

Short Communication



Chyle Leakage After Right Selective Lymph Node Dissection in a Patient With Papillary Thyroid Cancer: A Case Report

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Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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ABSTRACT

Chyle leakage is a rare but potentially life-threatening complication of lateral neck lymph node dissection for metastatic papillary thyroid carcinoma. Most cases of chyle leakage occur after left lateral neck node dissection; chyle leakage after right lateral neck node dissection is extremely rare because of the anatomy of the thoracic duct. We present a rare case of right selective neck node dissection (levels II-Vb) for right lateral lymph node metastasis of papillary thyroid carcinoma complicated by chyle leakage, which was successfully treated with thoracoscopic thoracic-duct ligation.

Keywords: Chyle; Neck dissection; Thyroidectomy; Thoracic duct

INTRODUCTION

Chyle leakage, also known as lymphatic fistula, is an uncommon but well-known complication of head and neck surgery. This potentially serious complication reportedly occurs in 0.5%–8.3% of patients following thyroid surgery and cervical neck node dissection (1-3). Most chyle leakage occurs following left lateral neck lymph node dissection, but it can also occur following right neck lymph node dissection or central compartment neck node dissection (4). Chyle leakage increases the length of hospital stay. In addition, if high-output chyle leakage persists, it can cause serious electrolyte, fluid, and protein imbalances; metabolic alterations; infection; and skin problems. Knowledge of the lymphatic anatomy and avoidance of intraoperative injury are crucial for preventing chyle leakage.

Conservative medical treatments, such as diet restriction, total parenteral nutrition, somatostatin analogs, and keeping the drain with a pressure dressing, are usually recommended for the initial management of chyle leakage. These treatments focus on decreasing chyle production and promoting the spontaneous closure of the leakage. Surgical treatment is recommended when the initial conservative medical treatment is ineffective; however, the indications for surgical treatment remain controversial (5,6). Advances in video-assisted thoracic surgery allow identification and ligation under thoracoscopic view in cases of chylothorax, chylopericardium, and chyle leakage of the neck (7,8).

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Herein, we report a rare case of right selective neck node dissection (level II-Vb) complicated by chyle leakage, which was successfully treated with thoracoscopic thoracic-duct ligation.

CASE REPORT

A 77-year-old man was referred to our department for surgical treatment of papillary thyroid carcinoma. A review of fine-needle aspiration cytology confirmed the diagnosis of papillary thyroid carcinoma. Thyroid ultrasonography performed at another hospital revealed a huge nodule 49 mm in size over the right lobe of the thyroid. No other masses or enlarged lymph nodes were detected during either physical examination or neck imaging using ultrasonography and computed tomography (CT). In October 2020, a total thyroidectomy with central neck dissections was performed. Pathological examination revealed a 42×30×20 mm papillary carcinoma in the right thyroid lobe with microscopic extrathyroidal extension and without surgical margin involvement. One of the 11 removed lymph nodes was diagnosed with metastasis. Postoperatively, thyroid stimulating hormone suppression treatment with 0.125 mg levothyroxine was initiated. Two months after the operation, the patient underwent radiofrequency ablation therapy (I131, 100 mCi), and radioiodine scanning revealed no persistent disease or distant metastases.

Ten months after the surgery, ultrasonography revealed suspicious lymph nodes in the right lateral neck. Fine-needle aspiration cytology of the suspicious right lateral cervical lymph node confirmed metastasis of papillary thyroid carcinoma. Subsequent CT scan revealed suspicious lymph nodes in the subclavicular space, right level IV, and right level VI (**Fig. 1**). Right selective lymph node dissection (levels II-Vb and VI) was performed in October 2021. Pathological examination of the specimen showed lymph node metastasis of the papillary carcinoma. Six of the 36 lymph nodes were metastatic.

