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Case Report

Minimally Invasive Treatment of Chyle Leak After Esophagectomy Using Indocyanine Green (Icg) Enhanced Fluorescence: A Case Report

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ABSTRACT

Chyle Leak (CL) is a relative rare but deadly complication after esophagectomy. The optimal management of CL is still unclear; however, a surgical re-intervention is usually considered necessary if the daily output from the thoracic drain exceeds 1 L. In case of re-intervention, surgical ligation of the thoracic duct (TD) is often resolutive, although TD visualization can be challenging in this setting. We report the case of a 66 years old male patient submitted to total minimally invasive Mc Kewon esophagectomy, who in the post-operative course developed a CL. After a first unsuccessful attempt of conservative management, we decided to re-submit the patient to surgery with a thoracoscopic approach. During the procedure, we injected the indocyanine green into the inguinal lymph nodes bilaterally. The fluorescence images allowed us to: 1- visualize the thoracic duct; 2- identify the exact site of the leak; 3- to confirm (after TD selective ligation) that the leak was correctly sealed. In two subsequent esophagectomies we used the same technique to intraoperatively identify the TD, allowing its prophylactic selective ligation.

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Introduction

Chyle leak (CL) is a relative uncommon complication after esophagectomy, with a reported incidence from 1,1% to 8,6% [1, 2]. This complication is, however, associated with a severe prognosis and in Literature mortality rates up to 20% have been described [1]. The optimal management for CL after esophagectomy is still unclear. Usually an initial conservative approach is adopted, with nil per os, total parenteral nutrition and thorax drainage, with or without the use of somatostatin or octeotride [3]. This conservative approach showed, in case of daily output from the thoracic drain < 1 L, a success rates up to 86% [4]. On the contrary, an invasive strategy is traditionally considered necessary when the output exceeds 1 L/day [5]. When a re-operation is performed, the surgical ligation of the thoracic duct (TD) is associated with a resolution of the leak in more than 90% of cases and is therefore considered mandatory [3]. However, the identification of the TD and/or of the exact site of the leak might be challenging. Here we report a case of CL after esophagectomy for cancer successfully treated with thoracoscopic re-intervention with identification of the thoracic duct and

of the site of the leak through Indocyanine Green (ICG) visualization and subsequent TD selective ligation.

Clinical Case

We present the case of a 66 years old male patient who underwent a minimally invasive McKeown esophagectomy for a locally advanced esophageal squamous cell carcinoma (stage cT3N1M0), after neoadjuvant chemo-radiotherapy (Verona Protocol [6]). The intervention was conducted through a laparoscopic, thoracoscopic and left cervicotomic approach. We performed a mediastinal standard and abdominal D1+ lymphadenectomy, without prophylactic TD ligation. A feeding jejunostomy was placed and enteral nutrition was started since 1st post-operative day (POD). On POD 2, we observed a milky-white debt from the thoracic drain, with an output >3 L. Triglyceride and chylomicrons levels in the pleural fluid were elevated. These findings were highly suspicious for chyle leak. A first conservative approach was attempted: we suspended the enteral nutrition from the jejunostomy and switched to total parenteral nutrition, thus obtaining a significant reduction in drain output in the following days (Figure 1).

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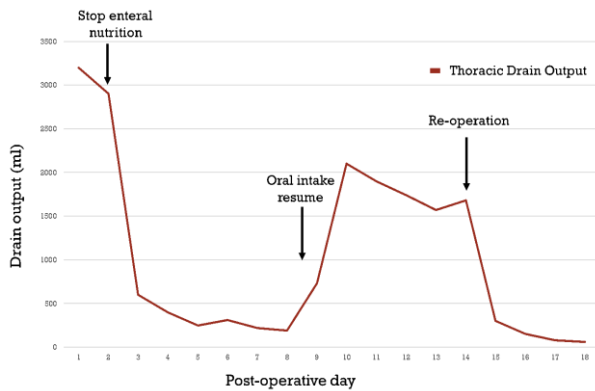


Figure 1: Thoracic Drain output after esophagectomy.

