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Laparoscopic management of refractory chylous ascites using fluorescence navigation with indocyanine green: A case report

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ABSTRACT

INTRODUCTION: Postoperative chylous ascites is a rare complication of colorectal surgery. Conservative management is usually effective in most cases of the postoperative chylous ascites. However, surgical intervention is performed for refractory cases.

PRESENTATION OF CASE: A 31-year-old man with neuroendocrine carcinoma developed chylous ascites after laparoscopic descending colectomy with D3 lymphadenectomy. Conservative treatment including total parenteral nutrition and somatostatin analogue failed and surgical intervention via laparoscopy was performed for the refractory chylous ascites. Lymphatic leakage was detected at the upper part of the inferior mesenteric artery during the laparoscopic exploration and was reconfirmed by intraoperative indocyanine green injection with an infrared camera system. Moreover, we injected the ICG into the other sites of the lymphadenectomy performed and identified the lymphatic flow. We confirmed there was no other lymphatic leakage. The lesion was ligated and closed with fibrin glue. Five months after the surgical intervention, no symptom was noted.

DISCUSSION: It is frequently difficult to detect the site of lymphatic leakage intraoperatively. Intraoperative indocyanine green injection is useful for detecting a lymphatic leakage site and especially making sure without other leakages. Additionally, laparoscopic surgery seems safe and effective for refractory chylous ascites.

CONCLUSION: we reported successful laparoscopic management of refractory chylous ascites using fluorescence navigation with indocyanine green.

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1. Introduction

Postoperative chylous ascites is a rare complication of colorectal surgery that is caused by the unrecognized interruption of the major lymphatic channels and lymphatic fistula formation [1]. The constant loss of protein and lymphocytes leads to serious malnutrition and immunologic deterioration. Therefore, effective management is necessary for good outcomes. Although conservative treatment is effective in most cases of the postoperative chylous ascites [2], a few cases are refractory and required surgical treatment. The site of fistula leakage is often difficult to detect

intraoperatively and various methods have been reported to detect leakage including lymphangiography, administration of fat-rich formula, and lipophilic dye [3]. Herein, we report a case of successful laparoscopic management using fluorescence navigation with indocyanine green (ICG) for refractory chylous ascites after colectomy.

This case report has been reported in line with the SCARE criteria [4].

2. Case report

A 31-year-old man with a complaint of left abdominal pain lasting over half a year was found to have descending colon cancer on colonoscopy. The cancer was diagnosed as a neuroendocrine carcinoma (NEC) of the descending colon by biopsy. The patient underwent laparoscopic descending colectomy with D3 lymphadenectomy, and the pathological diagnosis was NEC. On postoperative day (POD) 4, abdominal drainage showed milky white fluid. Laboratory investigations of the fluid revealed a triglyceride level of 436 mg/dL, consistent with chylous ascites. Cytology

Abbreviations: ICG, indocyanine green; NEC, neuroendocrine carcinoma; POD, postoperative day; CT, computed tomography; LFD, low fat diet; TPN, total parenteral nutrition; MCT, medium chain triglyceride; IMA, inferior mesenteric artery.

