

# Superselective retrograde lymphatic duct embolization for management of postoperative lymphatic leak

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## ABSTRACT

Lymphatic leak is a well-documented complication following neck dissection surgeries. When conservative methods fail to control the leak, thoracic duct embolization becomes an option. Transabdominal access is the standard for this procedure; however, it is not always feasible. We discuss a technique of selective lymphatic vessel embolization utilizing retrograde transvenous access.

Lymphatic duct injury is a well-known complication of neck surgeries, more commonly seen with neck dissections (1). Patients may present with lymphatic drainage at the wound site, chylous fistula, chylothorax, chylomediastinum, chylopericardium, lymphocele, persistent lymphorrhea, or secondary lymphedema (2). The management options include intraoperative repair of the injury if recognized, diet modifications, thoracic duct embolization, or re-exploration of the wound with repair (3). Lymphangiogram-assisted transabdominal access to the cisterna chyli is the standard technique to embolize the thoracic duct. Transvenous retrograde access to the lymphatic duct via its drainage into the subclavian/brachiocephalic vein is a more challenging alternative approach. It may fail in most cases and require multiple attempts for successful catheterization. However, it eliminates the need for traditional lymphangiogram.

## Technique

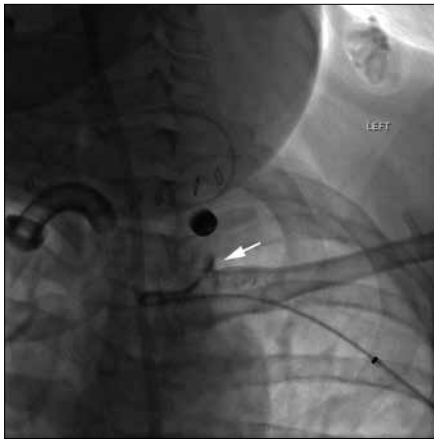
No institutional review board approval or informed consent was obtained as they are not required by our institution for case reports. The manuscript was prepared per Declaration of Helsinki principles. A 57-year-old woman underwent tracheostomy, bilateral neck dissection, frontolateral open laryngectomy and laryngoscopy for laryngeal mucosal melanoma. On postoperative day 4, her neck pain increased and Jackson-Pratt (JP) drain output color changed to milky-yellow. Despite conservative management for ten days, the JP drain output increased to 600 mL/day and the patient's pain and swelling continued to worsen. Interventional radiology was consulted for possible embolization options. Considering the presumed location of the lymphatic duct injury in the left lower neck and the patient's BMI of 32 kg/m<sup>2</sup>, decision was made to proceed with transvenous versus transabdominal access. Left arm basilic vein was accessed and a venogram was obtained to evaluate subclavian and brachiocephalic veins. A 5 F catheter (SOS-2<sup>®</sup>, Angiodynamics) was advanced into the brachiocephalic vein to interrogate the expected drainage site of the thoracic duct near the internal jugular and subclavian vein confluence. Small amounts of contrast were injected under fluoroscopy guidance to assess flow pattern of the catheterized branch vessels. After several attempts, a vessel with a very slow flow was identified and selectively catheterized (Fig. 1). A 2.1 F microcatheter (Echelon<sup>®</sup>, Covidien) was advanced coaxially through the catheter a few centimeters into the vessel. Contrast injection demonstrated lymphatic branches, confirming that the vessel was indeed the thoracic duct. The time from initial basilic vein access to successful catheterization of the lymphatic duct was 17 minutes. The microcatheter was further advanced into the lymphatic system with the guidance of a 0.014-inch soft guidewire (Synchro<sup>®</sup>, Stryker). Contrast injection through the

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**Figure 1.** Identifying the confluence of the thoracic duct with the subclavian vein.



**Figure 2.** Contrast extravasation is seen at the level of lymphatic branch injury.



**Figure 3.** Microcoils embolization is performed in addition to Onyx to achieve complete occlusion.

microcatheter showed extravasation from a transected lymphatic branch near the overlying surgical clips. The microcatheter was further advanced over the guidewire to the location of extravasation. Contrast injection confirmed the transection site and was shown passing into the lumen of the JP drain (Fig. 2). Proximal to the transection, two 2x4 mm and two 2x8 mm 0.014" detachable microcoils (Concerto<sup>®</sup>, Covidien) were deployed. That was followed by injection of 0.2 mL of ethylene vinyl alcohol (EVOH) (Onyx<sup>®</sup>, Covidien) (Fig. 3). The main thoracic duct was not embolized; neither was any other lymphatic branch. Postembolization lymphangiogram was not performed as the microcatheter was used for infusion of EVOH. Total procedure time from access to completion of the embolization was 75 minutes. No procedural complications occurred. On postprocedural day 2, the patient reported improvement in her neck pain and the JP drain output decreased to 10 mL/day. At nine months follow up, the patient continued to do well with no evidence of late recurrence.

