

Management of Cervical Thoracic Duct Injury and Chyle Leak; Tertiary Center Results

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Introduction: Thoracic duct injury is rare but serious incident that is mostly associated with thoracic and neck surgery rather than nonsurgical trauma. Generally, chylothorax requires prompt medical attention after diagnosis in order to prevent serious consequences or mortality.

Patient and methods: This is a retrospective study on patients who presented by chyle leak in Ain Shams University hospitals during the last 10 years in our tertiary center.

Results: 19 patients presented with chyle leak. 4 patients were discovered intraoperative (and those were the only cases repaired primarily). 8 presented on the first postoperative day. And 5, 2 cases presented on the second and third day respectively. About output flow 4 case had high output flow and 13 had low output flow, while two cases had no flow following primary intraoperative repair. Conservative management by diet control, pressure application and orlistat use were applied in all cases. Octreotide use was needed in 10 cases for a period ranging from 3-12 days. In resistant cases Sclerotherapy was needed in two cases and re-exploration was needed in three cases.

Conclusion: In all cases of chyle leak conservative management should be tried especially in low output flow. Surgical re exploration should be used in resistant cases. Any case discovered intraoperatively should be primarily explored and ligated.

Key words: Thoracic duct, chyle leak. octreotide. chylothorax.

Background

Although it is extremely uncommon owing to nonsurgical trauma, cyst leak (CL) from thoracic duct injury is a rare but dangerous occurrence frequently linked to thoracic surgical complications or cancer. Connected to neck surgery, with a 0.5–1.4% incidence of thyroidectomies and a 2-8% incidence of neck dissections. The thoracic duct is prone to accidental injury due to its delicate composition and variable anatomy. Up to 25% of CL cases involve surgery on the right neck, but the majority of CL cases involve surgery on the left neck. CL would undoubtedly arise in any practice performing head and neck surgery, despite its rarity. A CL must be identified as soon as possible and managed appropriately to ensure the best possible surgical result. Chylothorax requires prompt medical attention after diagnosis in order to prevent serious consequences or mortality.¹

The main organ that returns lymph to the venous circulation from the left and right bodies below the diaphragm is the thoracic duct. Chyle made from intestinal lacteals is included in this. In order to keep fluid balance and restore lymph and chyle to the systemic circulation, the thoracic duct is essential.²

Because of its thin vessel wall and close proximity to the internal jugular vein (IJV), the thoracic duct is especially prone to accidental damage during low-neck dissection. There is a considerably higher risk of iatrogenic CL and a more difficult surgical

dissection at the junction of the IJV and subclavian vein when there has been prior irradiation and metastatic lesions present.³

Disruption of the regular biochemical environment can lead to wound healing complications, which can appear as infection, fistula formation, or delayed wound healing. Extravasated chyle creates a strong inflammatory response in the wound bed, which hinders the healing process by releasing tissue proteases and proinflammatory cytokines.⁴

In the event that a CL is discovered during surgery, nonabsorbable suture or surgical clips may be used to oversewn the thoracic duct. Furthermore, locoregional flaps could be used to cover more of the surgical bed. It is possible to dissect the clavicular head of the sternocleidomastoid free and suture it to the wound bed.⁵ The management of a CL after surgery is contingent upon several factors, including drain output, patient comorbidities, institutional expertise, and surgeon preference.⁶

Patients and methods

This is a retrospective study on patients who presented by chyle leak in Ain Shams University hospitals.

All cases with cervical thoracic duct injury during neck surgery in the last 10 years in our tertiary center were included and studied. We studied type of neck surgery, time of diagnosis of thoracic duct injury, incidence, intraoperative and post operative

management and our results.

19 patients presented during this period of time with different primary surgeries.

Results

During the period of study: 19 patients presented with chyle leak during or after different primary surgeries.

7 underwent total laryngectomy and neck dissection. 4 underwent neck dissection only. 5 underwent total thyroidectomy. 1 underwent cervical discectomy through anterior approach. 1 underwent excision of neck mass (Parapharyngeal schwannoma). 1 was presented by stab wound in the neck in (**Fig. 1**).



Fig 1: Chyle leak seen in case no.1 (Stab wound).