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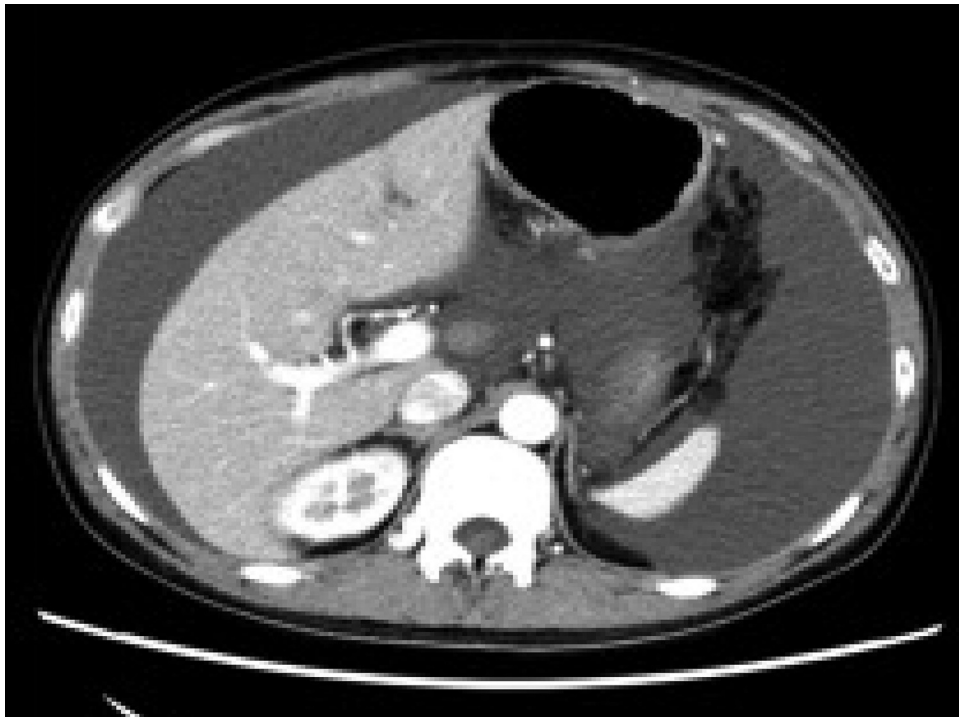


Fig. 1. Abdominal computed tomography showing significant ascites.

and cultures were negative. The drainage tube was removed on POD 7 because of the small amount of drainage and the patient was discharged on POD 13 without any symptoms. However, on POD 18, the patient was readmitted to our department with a complaint of abdominal distention. Abdominal computed tomography (CT) showed a large amount of ascites (Fig. 1). The abdominal drainage revealed milky white fluid with a markedly elevated triglyceride level of 1690 mg/dL. Initially, he was treated conservatively with a low-fat diet (LFD). We drained the ascites twice a week when the patient had abdominal distention. The amount of drainage was 1000 mL of chylous fluid in each drainage. On POD 26, oral feeding was discontinued and total parenteral nutrition (TPN) was started. The abdominal distention disappeared and LFD was restarted on POD 56. After a first cycle of adjuvant chemotherapy, he was discharged on POD 69.

He was admitted for a second cycle of chemotherapy on POD 96. However, he presented with abdominal distention again and paracentesis revealed chylous ascites. Laboratory data showed total protein and albumin levels of 4.2 g/dL and 1.9 g/dL, respectively. Therefore, conservative management was performed for refractory chylous ascites. On POD 97, TPN and somatostatin analog (300 µg/day) were started. The characteristic of the drainage output changed from milky white to serous and the amount of drainage temporarily decreased to 50–200 mL/day. Medium-chain triglyceride (MCT) diet was started on POD 113. However, the drain output revealed milky white fluid and the amount of drainage increased to 500–1000 mL/day. Conservative treatment was considered unsuccessful. Surgical intervention via laparoscopy was planned to treat the refractory chylous ascites.

Before the start of the surgery, 200 mL of milk was orally administered to facilitate visualization of the lymphatic fistula. On laparoscopic exploration, a large amount of whitish ascites was observed (Fig. 2a). The lymphatic leakage site was detected at the upper part of the inferior mesenteric artery (IMA) which was the site of the previous lymphadenectomy because a white stream of leaking chyle was visualized (Fig. 2b). Furthermore, we injected 0.5 mL of ICG (2.5 mg/dL) around the IMA (Fig. 3), and we recon-

firmed the leakage site by checking ICG leakage on fluorescence imaging using an infrared camera system (Fig. 4a). We injected the ICG into the other sites of the lymphadenectomy and identified the lymphatic flow, but there was no other lymphatic leakage (Fig. 4b). Thereafter, we ligated the lymphatic leakage site (Fig. 5a) and fibrin glue was sprayed over the entire ligation area (Fig. 5b).