On the fourth postoperative day, the drain appeared milky. An increasing trend was observed in the daily drainage amount. We decided to adopt a conservative medical-management strategy involving a strict diet, parenteral nutrition, and octreotide subcutaneous (SC) injection. Despite octreotide SC injection, strict diet, and total parenteral nutrition for



Fig. 1. Computed tomography image performed 10 months after the surgery. Enlarged lymph nodes (arrows) are seen in the subclavicular space, right level IV, and right level VI.

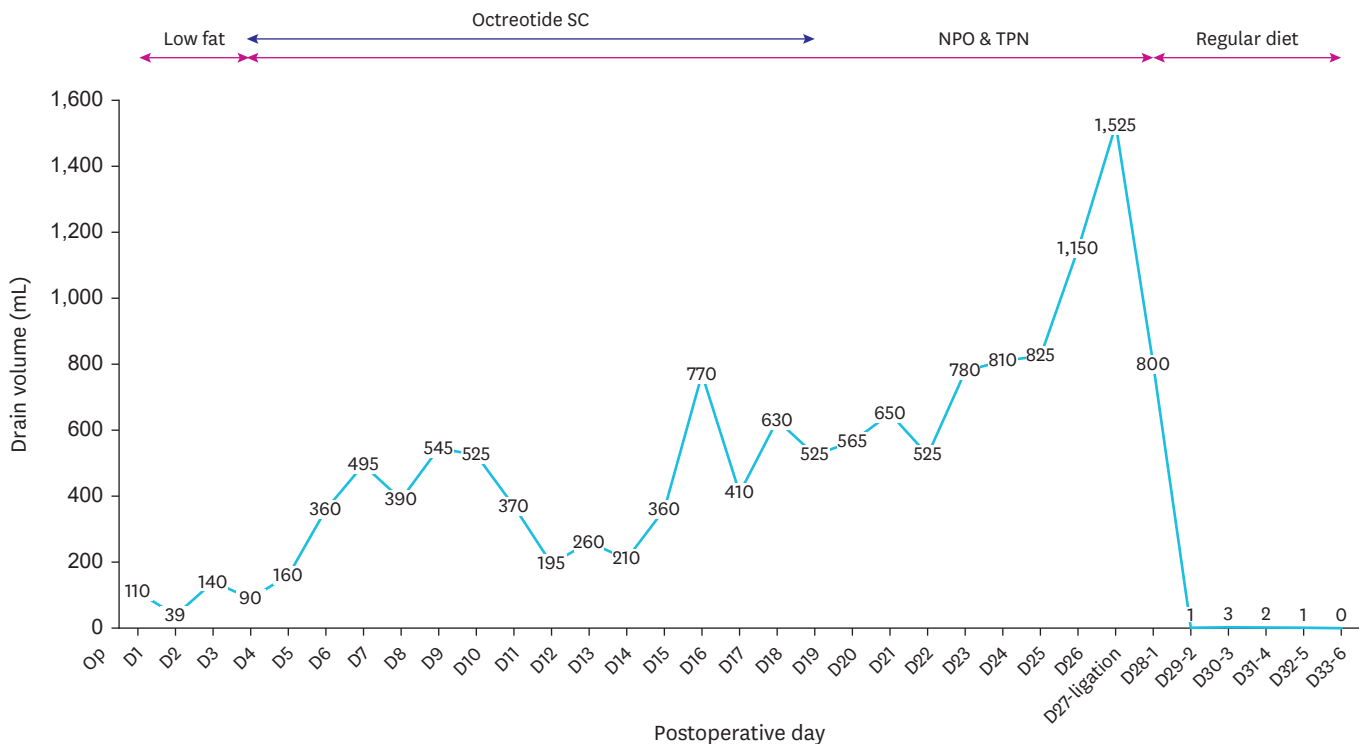


Fig. 2. Changes in drainage amount after surgery. SC = subcutaneous; NPO = nothing by mouth; TPN = total parenteral nutrition.