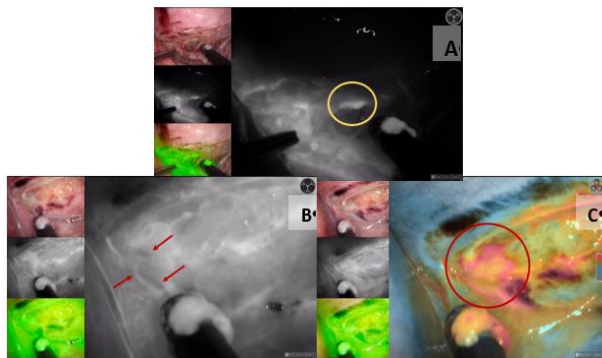


Figure 2: Intraoperative visualization with ICG fluorescence. A: cranial portion of the thoracic duct (in the yellow circle). B-C: lymph flow from the site of leak (between the red arrows and in the red circle).



Figure 3: Selective Ligature of the thoracic duct in the site of the leak.

On POD 9 we resumed the oral intake with a soft diet with medium-chain fatty acids. Unfortunately, we observed an immediate new increase of the milky-white drain output. On POD 15 we therefore decided to submit the patient to a new thoracoscopy to ligate the TD and to seal the leak. About 30 minutes before starting the intervention, 1 ml of indocyanine green (Verdye 0,5%, Diagnostic Green GhbH) was injected under ultrasound guide into the inguinal lymph nodes bilaterally. During the thoracoscopy, after abundant washing of the thorax, we obtained fluorescence images of lymph flow using a camera system which activates ICG with emitted light at a wavelength of 760 nm and filters out light with a wavelength below 820 nm. This system allowed a specific direct visualization not only of the thoracic duct, but also of the exact site of the leak, which was located about 2 cm above the diaphragm (Figure 2). A selective ligation of the TD was therefore performed (Figure 3), using a non-absorbable stitch and metallic clips. At the end of

the procedure, ICG fluorescence visualization was used to confirm that there was not residual leak (Figure 4). The following post-operative course was uneventful. The oral intake with a soft diet was resumed on POD 3, without evidence of chyle debt from the drain, which was therefore removed on POD 5 (POD 20 from esophagectomy). The patient was discharged on POD 7 (POD 22 from esophagectomy), after confirmation of the absence of liquid in the pleural space through a thorax x-ray. After 2 more weeks, we visited the patient in an ambulatory examination. He was in good clinical conditions and able to eat a soft diet. A thorax x-ray was negative for pleural effusion.

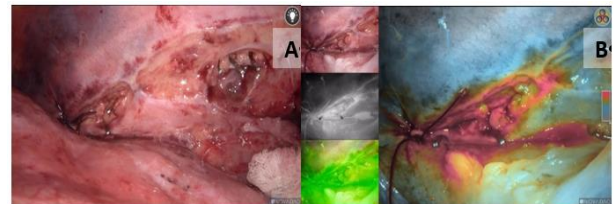


Figure 4: Operative field at the end of the procedure (A) and confirmation with ICG fluorescence of complete leak sealing (B).

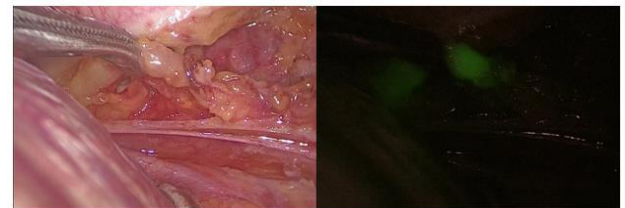


Figure 5: Identification during thoroscopic esophagectomy of the thoracic duct (lifted by surgical graspers) using the ICG.

