolones. Due to the increased incidence of methicillin-resistant Staphylococcus aureus infections, nasopharyngeal decontamination in addition to antibiotic prophylaxis can significantly reduce the incidence of stoma infections.[28,37] If the infection responds to antibiotic, taking samples of the exudate for microbiological culture or the removal of the tube is not necessary, although it could be contemplated in cases that evolve to peritonitis or necrotising fasciitis.

Peristomal leak

The loss of tightness of the stoma that occurs in the days after the gastrostomy is performed is associated with the incision having been made too wide or a delay in the production of granulation tissue in the stoma, especially in immunosuppressed, malnourished or diabetic patients. It can also be secondary to a too rapid administration of food or feeding excessively high volumes. However, this complication can also occur in the long term, and is frequent in patients carrying balloon catheters.

Treatment should begin with the optimisation of the nutritional status and medical factors and a review of the external fixation. The placement of larger-gauge gastrostomy tubes should be avoided, since they cause greater dilation of the stoma and route without promoting tissue growth or healing.[34] If the leak persists, the catheter can be removed in patients with a mature tract (more than four weeks after placement of the tube) while the guide is kept for another 24–48 h – thus achieving a partial closure of the stoma – and reinserting the tube the same location.[38] If all of the above fails, the tube should be removed and the endoscopic procedure repeated in a location close to the initial one that meets technical requirements.[34]

In the event that the leak occurs within the first four weeks of the placement of the tube, there is a high risk of peritonitis occurring when it is removed because of the immaturity of the tract. For this reason, surgical examination prior to the placement of a new tube is recommended.[39]

When the catheter comes out

The accidental coming out of the tube is a common reason for many ER visits; more than 12.8% of patients with these tubes have described this occurrence.[40] It can be caused by deflation of the internal balloon or by accidental extraction, especially in patients with cognitive impairment.

If the tube accidentally comes out during the first month of placement, the abdominal and gastric walls may be separated, and a blind placement of a new tube may result in placing the tube in the peritoneal cavity. Should this occur, the patient must be admitted, maintain an complete fast and initiate broad-spectrum antibiotic therapy. The stoma should close in approximately 7–10 days before placing a new gastrostomy tube in the vicinity, or even in the same place as the previous orifice.[41] Other techniques have been described for the handling of partial closures, such as dilatations with a hydrostatic balloon or with Savary type dilators.[42]

When tubes accidentally come out of patients who have a mature tract (more than one month), a new tube can be placed without the need for an endoscopy, or a Foley 16–18 Fr can be temporarily placed to ensure the tract remains permeable until a PEG tube becomes available. In case of doubts about the correct positioning of the tube, studies with water-soluble contrast should be conducted.

In patients whose tubes come out frequently, placing button tubes could be considered to prevent this complication, following a reassessment of the need to continue carrying a PEG tube.

Gastric outlet obstruction

Gastric outlet obstruction is a rare complication where there is an obstruction at the pylorus or duodenum, producing a complete or incomplete obstruction of the gastric outlet.[43] It should be suspected in patients who have abdominal pain, nausea and vomiting, although diagnosis is confirmed by upper digestive endoscopy. The resolution to this complication is pulling the tube, while keeping the external fixation at 1–2 cm from the abdominal wall.[43]

Obstruction of the tube

Blockage of the tube occurs frequently, it has a 23–35% incident rate.[44] Caring for the catheter and using the preventive measures described above help to prevent this problem from occurring. When an obstruction occurs, the first step is to infuse 50–60 ml of warm water or carbonated beverage. However, because in some cases this has been shown to worsen occlusion by denaturation of the proteins that enteral formulas contain, the alternative use of pancreatic enzymes has been suggested.[44]

Absence of stoma closure

After the removal of the catheter, the ostomy begins to close within the first hours and takes approximately three days to completely close. However, the fistula can remain open in up to 25% of patients after removal of the catheter; risk factors for this include

pluripathology, immunosuppression and prolonged duration of having the catheter.[45]

To address this complication, surgical techniques have been replaced by endoscopic techniques, which allow closure with hemoclips after coagulation with argon plasma, adhesion with fibrin, elastic bands[28,46] or closure with *Over-The-Scope-Clip* (OTSC®, a clip that is mounted onto the distal tip of an endoscope).[47]

Diarrhoea

Diarrhoea is an inherent complication in EN, occurring in up to 10–20% of cases.[48] Diluting enteral supplements, using formulations that are low in fat and lactose-free, or administering continuous perfusion via pump may correct it. In cases of refractoriness, the presence of a colocutaneous or jejunocutaneous fistula should be ruled out by performing a computed tomography (CT) scan.[49]

Ileus

Some patients may experience nausea and vomiting secondary to transient gastroparesis after the procedure, which rarely progresses to ileus (this occurs more frequently in patients with large pneumoperitoneum). In this case, nutrition must be suspended and the gastric cavity decompressed.[28]