#### Main points

- Thoracic duct embolization should be utilized for postoperative chyle leaks nonresponding to diet modifications.
- Retrograde thoracic duct embolization via its confluence with the subclavian vein is a challenging but feasible approach.
- When feasible, superselective embolization of the transected lymphatic branch controls the leak and saves the sequelae of embolizing the main thoracic duct.

## Discussion

Initial management of the postoperative lymphatic leak consists of conservative measures for seven to ten days. Surgical or interventional options are utilized in persistent leaks. Conservative measures include dietary modifications, octreotide, and negative pressure wound therapy. However, waiting for conservative measures to take effect may expose the patient to the risk of complications such as severe hypo-osmotic hyponatremia and wound infection.

Thoracic duct embolization procedure was first described by Cope et al. (4) in 2002. Recently, new technical approaches have been developed (5). The basic concept is to embolize the main thoracic duct using transabdominal access below or at the level of the cisterna chyli. Pedal or intranodal lymphangiogram is necessary to opacify the lymphatic vessels.

The transabdominal approach can be challenging due to the patient's body habitus, bowel movement, lymphatic vessel variations, and the need for lymphangiogram. Retrograde transvenous access to the thoracic duct was described by Mittleider et al. (6) and Koike et al. (7). In this technical note, a superselective catheterization of the injured branch of the thoracic duct was performed. Embolization took place proximal to the transection site. Additional distal embolization was not performed as the leak direction was retrograde in that specific vessel.

In conclusion, the advantages of this approach, when technically successful, include reduction in procedure time and radiation exposure without embolizing the main

thoracic duct. This technique could provide benefits especially in lymphatic leaks due to neck surgeries. Finding lymphatic duct orifice remains the most challenging part of this approach (Fig. 1).

#### Conflict of interest disclosure

Arslan B. is a speaker/advisory board member for Covidien Medtronic, WL Gore, BTG, Penumbra, Bard, Cook, and Guerbet. The other authors declared no conflicts of interest.

#### References

1. Crumley RL, Smith JD. Postoperative chylous fistula prevention and management. *Laryngoscope* 1976; 86:804–813. [\[CrossRef\]](#)
2. Campisi CC, Boccardo F, Piazza C, Campisi C. Evolution of chylous fistula management after neck dissection. *Curr Opin Otolaryngol Head Neck Surg* 2013; 21:150–156. [\[CrossRef\]](#)
3. Scorza LB, Goldstein BJ, Mahraj RP. Modern management of chylous leak following head and neck surgery: a discussion of percutaneous lymphangiography-guided cannulation and embolization of the thoracic duct. *Otolaryngol Clin North Am* 2008; 41:1231–1240. [\[CrossRef\]](#)
4. Cope C. Diagnosis and treatment of postoperative chyle leakage via percutaneous transabdominal catheterization of the cisterna chyli: a preliminary study. *J Vasc Interv Radiol* 1998; 9:727–734. [\[CrossRef\]](#)
5. Pieper CC, Schild HH. Direct Cervical Puncture for Retrograde Thoracic Duct Embolization in a Postoperative Cervical Lymphatic Fistula. *J Vasc Interv Radiol*. 2015; 26:1405–1408. [\[CrossRef\]](#)
6. Mittleider D, Dykes TA, Cicuto KP, Amberson SM, Leusner CR. Retrograde cannulation of the thoracic duct and embolization of the cisterna chyli in the treatment of chylous ascites. *J Vasc Interv Radiol* 2008; 19:285–290. [\[CrossRef\]](#)
7. Koike Y, Hirai C, Nishimura J, Moriya N, Katsumata Y. Percutaneous transvenous embolization of the thoracic duct in the treatment of chylothorax in two patients. *J Vasc Interv Radiol* 2013; 24:135–137. [\[CrossRef\]](#)