Concerning presentation: 4 patients were discovered intraoperative (**Fig. 2**). (and those were the only cases repaired primarily). 8 presented on the first postoperative day. And 5, 2 cases presented on the second and third day respectively.



Fig 2: Thoracic duct identification during left neck dissection surgery in case no.6. (1 internal jugular vein. 2 sternomastoid muscle. 3 dissected lymph node. 4 thoracic duct. 5 suprascapular vein).

About output flow 4 cases had high output flow and 13 had low output flow, while two cases had no flow following primary intraoperative repair.

Conservative management by diet control, pressure application and orlistat use were applied in all cases. Octreotide use was needed in 10 cases for a period ranging from 3-12 days. In resistant cases Sclerotherapy was needed in two cases and re-exploration was needed in three cases.

Discussion

With the exception of the right side of the head, neck, thorax, and arm, the thoracic duct serves as the main pathway for lymph from all body lymphatic vessels to return to the bloodstream. In adults, the thoracic duct measures 36 to 45 centimeters in length. It starts in the retroperitoneum at the cisterna chyli, which is situated on the first or second lumbar vertebra's anterior surface. Its path changes to the left at the fifth thoracic vertebra, ascending behind the aortic arch and the thoracic segment of the left subclavian artery, obtaining the neck's root. It rises in the shape of an arch, about 3 to 4 cm above the clavicle.

The thoracic duct at the superior border of the clavicle has a relationship to the esophagus medially, the left carotid sheath anteriorly, the omohyoid muscle laterally, and the anterior scalene fascia posteriorly. It then passes in front of the thyrocervical trunk, vertebral artery and vein, and subclavian artery before coming to an end by opening into the junction of the left internal jugular and left subclavian veins.^{7,8}

Chyle leak (CL) is an uncommon but dangerous side effect of head and neck surgery that can happen after a variety of neck surgeries, especially when the thoracic duct's delicate structure makes it more likely to occur.⁹

Valentine & Raffin,¹⁰ reported that over a 22-year period, they handled 191 cases. Only 6 cases (3%) had nonsurgical trauma as the underlying cause. Conversely, Doerr et al.¹¹ noted that over a 21-year period, 203 patients had chylothoraces brought on by surgery or trauma, but only 1 case involved blunt trauma. Only one case had a penetrating stab wound during the ten years of our study; all other cases were the result of surgical trauma.

Chyle leaks can be found both during and after surgery. Leaks found during surgery ought to be fixed right away because a CL can have a considerable amount of morbidity.

The supraclavicular area should be closely inspected during head and neck procedures, particularly if neck dissection is required. If a creamy or milky fluid is observed, the thoracic duct needs to be located, recognized, and closed.¹²

Table 1: Details of studied cases

No	PRIMARY SURGERY (CAUSE)	Diagnosis (start of leak)	Primary or intraoperative repair	Drain output post operative	Diet control	Pressure control	orlistat	Octreotide (days)	Doxycycline sclerotherapy	Re exploration
1	Stab wound	At presentation	done	low	YES	YES	YES	NO	NO	NO
2	Neck dissection (N D)	First post operative day	NO	low	YES	NO	YES	NO	NO	NO
3	Total laryngectomy (T L)	2days Post operative	NO	low	YES	YES	NO	NO	NO	NO
4	thyroidectomy	2days Post operative	NO	high	YES	YES	YES	YES 10 days	NO	YES
5	Anterior approach to cervical disc	First post operative day	NO	high	YES	YES	YES	YES 6 days	YES	NO
6	T L and N D	During surgery	done	No leak	NO	YES	NO	NO	NO	NO
7	Thyroidectomy and N D	First post operative day	NO	high	YES	YES	YES	YES 7 days	NO	YES
8	T L and N D	2days Post operative	NO	low	YES	YES	YES	YES 12 days	NO	NO
9	N D	First post operative day	NO	low	YES	YES	YES	YES 6 days	NO	NO
10	N D	First post operative day	NO	low	YES	YES	YES	YES 5 days	NO	NO
11	T L and N D	During surgery	done	No leak	YES	YES	YES	NO	NO	NO
12	Thyroidectomy and N D	During surgery	done	low	YES	YES	NO	YES 3 days	NO	NO
13	Thyroidectomy and N D	3days Post operative	NO	low	YES	YES	YES	NO	NO	NO
14	T L and N D	First post operative day	NO	low	YES	YES	YES	NO	NO	NO
15	N D	2days Post operative	NO	low	YES	YES	NO	NO	NO	NO
16	Excision of neck mass	First post operative day	NO	low	YES	YES	YES	YES 10 days	NO	NO
17	Thyroidectomy and N D	2days Post operative	NO	low	YES	YES	YES	YES 8 days	NO	NO
18	T L and N D	3days Post operative	NO	low	YES	YES	YES	NO	YES	NO
19	T L and N D	First post operative day	NO	high	YES	YES	YES	YES 7 days	NO	YES