Oral feeding was started on POD6 after the second surgery. The drain output characteristic was serous, with a triglyceride level of 30 mg/dL. After the drainage tube was removed, there was no symptom. He was discharged on POD 10 and there was no symptom 5 months after surgical intervention.

3. Discussion

Postoperative chylous ascites is a rare complication usually resulting from operative trauma caused by the unrecognized interruption of lymphatic channels. Chylous ascites is defined as the noninfectious extravasation of a milky fluid, with a volume of ≥ 200 mL/day and a triglyceride level of ≥ 110 mg/dL [5]. It has an incidence of 7.4% after oncological abdominal surgery [5]. The incidence of chylous ascites in colorectal cancer patients is 1.0%–6.6% [6]. The degree of lymphatic leakage after colorectal surgery may be milder than after upper abdominal surgery because peripheral lymphatic systems tend to be injured in colorectal surgery, whereas central lymphatic systems, the cisterna chyli, may be injured in upper abdominal surgery [7].

Generally, various treatment methods have been used to control chylous ascites. The treatment is primarily conservative because of better responsiveness, for the reasons mentioned above. Conservative management includes TPN, MCT diet, and somatostatin analog, and in a report, successful resolution was reported in more than 75% of the cases [2]. In the present case, the chylous ascites initially responded; however, it recurred.

Surgical management should be considered for cases that are refractory to conservative management. Although the duration of conservative therapy before surgical treatment is not defined, some protracted cases have been resolved after weeks or months [1].

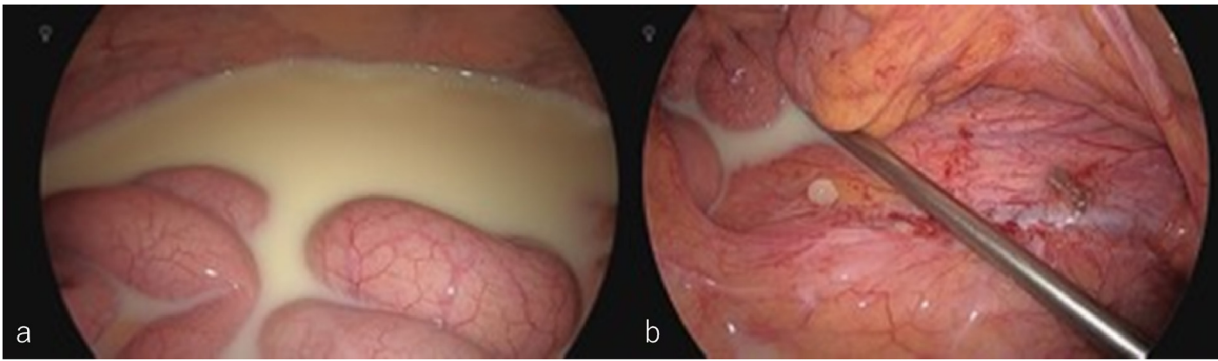


Fig. 2. a. Laparoscopic imaging showing a large amount of whitish chylous ascites. b. A white stream of leaking chyle was visualized at the upper part of the inferior mesenteric artery.



Fig. 3. To reconfirm the leakage site, 0.5 mL of indocyanine green (2.5 mg/dL) was injected around the inferior mesenteric artery.

