LEAK AFTER SLEEVE GASTRECTOMY WITH POSITIVE INDOCYANINE GREEN TEST: AVOIDABLE SCENARIO?

RUNNING HEADS: Indocyanine green test for evaluation of perfusion of staple line of the stomach during laparoscopic sleeve gastrectomy

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ABSTRACT

BACKGROUND: The staple line gastric leak (GL) is estimated to be the most serious complication of the sleeve gastrectomy. The use of indocyanine green (ICG) has been introduced in minimally invasive surgery to showthe vascularization of the stomach in real time and its application to the gastroesophageal junction (GE) during Laparoscopic Sleeve Gastrectomy (LSG) seems very promising.

CASE PRESENTATION: We present the case of a 40-year-old female underwent laparoscopic sleeve gastrectomy. Intraoperative indocyanine green test showed a small dark area in the proximal third of the staple line reinforced with fibrin glue. Two weeks later the patient presented to the emergency room (ED) with abdominal pain, fever, vomiting, intolerance to oral intake and the evidence of a leak on the abdomen Computer Tomography (CT).

CONCLUSIONS: This case report shows that intraoperative ICG test can be helpful in determining which patients are at greater risk of the leak and, more importantly, the cause of the leak but further tests are needed to determine if the ICG predicts leak due to ischemia.

Key words: laparoscopic sleeve gastrectomy, Indocyanine green test, gastric fistula.

INTRODUCTION

Obesity is a major current public health problem of global significance.Obesity is associated with a myriad of serious health conditions, including hypertension, type II diabetes mellitus, sleep disorders, dementia, cardio-vascular diseases, and various malignancies, and is associated with increased morbidity and mortality [1].

Laparoscopic sleeve gastrectomy (LSG) has become in the last decades the most frequently performed bariatric procedure worldwide since it is a less demanding procedure compared to Roux-en-Y gastric bypass (BRGY), with a shorter operative time and absence of anastomosis. [2]

The staple line gastric leak (GL) is estimated to be the most serious complication of this procedure, due to a difficult healing process when using a non-standardized endoscopic approach, with a currently reported rate of 0.4 to 2.7%. [3]

Post LSG leaks can be misdiagnosed, resulting in delayed management and catastrophic consequences [4,5]. The clinical presentation, signs, and symptoms are highly variable, ranging from asymptomatic to septic shock [6].

Fistulas are complex and have multifactorial origins. Situations that cause difficulty in gastric emptying, with a consequent increase in intraluminal pressure, may lead to a rupture of the stapling line in the region of the esophagogastric junction, at the His angle, causing a gastric fistula [7]. Stapling failures, gastric twist, tissue damage, and distal strictures are some of the conditions that pose an additional risk for the development of fistulas after SG [8, 9].

The use of indocyanine green (ICG) has been introduced in minimally invasive surgery[10-12].

Indocyanine Green (ICG) is a liquid that can be injected into the human bloodstream without adverse effects. [13] The ICG fluoresces when excited with light of wavelength in the near infrared (NIR) spectrum (approximately 820 nm) [14] [15, 16]. Special telescopes detect the fluorescence that is transmitted to a standard monitor that allows the identification of the anatomical structures in which the dye is present (eg biliary tract, vessels, lymph nodes, etc.). It is a low cost technique capable of showing the

vascularization of the stomach in real time and its application to the gastroesophageal junction (GE) during LSG seems very promising [17-19].

In this article, we present a case report of a 40-year-old female with a positive intraoperative indocyanine green test as a prediction of the leak after sleeve gastrectomy.

CASE PRESENTATION

A 40-year-oldfemale with a body mass index of 43,1 Kg/m^2 and weighing 115 Kg underwent laparoscopic sleeve gastrectomy. Her past medical history includes hypertension, hypothyroidism with Basedow's disease, left eye glaucoma, depressive disorder.During the operation after four port placement, detachment from the great curvature with dissection of the gastroepiploic and short gastric vessels was performed employing an energy device.

The sleeve resection was shaped around a 40-French bougie in place using a mechanical linear stapler; 5 ml of ICG were then injected intravenously to identify the stomach, carefully assessing the angle of His (preoperative written informed consent was obtained from the patient).

Adequate perfusion was defined as “the direct and clear visualization of the fluorescence around the gastric tube, after an estimated time of 150-180 s following i.v. administration".