2 weeks, the amount of drainage gradually increased. Therefore, We discontinued the octreotide SC injection but maintained a strict diet and parenteral nutrition. However, the amount of drain continued to gradually increase to more than 1,000 mL, it was decided to abort conservative management of the fistula was aborted, and thoracoscopic ligation of the thoracic duct was performed (**Fig. 2**).

On the twenty-seventh postoperative day, the patient underwent 3-port thoracoscopy via the right approach. After identifying the azygos vein, the soft tissue along it was dissected. Unfortunately, the thoracic duct was not definitively identified. Therefore, multiple clippings with hemoclips occurred on the duct-like structure of the dissection area (**Fig. 3**). After irrigation of the operative field, a chest tube was placed, and the operation was completed. The patient was then transferred to the general ward. On the day after thoracoscopic thoracic duct ligation, the drain volume dramatically decreased to less than 5 mL. The neck drain and chest tube were removed on the sixth postoperative day after thoracoscopic thoracic duct ligation. The patient was discharged to home. Two months after thoracoscopic thoracic duct ligation, the patient showed no signs or symptoms of recurrent chyle leakage or postoperative functional or cosmetic sequelae.

DISCUSSION

Generally, most of the chyle (2–4 L/day) passes through the thoracic duct. Chyle production and flow depend on the diet, intestinal absorption, intra-abdominal pressure, and physical activity. The chyle contains triglycerides, chylomicrons, glucose, electrolytes, albumin, and immunoglobulin. In addition, the electrolyte concentration of chyle is similar to that

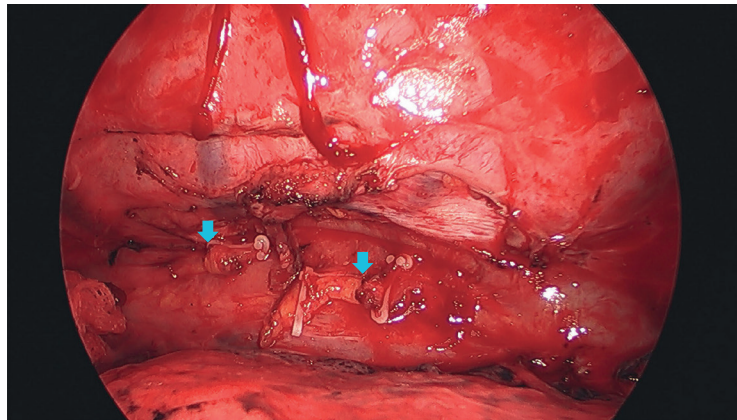


Fig. 3. Thoracoscopic findings during thoracic duct ligation surgery. Multiple clippings with hemolocks were applied on a duct-like structure (arrows).

of plasma. Chyle also contains white blood cells, mainly lymphocytes (9). Owing to the composition of the chyle, prolonged high-output chyle leakage carries the risk of potentially life-threatening malnutrition, and fluid and electrolyte alterations. Massive loss of white blood cells may have a primary immunosuppressive effect, thereby increasing the risk of infection. In addition, flap necrosis and delayed wound healing may result from the local pressure induced by chyle leakage (5,10).

The thoracic duct is thin-walled, similar to the lymphatic vessels, and 2–5 mm in diameter. It is the largest lymphatic channel and is generally 45 cm long. It drains the intestinal chyle and lymphatic fluid from the entire body, except for the right hemithorax. The thoracic duct originates from the cisterna chyli. It ascends between the aorta and the azygos vein and passes through the aortic hiatus of the diaphragm. At the level of the 7th–5th thoracic vertebrae, the thoracic duct passes obliquely behind the esophagus from the right side to the left side. The ascending thoracic duct extends from the left side of the esophagus to the neck. At the base of the neck, the thoracic duct passes posterior to the carotid sheath and drains to the junction of the left subclavian and left internal jugular veins. In addition, the right lymphatic duct is generally 2 cm long. It drains lymphatic fluid from three lymphatic trunks of the right hemithorax—the right jugular, right subclavicular, and right bronchomediastinal—to the junction of the right subclavian and right internal jugular veins (11).