Only 4 cases were found intraoperatively during our study, and they were mostly repaired. Two of them had no post-operative leaks, and the other two had low output leaks that could only be controlled by cautious post-operative management.

Depending on the drain output, chyle leaks are classified as low output (<500 mL/day) or high output (>500 mL/day). Making decisions about treatment is aided by this classification. For low output CL, conservative management is usually sufficient; however, surgical intervention may be necessary for high output fistulas, which may not respond to conservative management alone.¹³

In this study, there were only 4 cases with high output flow and 13 cases with low output flow. In every case, orlistat was used in conjunction with diet control to provide conservative management. In contrast, octreotide was required in 10 instances. One high output case and all low output flow cases could be controlled with this level of management. To control the flow, further investigation was required in the other three cases.

Pancreatic lipase inhibitors like orlistat disrupt the duodenum's lipid metabolism, lowering lipid absorption and, as a result, chyle production.¹⁴

By decreasing intestinal, pancreatic, and stomach secretions, somatostatin and octreotide reduce the formation of chyles. To reduce the production of lymph, it constricts the smooth muscles in the splanchnic and lymphatic vessels.¹⁵

In contrast to a different retrospective study, 11 people with chylous fistulas were found in the review of 221 patients who had neck dissections by de Gier et al. In five of these patients, dietary adjustments were enough to stop the leak. Total parenteral nutrition had to be started in the other 6 cases.¹⁶

In situations where resistance exists In two of the cases in our study that had successful outcomes and leak control, sclerosing therapy was required. as opposed to Marthaller et al., who detailed a number of patients who experienced thoracic duct damage after esophagectomy. The authors attempted percutaneous thoracic duct embolization in these cases, but further research was required.¹⁷

Thoracic duct identification may be challenging due to local inflammation resulting from extravasated chyle when re-exploration is necessary. The CL site can be easier to identify with Trendelenburg positioning and techniques that increase intrathoracic and intraabdominal pressure. Prior to surgery, the patient's intake of a high-fat diet can promote the production of chyles and facilitate CL localization.¹⁸

The leaking thoracic duct can be identified and treated with a variety of sclerosing agents, adhesive agents, or mesh. Alternatively, it can be covered with a muscle flap.

Re-exploration was carried out during our study utilizing the chyle duct identification, a muscle flap (Sternomastoid) and fibrin glue as an adhesive was used. Compared to a study by de Gier et al. that showed two cases needed a pectoralis major muscle flap transfer for surgical re-intervention.¹⁶ One case required percutaneous sclerotherapy in addition to dietary control after it was discovered during anterior cervical disc fixation. In contrast, 3 cases of chylothorax were reported by Propst-Proctor et al., who examined 1000 anterior thoracolumbar surgeries and treated them conservatively with closed chest tube drainage and a low-fat diet.¹⁹

Conclusion

In all cases of chyle leak conservative management should be tried especially in low output flow. Surgical re-exploration should be used in resistant cases. Any case discovered intraoperatively should be primary explored and ligated.

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Authors' contributions

All authors had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. The authors read and approved the final manuscript.

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Availability of data and materials

The datasets used during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate Ethical approval for the current study protocol (R302/2023) was obtained from Ain Shams University Faculty of Medicine Research Ethics Committee (REC) FWA00017585. Informed written consent to participate in the study was provided by all participants.

Conflict of interests

The authors declare that they have no conflict of interest.

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