Discussion

Chyle leak after esophagectomy is a severe complication, with reported high rates of mortality [1]. The loss of proteins and lipids, which may lead to malnutrition and immunosuppression, the risk of respiratory failure for pulmonary atelectasis and the higher incidence of infectious complications are all factors that contribute to the severity of the prognosis [7]. Even if there is no consensus on the optical management of the CL, most of the Authors agree that, when the daily output from the thoracic drain exceeds 1 L/day, a reintervention is probably necessary to seal the leak [3, 5, 8]. Patients with a CL requiring a surgical intervention have been traditionally managed with a new thoracotomy. In the last years, however, many studies have been reporting good results of the thoroscopic approach, in terms of both overall and pulmonary complications rates [9]. Either with an open or a thoroscopic approach the identification of the TD during a re-intervention after esophagectomy, especially if the patients had received neoadjuvant chemo-radiotherapy, could be difficult. Reisanauer reported in 2018 a large series of 97 post-operative chylothorax after various surgical operations: in this study a ligation of the TD was necessary in 52 patients, with a success rate of 85%. However, a clear visualization of the TD and thus its selective ligation was possible only in 33 (60%) cases, while in the others 19 (40%) patients a mass ligation had to be performed [3]. To overcome these limitations, we used the ICG fluorescence to precisely identify the TD. With this technique, moreover, we did not only visualize the TD, but we were also able to identify the exact site of the leak and so to perform a precise ligation. In addition, the ICG fluorescence allowed us to confirm that the leak was correctly sealed at the end of the

procedure. To our knowledge, this is one of the first cases reported in Literature of a thorascopic visualization with ICG of a CL after esophagectomy. The first experience of ICG use with this purpose was reported in 2009 Kamiya et al. they presented a case of CL after esophagectomy submitted, on 28th post-operative day, to a right thoracotomy [10]. During the exploration of the thorax the Authors were not able to identify the exact site of the fistula and only through the images obtained through ICG fluorescence the site of the leak was visualized. Kaburagi and Matsutani reported two similar cases of CL after esophagectomy [11, 12]. They both submitted the patient to a relaparotomy and, even if they couldn't see directly the fistula (which was located in the thorax), used the ICG visualization to proceed to a mass ligation of the cisterna chyli, which was easily identified through the fluorescence images. Good results with the use of ICG fluorescence for the treatment of post-operative chylothorax were also reported after lung surgery for cancer and after paediatric surgery for esophageal atresia [13, 14].

Considering the elevated morbi-mortality related to post-esophagectomy CL, some Authors proposed to perform a routine mass ligation of the TD during the esophagectomy, to reduce the risk of developing this complication. In Literature, however, there is not a strong evidence supporting this approach [15]. A possible explanation for the incomplete success of the intra-operative ligation is that in up to 40% of patients a duplicate or triplicate TD can be observed [16]. To overcome this limitation, we used the ICG fluorescence during two subsequent thorascopic esophagectomy, obtaining a precise visualization of the TD and so proceeding to its selective ligation (Figure 5). To conclude, ICG fluorescence visualization seems to be a promising, un-expensive and safe tool in the minimally-invasive treatment of the CL after esophagectomy. Further studies are needed to confirm this result.

Conflicts of Interest

The authors declare that they have no conflict of interest.

Ethical Approval

The authors have no affiliations with or involvement in any organization or entity with any financial interest.

Informed Consent

No informed consent is required.