Jacobsson reported 122 autopsy cases of the clinical anatomy and pathology of the thoracic duct (12). Most thoracic ducts drained to the left side. Interestingly, 4% of thoracic ducts drained into the right neck. Other small number of cases of dissection have reported a prevalence of right-sided drainage of the thoracic duct to be 1%–5% (13-16). In contrast, another large published study including 1,081 cadavers demonstrated that all thoracic ducts drained to the left side (17). Therefore, the definite prevalence of thoracic-duct drainage on the right side remains unclear. However, surgeons must consider the possibility of thoracic-duct drainage to the right side during right neck lymph node dissection.

Surgeons should always remember that the prevention of chyle leakage is more important than treatment. Therefore, surgeons' knowledge of and attention to the surgical anatomy of the thoracic duct are critical in preventing and minimizing the incidence of chyle leakage. Lorenz et al. (18) recommended meticulous surgical techniques using magnifying glasses to prevent thoracic-duct injury. In addition, they recommended ligation of the injured thoracic

duct rather than suturing the injured site as treatment for intraoperative chyle leakage (18). Postoperative chyle leakage requires conservative medical and surgical treatment. Unfortunately, there are no standard guidelines for optimal management or timing of interventions for chyle leakage (19). Conservative medical treatment is usually recommended as the initial treatment for postoperative chyle leakage. This consists of a local pressure dressing, drainage, a low-fat diet or diet restriction, total parenteral nutrition, and injection of somatostatin analogs. These treatments focus on decreasing chyle production and promoting the spontaneous closure of the leakage.

Surgical treatment is usually recommended when conservative medical treatments fail or persist in patients with high-output chyle leakage. However, the indications and timing of surgical treatment remain controversial. Surgical treatment consists of re-exploration of the injured site with repair, interventional radiological embolization of the thoracic duct, and minimally invasive thoracoscopic thoracic-duct ligation (20). Re-exploration of the neck with repair of the injured thoracic duct is difficult because of postoperative adhesions, and there is a risk of additional injury to the adjacent structure. Interventional radiological embolization can be performed. Although the reproducibility and success rate of thoracic duct embolization have been unsatisfactory in the past, recent reports suggest that this approach may be effective in managing high output chyle leakage. Several retrospective studies involving 34, 109, and 105 patients have demonstrated a high rate of effectiveness, with over 70% of patients achieving control of chyle leakage (70.6%, 71%, and 79%, respectively). Additionally, these studies showed a low rate of morbidity and mortality (21-23). However, this procedure is performed by an experienced radiologist using special equipment and facilities. Therefore, it was not available at all centers. Thoracoscopic thoracic-duct ligation is an option for surgical management of chyle leakage. This procedure originates from open thoracic surgery for refractory chylothorax. Thoracic-duct ligation was performed just above the supradiaphragmatic esophageal hiatus under right-sided open thoracotomy (24). With advances in minimally invasive thoracoscopic surgery, intrathoracic-duct ligation under thoracoscopy is possible at the same level as thoracic-duct ligation under open thoracic surgery. In addition, thoracoscopic thoracic-duct ligation can decrease morbidity and hospital stay (7). According to the anatomical variations of the thoracic duct, right-sided chyle leakage can be managed effectively with thoracoscopic thoracic-duct ligation.

As mentioned above, the incidence of the right thoracic duct is reported to be 1%–5%. Therefore, attention should be paid to reduce right thoracic-duct injury during right lateral neck lymph node dissection. Advances in surgeons' knowledge and attention to anatomic landmarks and variations of the right lymphatic duct and cervical thoracic duct can prevent and minimize the incidence of chyle leakage after right lateral neck lymph node dissection (25). In cases of chyle leakage after right neck lymph node dissection, the treatment options are the same as those for chyle leakage after left neck lymph node dissection. In addition, thoracoscopic thoracic-duct ligation can be an option for treating right neck chyle leakage.

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