Haemorrhage

Bleeding after performing the technique is rare, severe haemorrhaging (defined as bleeding that requires transfusion, endoscopic or surgical intervention) occurs in only 2.5% of cases. It can originate in the abdominal wall or along the gastrostomy route, as well as due to a lesion of large vessels, such as the gastric or splenic arteries or the mesenteric veins.[28] It is an early complication, manifesting as peristomal haemorrhage, manes, haematemesis or patient instability, and may require endoscopy, CT or even surgical exploration for its correct diagnosis. In most cases it stops spontaneously, but if it does not, it is usually controlled by pressure on the abdominal wound or tightening the external fixation for a period that does not exceed 48 h.[28]

Bronchopulmonary pneumonia

Bronchopulmonary pneumonia is a serious and potentially fatal complication. Although placing a PEG in many patients with a neurological disease is often requested in order to avoid pneumonia secondary to bronchoaspiration, there are studies that have contradicted this, such that there is no evidence for this indication.[8,9]

Bronchoaspiration can occur during the gastroscopy in supine decubitus and under sedation, or be associated with a high volume of feeding. The use of postpyloric or jejunal tubes introduced through percutaneous gastrostomy can reduce the incidence of bronchial pneumonia by up to 30%. However, insertion by this technique is technically more complex than that of gastric tubes.[50]

Injury of internal organs

Any intra-abdominal organ can be injured during the placement of a PEG tube, especially the colon and small intestine.[28] Perforation of the hollow viscus is more frequent in elderly patients, due to the hypermobility of the colonic mesentery and postsurgical adhesions.[7,28] It may initially present as haemorrhage or peritonitis, or late as a colocutaneous or enterocutaneous fistula.

Radiological studies have a limited value for the diagnosis of perforation, given the transient asymptomatic pneumoperitoneum that occurs after performing the technique.[51] If this persists for more than 72 h, or there are symptoms, an abdominal CT with water-soluble contrast should be performed, and urgent surgery must be carried out in case of perforation.

An adequate transillumination and gastric imprint when probing is essential if perforation is to be avoided

Necrotising fasciitis

Necrotising fasciitis is a rare and serious complication, consisting of a severe infection of the peristomal soft tissues, of acute and rapidly progressive onset, generally of a polymicrobial nature. It can be recognised by the appearance of oedema, erythema, pain and fever, with the possibility of developing bullae. It is associated with diabetes mellitus, malnutrition, neoplasms or immunosuppression,[52] as well as excessive traction or pressure of the tube on the gastrostomy orifice.[53]

To prevent it, keeping the external fixator 1–2 cm from the abdominal wall is essential.[28] Treatment is based on broad spectrum intravenous antibiotic therapy and urgent surgical debridement.

Buried bumper syndrome (internal fixation migration)

Buried bumper syndrome is a very rare complication (occurs in 1.5–1.9% of procedures)[54] where the internal fixation device migrates out of the stomach, impacting on the gastric wall and the skin along the gastrocutaneous fistula. It usually occurs as a result of excessive tension between the external and internal fixations, producing ischaemia, necrosis and ulceration.[55] Avoiding tension between the fixators and rotating the tube daily can prevent it. It usually occurs in the first four months of using the tube.[56]

Clinical manifestations depend on the depth of migration of the fixation, which can cause pain, inability to infuse food and pervaded extravasation of the nutritional formula, the latter being the most frequent manifestation. In addition, it can be complicated by haemorrhage, gastric perforation or peritonitis.

Diagnosis is made by direct visualisation and subcutaneous palpation of the internal fixation, using upper digestive endoscopy in case of doubt, which will identify the internal fixation of the device buried inside the gastric mucosa. Carrying out a study with endoscopic ultrasonography or ultrasound is essential to confirming how it will be managed, as if the migration affects the gastric muscle itself, treatment must be surgical, or if not, endoscopic. To treat it, it can be pulled from the outside when it is a balloon catheter or flexible internal fixator. If the problem still persists, endoscopic removal would be indicated. For this there are different methods, such as dissecting the tissue that contains the internal fixation with a Needle-Knife Sphincterotome by making four radial incisions in the four quadrants,[57] argon plasma ablation, using the electrosurgical L-shaped hook *HookKnife*®[58] (electrocautery) or using the push-pull T technique.[59]

Tumour harvesting

In patients with oesophageal and oropharyngeal tumours, transfer and mechanical inoculation of tumour cells to the gastrostomy area have been described. However, the clinical significance of this complication is unknown due to the low risk of its occurrence (incidence less than 1%). In order to avoid it, using the Russell technique or the introducer method is suggested.[60] Upon suspicion, biopsy of the peristomal area and performing an abdominal CT is necessary.

Conclusions

EN is the artificial nutritional support technique of choice, and PEG is considering a safe and effective procedure. Those entities

that condition dysphagia and alterations in swallowing are the main indications for this technique – but they are not currently recommended in patients with advanced dementia because of its doubtful benefit for them. It is usually done by traction, gastropexy is reserved for cases of anatomical alterations of the upper digestive tract. The majority of complications can be prevented by adequate care of the catheter, the most frequent being those of a mild nature, such as diarrhoea, obstruction of the catheter, accidental extraction of the catheter and the absence of stoma closure.

Conflict of interest

The authors declare no conflict of interest.

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