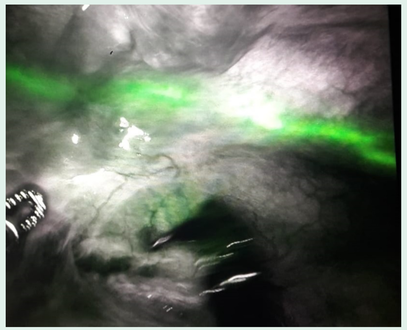
A SIMPLIFIED ICG ADMINISTRATION FOR FLUORESCENT THORACIC DUCT IDENTIFICATION

Giuseppe Barbato, Francesco Coratti, Mauro Marzano, Simone Buccianti, Rosaria Tucci, Isabella Ameli, Fabio Cianchi.

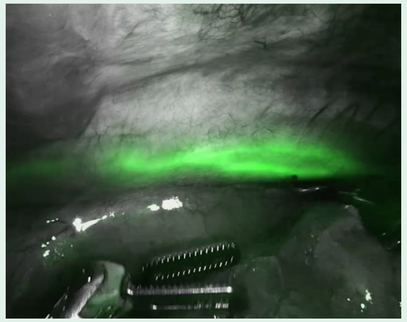
DEPARTMENT OF EXPERIMENTAL AND CLINICAL MEDICINE, CAREGGI UNIVERSITY HOSPITAL.
Dir. Prof. F. Cianchi

INTRODUCTION



Chylothorax refers to the presence of lymphatic fluid in the pleural space secondary to a leakage from the thoracic duct (TD) or one of its main tributaries, with a prevalence of about 4-6 % [1-3]. As evidenced in the literature, indocyanine green (ICG) lymphography can be performed to obtain real-time fluorescent images of the lymphatic flow, which can be useful for identifying the TD and a chyle leak. In order t**o make the procedure safe, the injection of ICG into the inguinal nodes is ultrasound-guided, so the structures** near the inguinal nodes **can be visualized** clearly a**nd easily avoided**. **Therefore this refined and accurate method requires ultrasound guidance and radiological abilities.**
In our experience, the use of ICG US-guided inguinal node injection to identify TD during robotic esophagectomy using Firefly® system is safe and reproducible but the US-guided procedure could be complex, requires trained staff, and extends operating times. Recently **we revised the procedure by simplifying it, assuming that the lymphatic drainage of the inguinal region is adequate to identify the TD without the need for an intranodal injection**. ICG was diluted in 10 ml of sterile water, and according to the patient's weight, 0.5 mg/Kg was injected in the subcutaneous tissue of the inguinal region bilaterally 14-16 hours before surgery.

