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CASE REPORT

Subcutaneous Emphysema Following Percutaneous Endoscopic Gastrostomy (PEG): A Case Report

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Abstract

Percutaneous Endoscopic Gastrostomy (PEG) has been used since 1980 as an alternative to feed patients with swallowing difficulties. Most of the complications resulting from this procedure are not too severe, including gastric content leakage around the tube, local infections and bleeding, and pneumoperitoneum. Post-PEG subcutaneous emphysema is rare, with few cases reported in the literature. We present a PEG case using a traction ("pull") method in a 73-year-old woman who developed extensive pneumoperitoneum and subcutaneous emphysema in the face, neck and chest as identified immediately after the procedure.

Keywords: Gastrostomy, Gastrointestinal Endoscopy, Subcutaneous Emphysema.

1. Introduction

The first cases of endoscopic gastrostomy (PEG) were performed in 1980, and since then the procedure has been used as an alternative route to feed patients with swallowing difficulties resulting from several conditions, as well as for decompression [1].

One of the most frequent scenarios is dysphagia that affects patients with neurological diseases such as dementia, Alzheimer's disease, stroke, etc. [2]. It has the advantage of not requiring general anesthesia, and some authors [3,4] have reported lower complication rates.

From the outset, two methods have been used to implement it. The pull method, where the gastrostomy tube is drawn orally, and the puncture ("introducer") method, where the tube is positioned inside the gastric cavity using a kit for insertion through the abdominal wall [1,4,5].

Although it is considered a safe procedure, several complications have been reported, most of which are

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of the low morbidity type, such as local infection, local bleeding, tube displacement, fluid leakage around the tube, local pain and tube obstruction, which may occur in 18-38% of the cases [3,4]. Major complications such as aspiration pneumonia, abdominal organ injury, and high bleeding are less frequent and may occur in 3-23% of the cases [3,4]. A higher incidence of complications has been reported depending on the underlying disease or comorbidities such as pulmonary, cardiac, and neurological diseases, hypoproteinemia, anemia, advanced age, etc. [6,7].

Subcutaneous emphysema can be seen when free air enters the subcutaneous space. The most common causes include pneumothorax or pneumomediastinum. It may also be secondary to other scenarios such as orbital fracture, post-tracheostomy, deep ulcerations in the pharyngeal region, esophageal injuries and perforations in the larynx and trachea. Occasionally, it may occur as complications such as thoracentesis, asthma, and abdominal surgery. Air is rarely formed directly in the subcutaneous space produced by some bacteria [8]. Reports of subcutaneous emphysema in patients submitted to endoscopic gastrostomy are not frequent, with no evidence of perforation. Therefore, the purpose of this article is to report the case of a marked subcutaneous emphysema in the face, neck, and chest in a 73-year-old woman submitted to PEG.

2. Case Report

A 73-year-old woman was seen at the Digestive Endoscopy Unit of an Academic Hospital in the city of Juiz de Fora, state of Minas Gerais, Brazil, to undergo a PEG, as indicated for dysphagia due to neurological causes (stroke). She presented with comorbidities such as hypertension, dyslipidemia, a previous stroke ten years before, and long-term smoking. She was being treated for sepsis with a pulmonary focus.

She was using meropenem, sultamicillin, piperacillin sodium/tazobactam sodium, ceftriaxone, clindamycin hydrochloride, enoxaparin, acetylsalicylic acid, simvastatin, escitalopram oxalate, Saccharomyces boulardii and amlodipine besylate.

Sedated by the anesthesiologist, she underwent the PEG procedure using the pull technique with the placement of a 20F tube. Propofol, fentanyl and midazolam were used during sedation, with O_2 delivered through a nasal cannula.

The patient tolerated the procedure well with no desaturations and remained hemodynamically stable. In the recovery room, she developed subcutaneous emphysema – initially periorbital – which progressed toward the face, neck, and chest, with desaturation and mild respiratory effort. O_2 was delivered using a face mask with gradual improvement of the condition. She was then transferred to the Intensive Care Unit (ICU) and was eupneic, hemodynamically stable and time- and space-oriented.

A Computed Tomography (CT) of the cervical region, chest and abdomen showed extensive subcutaneous emphysema (Figure 1) in the face, neck and chest, pneumoperitoneum (Figure 2), and slight pneumothorax with no evidence of perforation.

