A chyle leak can occur as a complication after neck or chest surgery. Such a leak prolongs the hospital stay and is sometimes life-threatening. The treatment options are conservative management, interventional radiologic embolization, and surgery. Thoracoscopic ligation of the thoracic duct has emerged as a promising and definitive treatment. The case of a 65-year-old Japanese male patient with a rare congenital right aortic arch (type III B1 of Edward's classification) and a severe chyle leak that occurred after a total pharyngolaryngo-esophagectomy (TPLE) is described. The chyle leak was successfully managed by thoracoscopic ligation of the thoracic duct via a left-side approach with the patient in the prone position.

**Key words:** chyle leak, thoracic duct, thoracoscopy, prone position
underwent an uneventful total pharyngolaryngo-
esophagectomy (TPLE) and radical neck dissection by
the head and neck team to remove the tumor after
chemotherapy, and he left the intensive care unit
(ICU) on the 3rd postoperative day. The chyle leak in
the cervical region occurred after his discharge from
the ICU. Conservative therapy and 3 surgical proce-
dures to ligate the duct via a cervical approach were
attempted, but the chyle leak was uncontrollable and
continued at over 1,000 mL/day (Fig. 1). The inter-
ventional radiologic (IVR) team examined the lymph-
angioscintigraphy findings and attempted thoracic duct
embolization twice but failed. We were thus consulted
by the head and neck team regarding surgical ligation
of the thoracic duct to control the chyle leak.

Three-dimensional CT angiography showed that the
patient had a rare aortic malformation: a right aortic
arch Type IIB1 of Edward’s classification. The aortic
diverticulum called Kommerell’s diverticulum and the
aberrant left subclavian artery branching off from it
were identified (Fig. 2A). Lymphangiography and CT
lymphangiography showed that the thoracic duct was
injured in the cervical region and was located on the
normal route in the mediastinum: on the right side of
the middle and lower mediastinum and on the left side
of the upper mediastinum. However, the descending
aorta was located on the right side of the thoracic duct
in the middle and lower mediastinum (Fig. 2B–E), and
thus the ordinary right-side transthoracic approach
could not provide a good surgical view anatomically to
detect and ligate the thoracic duct.

After discussion, we performed a thorascopic
ligation of the thoracic duct via a left-side approach
with the patient in the prone position on the 35th day
after the first operation. The operative procedure was
as follows. A 12-mm port for the operator’s right hand
was inserted into the seventh intercostal space on the
posterior axillary line with 8-mmHg pneumothorax. A
12-mm camera port was then inserted into the ninth
intercostal space on the lower scapular line. A 5-mm
port for the operator’s left hand was inserted into the
fifth intercostal space on the posterior axillary line,
and a 12-mm port for the assistant was inserted into
the third intercostal space on the middle axillary line.
A small pleural effusion was observed, but adhesions
and other inflammatory changes were not observed.

The parietal pleura was cut open in the upper
mediastinum, and the aortic diverticulum (called
Kommerell’s diverticulum) and the aberrant left sub-
clavian artery branching off from it were identified.
The thoracic duct was identified between the aberrant
left subclavian artery and the vertebral bodies (Fig.
3A) and ligated with Hem-o-lok® polymer clips (Teleflex,
Limerick, PA, USA). We dissected the thoracic duct and confirmed the lumen to be ensure
that the thoracic duct was ligated (Fig. 3B). The
chyle leak decreased immediately after the operation
(Fig. 1). All drains were removed on the third day
after ligation. No recurrence was seen after the
beginning of enteral feeding.

![Fig. 1 Treatment progress and total drain output changes.](image-url)
Discussion

A chyle leak is a rare but potentially life-threatening complication after neck or chest surgery, with a reported incidence of 1%-2.5% [15]. Initial treatment is conservative, including the use of intestinal nutrition with medium-chain triglycerides (MCTs) and free fat, total parenteral nutrition (TPN), and the somatostatin analogues orlistat and etilefrine [15]. Wound exploration and fistula ligation often fail to stop a chyle leak. Thoracic duct embolization using the IVR technique was recently introduced as a minimally invasive approach. Embolic therapy is performed via percutaneous transabdominal cannulation. However, its efficacy is not sufficient to replace the surgical procedure [16-18]. Surgical ligation of the thoracic duct is still thought to be the most reliable therapeutic method for a severe chyle leak [7-12].

Surgical ligation is ordinarily performed via a right-side transthoracic approach because the thoracic duct is located on the right side of the middle and lower mediastinum in almost all cases, but there are
several variations of it at the upper mediastinum [19]. This procedure has been performed via thoracoscopy [12, 20]. In the present case, the preoperative radiological findings showed that the patient had a rare, congenital aortic malformation, a right aortic arch Type III/IB1 of Edward's classification. Lymphangiography and CT lymphangiography showed that a good surgical view could not be obtained via a right-side thoracoscopic approach. Therefore, the thoracoscopic ligation was performed via a left-side approach with the patient in the prone position. Advances in thoracoscopic surgery using the prone position have been remarkable, especially for esophagectomy [21, 22]. The biggest advantage of the prone position is the good view of the surgical field. With the patient in the prone position, the heart and lungs can be displaced by gravity and the artificial pneumothorax.

We have also reported the ergonomic usefulness of thoracoscopic surgery using the prone position for esophagectomy [23]. In the present case, the technique of thoracoscopic esophagectomy in the prone position was used for ligation of the thoracic duct, and these benefits allowed successful ligation of the thoracic duct and a good postoperative course.

Conclusion

The successful thoracoscopic ligation of the thoracic duct to stop a severe chyle leak in a patient with a right aortic arch was described. Thoracoscopic surgery using the patient-prone position also has the potential to become a useful surgical approach for such a rare complication because of its minimal invasiveness, good surgical field, and reduced ergonomic burden for the surgeon.

References