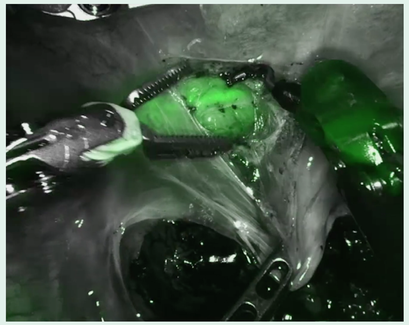
DISCUSSION

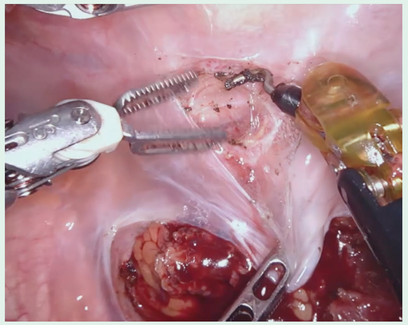


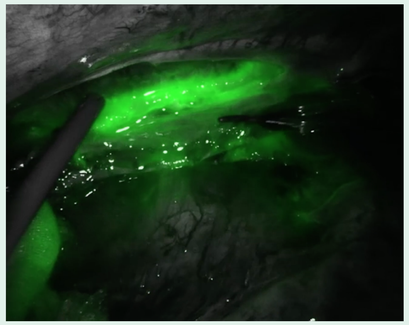
We enrolled **13 patients** from October 2019 to May 2020. The mean age was 68.1 (DS 7.3 y). All the patients examined were **affected by adenocarcinoma of the cardia** (38.5%) or **distal third of the esophagus** (61.5%). The 76.9% of patients underwent preoperative chemotherapy. **No adverse reactions or iatrogenic lesions at the injection site were observed**. The **TD** was **immediately visualized in every case considered and preventively ligated.** No aberrant TD was visualized. **In one patient an intraoperative leak of the TD**, despite it having been ligated, was **immediately identified and fixed. Fluorescence** was **present until** the **end** of the **operation in all cases**. **No patient had postoperative chylothorax.**
The **main risk factors for the postoperative chylothorax are the location of the esophageal neoplasm, histotype, BMI, neoadjuvant therapy** [8]. Some papers showed a mortality rate of 20% in patients who developed chylothorax, attesting the clinical importance of reducing chylothorax rates. It should be noted that chylothorax has been associated with a higher rate of morbidity and mortality among patients who underwent esophageal surgery.
Prophylactic ligation of the TD is an effective and safe measure to **minimize** the **risk of postoperative chylothorax**. The use of a minimally-invasive approach may **reduce complication rates and postoperative in-hospital staying**. Patients developing a chyle leak had a significantly longer critical care stay and overall hospital stay.

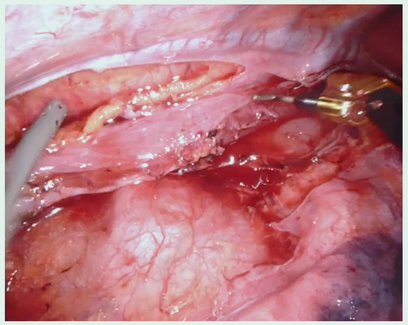
CONCLUSIONS

In our initial experience, the **procedure is easy to perform** and **does not require specifically trained staff.** In addition, it is not time-demanding and has comparable results to the procedure performed under ultrasound guide. Certainly, more cases will be needed to determine the mode of administration and the injection site with greater accuracy. The **simplification of the procedure** that we propose could **increase** the **diffusion of the method**. Further larger studies are needed to validate the procedure.









REFERENCES:

1. Alexiou C. Chylothorax following oesophagogastrectomy for malignant disease. Eur J Cardiothorac Surg. 1998;14(5):460-466. doi:10.1016/S1010-7940(98)00230-9
2. Mboumi IW, Reddy S, Lidor AO. Complications After Esophagectomy. Surg Clin North Am. 2019;99(3):501-510. doi:10.1016/j.suc.2019.02.011
3. Rasmussen SR, Nielsen RV, Fenger A-S, Siemsen M, Ravn HB. Postoperative complications and survival after surgical resection of esophageal squamous cell carcinoma. J Thorac Dis. 2018;10(7):4052-4060. doi:10.21037/jtd.2018.07.04
4. Vecchiato M, Martino A, Sponza M, et al. Thoracic duct identification with indocyanine green fluorescence during minimally invasive esophagectomy with patient in prone position. Dis Esophagus. 2020;33(12):doaa030. doi:10.1093/dote/doaa030
5. Dougenis D, Walker WS, Cameron EW, Walbaum PR. Management of chylothorax complicating extensive esophageal resection. Surg Gynecol Obstet. 1992;174(6):501-506.
6. Lai F-C, Chen L, Tu Y-R, Lin M, Li X. Prevention of Chylothorax Complicating Extensive Esophageal Resection by Mass Ligation of Thoracic Duct: A Random Control Study. Ann Thorac Surg. 2011;91(6):1770-1774. doi:10.1016/j.athoracsur.2011.02.070
7. Choh CTP, Khan OA, Rychlik IJ, McManus K. Does ligation of the thoracic duct during oesophagectomy reduce the incidence of post-operative chylothorax? Int J Surg. 2012;10(4):203-205. doi:10.1016/j.ijsu.2012.03.011
8. Fujita T, Sato T, Sato K, Hirano Y, Fujiwara H, Daiko H. Clinical manifestation, risk factors and managements for postoperative chylothorax after thoracic esophagectomy. J Thorac Dis. 2019;11(S3):S198-S201. doi:10.21037/jtd.2019.02.31