REFERENCES

- Brinkmann S, Schroeder W, Junggeburth K, Gutschow CA, Bludau M et al. (2016) Incidence and management of chylothorax after Ivor Lewis esophagectomy for cancer of the esophagus. *J Thorac Cardiovasc Surg* 151: 1398-1404. [[Crossref](#)]
- Low DE, Kuppasamy MK, Alderson D, Cecconello I, Chang AC et al. (2019) Benchmarking Complications Associated with Esophagectomy. *Ann Surg* 269: 291-298. [[Crossref](#)]
- Reisenauer JS, Puig CA, Reisenauer CJ, Allen MS, Bendel E et al. (2018) Treatment of Postsurgical Chylothorax. *Ann Thorac Surg* 105: 254-262. [[Crossref](#)]
- Takuwa T, Yoshida J, Ono S, Hishida T, Nishimura M et al. (2013) Low-fat diet management strategy for chylothorax after pulmonary resection and lymph node dissection for primary lung cancer. *J Thorac Cardiovasc Surg* 146: 571-574. [[Crossref](#)]
- Cerfolio R, Allen M, Deschamps C, Trastek V, Pairolero PC (1996) Postoperative chylothorax. *J Thorac Cardiovasc Surg* 112: 1361-1365. [[Crossref](#)]
- Pasini F, de Manzoni G, Zanoni A, Grandinetti A, Capirci C et al. (2013) Neoadjuvant therapy with weekly docetaxel and cisplatin, 5-fluorouracil continuous infusion, and concurrent radiotherapy in patients with locally advanced esophageal cancer produced a high percentage of long-lasting pathological complete response: a phase. *Cancer* 119: 939-945. [[Crossref](#)]
- Lei Y, Feng Y, Zeng B, Zhang X1, Chen J et al. (2018) Effect of Prophylactic Thoracic Duct Ligation in Reducing the Incidence of Postoperative Chylothorax during Esophagectomy: A Systematic Review and Meta-analysis. *Thorac Cardiovasc Surg* 66: 370-375. [[Crossref](#)]
- Fujita T, Sato T, Sato K, Hirano Y, Fujiwara H et al. (2019) Clinical manifestation, risk factors and managements for postoperative chylothorax after thoracic esophagectomy. *J Thorac Dis* 11(Suppl 3): S198-S201. [[Crossref](#)]
- Hayden JD, Sue-Ling HM, Sarella AI, Dexter SP (2007) Minimally invasive management of chylous fistula after esophagectomy. *Dis Esophagus* 20: 251-255. [[Crossref](#)]
- Kamiya K, Unno N, Konno H (2009) Intraoperative indocyanine green fluorescence lymphography, a novel imaging technique to detect a chyle fistula after an esophagectomy: report of a case. *Surg Today* 39: 421-424. [[Crossref](#)]
- Kaburagi T, Takeuchi H, Oyama T, Nakamura R, Takahashi T et al. (2013) Intraoperative fluorescence lymphography using indocyanine green in a patient with chylothorax after esophagectomy: report of a case. *Surg Today* 43: 206-210. [[Crossref](#)]
- Matsutani T, Hirakata A, Nomura T, Hagiwara N, Matsuda A (2014) Transabdominal approach for chylorrhea after esophagectomy by using fluorescence navigation with indocyanine green 2014: 464017.
- Yang F, Zhou J, Li H, Yang F, Xiao R et al. (2018) Near-infrared fluorescence-guided thorascopic surgical intervention for postoperative chylothorax. *Interact Cardiovasc Thorac Surg* 26: 171-175. [[Crossref](#)]
- Shirotsuki R, Uchida H, Tanaka Y, Shirota C, Yokota K et al. (2018) Novel thorascopic navigation surgery for neonatal chylothorax using indocyanine-green fluorescent lymphography. *J Pediatr Surg* 53: 1246-1249. [[Crossref](#)]
- Lei Y, Feng Y, Zeng B, Zhang X1, Chen J et al. (2018) Effect of Prophylactic Thoracic Duct Ligation in Reducing the Incidence of Postoperative Chylothorax during Esophagectomy: A Systematic Review and Meta-analysis. *Thorac Cardiovasc Surg* 66: 370-375. [[Crossref](#)]
- Zilversmit DB (1965) The composition and structure of lymph chylomicrons in dog, rat, and man. *J Clin Invest* 44: 1610-1622. [[Crossref](#)]