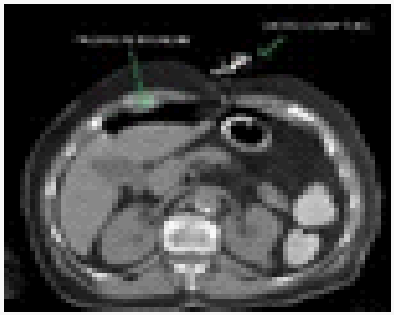

Figure 1. *CT slice showing subcutaneous emphysema (green arrow).*

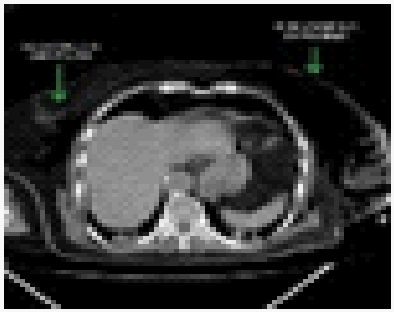

Figure 2. *CT slice showing pneumoperitoneum.*

During her ICU stay, the patient progressed well with mild abdominal pain and progressive and spontaneous resolution of the subcutaneous emphysema and was discharged to the ward after the fourth day.

3. Discussion/Conclusion

Although PEG is considered a safe procedure, several complications have been reported, most of which are of the low morbidity type, such as local infection, local bleeding, tube displacement, fluid leakage around the tube, local pain and tube obstruction, which may occur in 18-38% of the cases [3,4]. Major complications such as aspiration pneumonia, abdominal organ injury, and high bleeding are less frequent and may occur in 3-23% of the cases [3,4]. In this case report, an extensive subcutaneous emphysema is presented in the face, neck, and chest in a 73-year-old patient who progressed after undergoing a PEG. Although this is not frequent, some cases have been published, and some hypotheses are offered for its occurrence.

Stathopoulos et al. [2] reported two cases of subcutaneous emphysema following PEG. The first case was a 74-year-old alcoholic woman who was hospitalized for seizures that were difficult to control after a subdural hematoma. She developed intermittent weakness and was unable to eat properly, and PEG was indicated. After 6 hours, the patient continued with a low temperature, and a crepitus was identified that extended from the gastrostomy to the anterior wall of the abdomen, chest, and flanks.

A plain radiography identified emphysema. The abdomen scan was normal. She remained fasting for 14 days with progressive improvement in the temperature and crepitus, and eating was started with no further issues. The second case was of an 88-year-old woman with dysphagia due to neurological causes (dementia). PEG was performed with no further issues, and eating started normally. Crepitus was noted on the seventh day, which was confirmed by plain X-rays, as well as subcutaneous emphysema in the chest and neck.

As the patient was asymptomatic and with no other findings, she was followed up clinically with no discontinued eating. The emphysema resolved spontaneously within five days. The authors [2] argue that emphysema that appears soon after the procedure is probably the result of subcutaneous dissection by intragastric air. Inflation could lead to intraluminal pressure greater than 70 mmHg (95 cm/H_2O), well above the interstitial pressure of 5 cm/H_2O. As a preventive action, they suggested a larger skin incision[2].

In this case report, the identification of emphysema occurred immediately after the procedure. There was no perforation or technical difficulty for the PEG. Oxygen was supplied with a nasopharyngeal cannula. At first, the emphysema was periorbital, subsequently extending to the face, neck, and chest.

Patel et al. [10] reported the case of pneumoperitoneum, pneumomediastinum and subcutaneous emphysema in the neck and chest following a PEG in a 48-year-old man with cancer at the base of the tongue. These were incidentally identified approximately two weeks after the procedure with no subsequent clinical effects. No perforation was identified. They discussed the possibilities for this event. Pneumoperitoneum, which occurs in up to 50% of cases, could be the origin of pneumomediastinum.

Pneumoperitoneum would cause pneumomediastinum via diaphragmatic hiatus due to congenital abnormalities, weak points or defects close to the diaphragmatic hiatus. The cause may have been the pneumoperitoneum due to inadequate attachment of the gastrostomy tube, or even an air leak into the cavity during the abdominal wall puncture [10]. In this case, perforations were also ruled out. A significant pneumoperitoneum and subcutaneous emphysema occurred with no pneumomediastinum. Therefore, there was no air passing from the abdomen into the mediastinum.