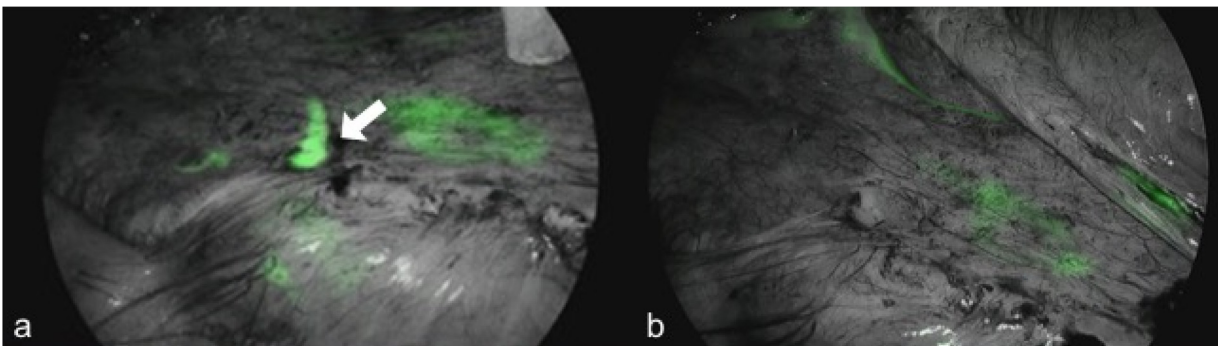


Fig. 4. a. After indocyanine green injection, fluorescence imaging using an infrared camera system revealed the leakage site (arrow). b. Lymphatic flow was noted after injecting other sites of the lymphadenectomy with indocyanine green. However, these sites did not show additional lymphatic leakage.

Thus, 4–8 weeks seem necessary for assessing the outcome of conservative management before attempting surgery [1]. Postoperative chylous ascites is associated with a prolonged length of hospital stay [8], with a delay in the start of additional treatment such as adjuvant chemotherapy. In the present case, diagnosed as NEC, it was necessary to perform adjuvant chemotherapy as soon as possible [9], and this was one of the reasons why we decided to perform surgery. Some cases of postoperative chylous ascites have been treated via tumor resection with extended lymphadenectomy [10] and needed early adjuvant chemotherapy. In addition, surgi-

cal intervention plays a significant role in reducing healthcare costs due to a prolonged hospital stay.

The laparoscopic approach was primarily used for surgery because of the laparoscope's magnifying effect. The leakage site was detectable on a careful exploration of the suspected site. Surgical management, including suturing and the application of fibrin glue could be used in order to achieve complete closure of lymphatic leakage.

However, it is frequently difficult to detect the site of lymphatic leakage intraoperatively. Various methods to identify the site of

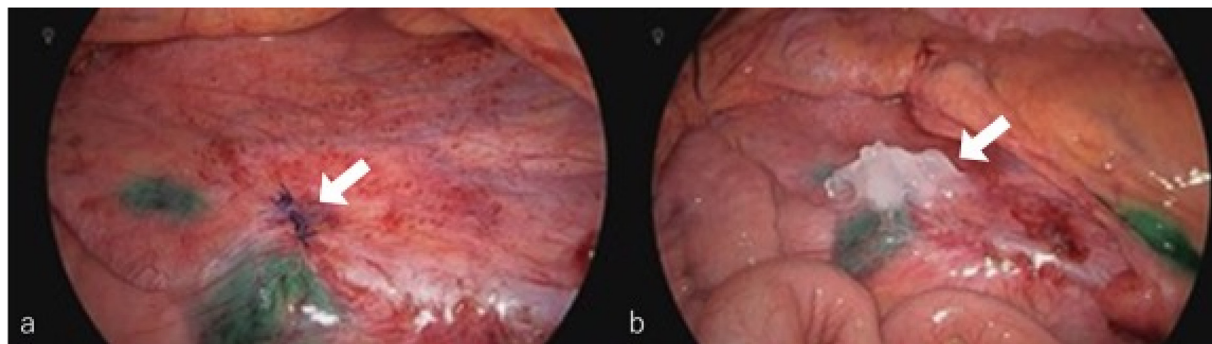


Fig. 5. a. The lymphatic leakage site after ligation (arrow). b. Fibrin glue was sprayed over the entire ligated area (arrow).

the leakage have been developed [3]. In the present case, milk was orally administered preoperatively in order to facilitate the visualization of the lymphatic fistula. Furthermore, we injected ICG around the IMA, and we reconfirmed the leakage site via fluorescence imaging using an infrared camera system. We injected the ICG into the other sites of lymphadenectomy and identified the lymphatic flow, but there was no other lymphatic leakage. Especially, we stress to confirm there was no lymphatic leakage at the other lymphadenectomy site. Lymphangiography has traditionally been used to evaluate chylothorax. However, it is difficult to cannulate lymphatic channels. Contrast medium can cause adverse effects such as local tissue necrosis, fat embolism to the lungs, hypersensitivity reactions, or worsening of the lymphedema in lymphangiography [11]. ICG preferentially enters lymphatics because ICG readily binds to albumin and other large proteins. Lymphatics take up large molecules more easily than blood vasculature.