Intraoperative indocyanine green test showed a small dark area at the proximal third of the staple line, therefore it was decided to reinforce the suture line using fibrin glue (Figure 1a – 1b).

She had a smooth recovery with discharge home on the second postoperative day after a negative Gastrografin swallow test (Figure 2).

Two weeks later the patient presented to emergency department (ED) with abdominal pain, fever, vomiting and intolerance to oral intake. Her laboratory workups were within normal, computed tomography (CT) abdomen with oral and intravenous (IV) contrast revealed a collection 13x9 cm with air pocket adjacent to the staple line at the upper stomach (Figure 3).

The collection was treated with the placement of two abdominal drainages with laparoscopic approach and a self-expanding covered prosthesis placed with endoscopic technique to exclude the fistula (Figure 4-5). The patient was discharged in good general conditions, normal laboratory tests, control CT showing a clear reduction of the intra-abdominal collection (Figure 6). The patient will undergo a replacement of the prosthesis in 3/4 weeks.

DISCUSSION

The esophagogastric junction represents an anatomical area of weakness for any digestive suture. The fundic wall is thinner, and vascularization is more precarious than the rest of the stomach. This area under the cardia is more sensitive to technical failure or to any increase in intragastric pressure [20]. Experience showed us that almost all leaks after bariatric surgery originate in this location, namely just below the GE junction [21].

The gastric leakage could be due to the creation of a long and narrow tube with the maintenance of the pylorus which surely increases the intraluminal pressure (intragastric hypertension) or to the localized ischemia related to the gastroepiploic and the ligation of the short gastric vessel during the detachment a greater curvature or even an inadequate and abnormal inflammatory response to the surgical procedure [22, 23].

Recently, much interest has been focused on the possibility of assessing blood supply during surgery with the use of ICG fluorescence angiography, which is a real-time, inexpensive and feasible method of establishing vascularity in an selected area. [24,25]. It has been fully and positively approved in most laparoscopic procedures [26] but there is still little literature on its usefulness in bariatric procedures.

Di Furia et al. led a study on 43 patientsand concluded that intraoperative view of the blood supply of the stomach does not appear to represent a prognostic factor for the risk of gastric leakage, suggesting a complex multifactorial etiology (intragastric hypertension? Abnormal inflammatory response?) Which needs further data to be established[27].

Ortega et al. have obtained satisfactory results on 86 patients showing that ICG fluorescence angiography allows to determine the increased blood supply to the proximal stomach before any dissection during sleeve gastrectomy, so that an effort can be made to avoid unnecessary injury to these vessels during the procedure[28, 29].
Frattini et al. in their preliminary experience, the results of the ICG resemble the intraoperative methylene blue test and the postoperative contrast swallow test. The ICG allows for real-time assessment and provides a direct picture of tissue perfusion and vascularity. Furthermore, IGF may be useful in explaining the exact pathogenesis of gastric leak[30].

CONCLUSIONS

Intraoperative ICG test can be helpful in determining which patients are at greater risk of the leak and, more importantly, the cause of the leak. In this case the fibrin glue was not sufficient to avoid the gastric fistula, but other reinforcement methods could be implemented in case of inadequate perfusion found with the ICG test, such as sutures. Further tests are needed to determine if the ICG predicts leak due to ischemia.

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DECLARATIONS

Ethics approval and consent to participate: The ethics committee (DDG n. 363 del 25/10/2016 e s.m.i. DDG n. 318 del 14/06/2019) of our institution (PoliclinicoRiuniti) approved the study.
All research methods were carried out in accordance with relevant guidelines and regulations.
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GIOVANNA PAVONE and NICOLA TARTAGLIA performed the study conception and design.
MARIO PACILLI, FRANCESCA MADDALENA and FABIO PETRUZZELLI analysed and interpreted the data.
GENNARO MARTINES and MICHELE DE FAZIO contributed to acquisition of the data.
ANTONIO AMBROSI revised the manuscript.

Figure 1a: Evaluation of perfusion of staple line of the stomach by using Indocyanine green test

Figure 1b: Intraoperative picture of the staple line of the stomach

Figure 2: Gastrografin swallow test

Figure 3: The collection and the air pocket adjacent to the staple line at the upper stomach on the abdominal CT

Figure 4: The endoscopic evidence of the gastric fistula

Figure 5: Self-expanding covered prosthesis placed to exclude the fistula

Figure 6: Control abdomen CT that shows a clear reduction of the intra-abdominal collection