Bernstein et al. [11] published the case of a seven-month-old boy with swallowing problems due to glucose-6-phosphate dehydrogenase (G6PD) deficiency who was submitted to percutaneous gastrostomy using the image-guided puncture ("introducer") technique. Twelve hours after the procedure, he developed fever, abdominal tenderness, and leakage of a dark fluid around the gastrostomy tube. After 36 hours, he presented with a subcutaneous emphysema extending to the flanks and chest. They concluded that the gastrostomy tube intermittently migrated in and out, allowing air to pass into the subcutaneous tissue [11].

Barbeiro et al. [12] reported the case of a 68-year-old man submitted to PEG for dysphagia due to neurological causes secondary to Amyotrophic Lateral Sclerosis (ALS). The procedure was performed using the pull technique, with no immediate complications, and eating was introduced as usual. Four days

after the PEG, the patient developed dyspnea, subcutaneous emphysema and abdominal bloating with diffuse tenderness and signs of peritoneal irritation. Radiological examinations showed pneumoperitoneum, and the internal tube screen was found to be in an intraperitoneal position.

The patient underwent exploratory laparotomy, abdominal cavity washing, suture of the gastric perforation by omentoplasty, as well as jejunostomy. The patient recovered well after surgery. They argued that a potentially excessive pull may have been the reason for migration of the inner screen into the abdominal cavity [12].

Ruiz & Rahni [13] described the case of a 67-year-old patient with glioblastoma multiforme under palliative care. One month after removal of the PEG tube and clip closure, the patient presented with abdominal bloating and crepitus to abdominal palpation. A CT scan revealed extensive subcutaneous emphysema extending to the chest. Since this was a terminal patient, he was referred to palliative care.

Subcutaneous emphysema affecting the face, neck and chest has also been reported in dental procedures, head and/or neck surgery, and craniofacial trauma [14]. Gasparini et al. [15] also reported a case of subcutaneous emphysema of the face, neck, and chest, as well as in the larynx, uvula, and tongue, during submental and abdominal liposuction procedure. Emphysema appeared immediately after the insertion of a nasopharyngeal cannula for supplementary oxygenation, causing respiratory difficulty and the need for intubation.

They discussed the anatomical characteristics of the submucosal space in this region and the possibilities for this complication, with the added possibility for pneumothorax and pneumomediastinum [15]. The patient in this case report was also approached by the anesthesiologist with nasopharyngeal probing for supplementary oxygen therapy; however, a laryngoscopy was not performed that could identify emphysema in the larynx, pharynx, and base of the tongue. The patient presented desaturation, which indicates difficult ventilation, with no need for tracheal intubation. As the emphysema was descending, i.e. at first periorbital and then extending to the face, neck and chest, this mechanism may have been the same as that seen by Ruiz & Rahni [13].

Post-PEG pneumoperitoneum is not uncommon; however, subcutaneous emphysema is rare. Some possibilities should be taken into account when they occur.

Once the possibility of laryngopharyngeal, airway or esophageal perforation has been ruled out, there are other possibilities such as the migration of abdomen air into the mediastinum and subcutaneous region of the neck and chest due to defects at the diaphragmatic hiatus level; migration from the stomach directly into the subcutaneous space of the abdomen and chest, considering the difference in pressure between the gastric lumen and the subcutaneous lumen; as well as the migration of the internal screen of the gastrostomy tube into the abdominal cavity or subcutaneous space by excessive pull or wall necrosis.

Another possibility that was also mentioned, albeit infrequent, is bacterial contamination of the subcutaneous space with the formation of gases directly in that space. The diagnosis, which is initially clinical by manually identifying the crepitus, can be confirmed by imaging.

The conduct is mostly expectant via clinical follow-up, but, depending on the etiology, may require a surgical approach. For PEG, it is recommended not to produce excessive intragastric pressure in the post-procedure control examination, as well as to make a skin incision a little larger than the tube gage to allow for any migration of air to the outside.

Ethics Statement

Written informed consent was obtained from the patient for publication of the details of their medical case and any accompanying images.

Declaration of Conflicts of Interest

The authors declare no conflicts of interest.

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This study received no financial support.

Contributions by the Authors

Bertges LC wrote the manuscript, Abreu VGperformed the endoscopic procedure, Araujo PMperformed the anesthetic procedure, Cangussú IVfollowed the patient post-procedure for intervention in case of a potential surgical approach, Martins JVA and Abdo SF gathered all the data and images from the patient's records. All authors contributed by participating in the case itself, or at some stage in the preparation of the manuscript, and also approved its final version.

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