In conclusion, we reported the successful laparoscopic management of refractory chylous ascites using fluorescence navigation with ICG. The intraoperative use of ICG to detect the site of lymphatic leakage is useful because it is a simple technique with fewer adverse effects. Additionally, laparoscopic surgery seems safe and effective for refractory chylous ascites.

Conflicts of interest

The authors declare that they have no conflict of interests.

The procedure was approved by the Ethics Committee at the Hiroshima University.

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Ethical approval

The procedure was approved by the Ethics Committee at the Hiroshima University.

Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Author contributions

Shimajiri H, Egi H, Yamamoto M, Kochi M, Mukai S, Ohdan H drafted the manuscript. Ohdan H has given the final approval of the version to be published. All authors read and approved the final manuscript.

Guarantor

Hiroyuki Egi.

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References

- [1] I. Leibovitch, Y. Mor, J. Golomb, J. Ramon, The diagnosis and management of postoperative chylous ascites, *J. Urol.* 167 (2 Pt. 1) (2002) 449–457.
- [2] M. Weniger, J.G. D'Haese, M.K. Angele, A. Kleespies, J. Werner, W. Hartwig, Treatment options for chylous ascites after major abdominal surgery: a systematic review, *Am. J. Surg.* 211 (1) (2016) 206–213.
- [3] M. Kuroiwa, F. Toki, M. Suzuki, N. Suzuki, Successful laparoscopic ligation of the lymphatic trunk for refractory chylous ascites, *J. Pediatr. Surg.* 42 (5) (2007) E15–E58.
- [4] R.A. Agha, A.J. Fowler, A. Saeta, I. Barai, S. Rajmohan, D.P. Orgill, The SCARE statement: consensus-based surgical case report guidelines, *Int. J. Surg.* (Lond., Engl.) 34 (2016) 180–186.
- [5] R. Kaas, L.D. Rustman, F.A. Zoetmulder, Chylous ascites after oncological abdominal surgery: incidence and treatment, *Eur. J. Surg. Oncol.* 27 (2) (2001) 187–189.
- [6] S.J. Baek, S.H. Kim, J.M. Kwak, J. Kim, Incidence and risk factors of chylous ascites after colorectal cancer surgery, *Am. J. Surg.* 206 (4) (2013) 555–559.
- [7] H. Nishigori, M. Ito, Y. Nishizawa, A. Koyama, T. Koda, K. Nakajima, et al., Postoperative chylous ascites after colorectal cancer surgery, *Surg. Today* 42 (8) (2012) 724–728.
- [8] T. Matsuda, H. Fujita, Y. Kunimoto, T. Kimura, K. Ogino, Chylous ascites as a complication of laparoscopic colorectal surgery, *Asian J. Endoscopic Surg.* 6 (4) (2013) 279–284.
- [9] H. Sorbye, J. Strosberg, E. Baudin, D.S. Klimstra, J.C. Yao, Gastroenteropancreatic high-grade neuroendocrine carcinoma, *Cancer* 120 (18) (2014) 2814–2823.
- [10] S. Yol, E.B. Bostanci, Y. Ozogul, M. Ulas, M. Akoglu, A rare complication of D3 dissection for gastric carcinoma: chyloperitoneum, *Gastric Cancer* 8 (1) (2005) 35–38.
- [11] M. Kranzfelder, R. Gertler, A. Hapfelmeier, H. Friess, M. Feith, Chylothorax after esophagectomy for cancer: impact of the surgical approach and neoadjuvant treatment: systematic review and institutional analysis, *Surg. Endoscopy* 27 (10) (2013) 3530–3538.

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