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Anatomical Variations of Cervical Portion of Thoracic Duct and Management of Chyle Leak: Case report And Reviewof The Literature.

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Abstracts: *The variable anatomy and fragile composition of the thoracic duct render it prone to inadvertent injury. We reported the cases where we encountered leash of thoracic ducts and anatomical variations of thoracic duct within the neck, while performing neck dissection which were sealed by thermofusion and sectioned with the LigaSure device. Prior papers that specifically endorse a proposed management protocol of chyle leak (CL) are reviewed. A historical context will be used when applicable to further enhance an understanding of the evolution of treatment strategies. Chylous fistula is a bilateral threat and same care should be taken on right as on left. Coagulation and section of the thoracic duct with the LigaSure device appears to be a simple, effective, and safe therapeutic option for CL in cervical region. In case of CL early diagnosis and aggressive treatment essential to avoid local and systemic complications that prolongs hospitalization.*
KEY WORDS*: Thoracic duct (TD) variations, chylous leak (CL), LigaSure.*

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I. Introduction

This case report and review of literature is of clinical significance given the relative infrequency of lymph vessel injuries following cervical surgery; which is reported annually around 2% [1], even smaller incidence of right sided neck involvement. The variable anatomy and fragile composition of the thoracic duct render it prone to inadvertent injury. The majority of chyle leak(CL) transpires with surgery of the left neck; however, up to 25% of CL occur with right neck surgery [2,3]. Although uncommon, CL would surely be encountered in any head and neck surgery practice. Early identification and appropriate management of a CL are imperative for optimal surgical outcome. We are presenting a case in whom intraoperative thoracic duct variations seen within the neck, while performing neck dissection for management of CA tongue & within a patient of neurofibroma having right sided growth of spindle cell tumour while performing wide local excision. We report the cases where we encountered leash of thoracic ducts which weresealed by thermofusionand sectioned with the LigaSure device. The aim of this review is to provide an accurate description of the clinical physiology and surgical anatomy of the thoracic duct (TD) with its variations based on the evidences available. Prior papers that specifically endorse a proposed management protocol of CL are reviewed. A historical context will be used when applicable to further enhance an understanding of the evolution of treatment strategies[4].

The TD is the largest lymphatic vessel in the body and drains about 75% of the body's lymph. The TD has a vital role in transport of chyle [5]. Chyle is a mixture of lymph from interstitial fluid and emulsified fat from intestinal lacteals [4]. This mildly alkaline fluid typically forms 3 layers on standing: a cream top layer, milky middle layer, and a cellular sediment[6]. The fat content is 1% to 3% and is mostly composed of triglycerides [3]. Long-chain triglycerides (approximately 70% of dietary fat) enter the blood through the chylous route, whereas medium-chain triglycerides (MCTs) and short chain triglycerides are absorbed directly into the portal circulation[4]. The fat content gives chyle a milky appearance and greasy texture [7]. The flow rate is augmented by movement of the torso or upper extremities, intestinal peristalsis, respiratory movements, coughing or straining, and a fatty meal[8,9,10]. In health chyle is sterile; however, in acute illness, the chyle may contain bacteria, endotoxins, and other intestine-derived factors, which contribute to the chyle becoming toxic and promoting multiple organ dysfunction. In contrast with portal venous blood, mesenteric lymph bypasses the liver, thereby avoiding detoxification. The TD usually originates from the cisterna chyli, which is formed by the confluence of the intestinal lymphatic duct and the left lumbar trunk, or less commonly, the right lumbar trunk. It receives lesser contributions from the periaortic nodes and intercostal lymphatics. In the majority of individuals, the cisterna chyli exits as a fusiform or saccular lymphatic dilatation and can be up to 3 cm long and 1 cm wide. The cisterna chyli is situated behind the lower right crural pillar, to the right of the aorta and in front of the anterior longitudinal ligament of the first and second lumbar vertebrae [5]. It ascends through

the thorax in posterior mediastinum between aorta and azygous vein. As it enters the neck it forms an arch, rising 3-5 cm above the clavicle and passes anterior to the subclavian artery, vertebral artery and vein and thyrocervical trunk or its branches. It is also anterior to phrenic nerve and medial border of scalenus anterior muscle. The carotid artery, vagus nerve and internal jugular vein usually lie in front of the duct as it arches upward, forward, and lateral from thoracic inlet to open into the angle formed by junction of left subclavian vein with left internal jugular vein. Close to its ending it may receive the jugular trunk from deep cervical nodes, the subclavian trunk of ipsilateral axillary nodes and the left broncho-mediastinal trunk. The right lymphatic duct formed by right jugular trunk, right subclavian trunk and right broncho-mediastinal trunk or each may terminate separately. The right lymphatic duct ends in right subclavian vein at its junction with the right internal jugular vein [3]. Ostial type of valve found at the lympho-venous junction. This type of valve is particularly important for preventing reflux of blood into the TD during periods of increased venous pressure (e.g., coughing, sneezing) and enabling flow when venous pressure drops (e.g., during expiration)[5].

Case 1 (left sided neck dissection)

A 43year old male was admitted to our hospital having CA tongue, posted for wide local excision of tongue lesion. With posterior approach for left sided modified radicle neck dissection intraoperatively several channels of TD were found which are draining into internal jugular vein (IJV), subclavian vein (SV), external jugular vein (EJV) by forming a leash of ducts (Figure 1). These were carefully grasped, skeletonized and sealed, sectioned with the 5-mm vessel sealing device-LigaSure. Figure 2 showing branch of thoracic duct draining the EJV, black solid triangle showing spinal accessory nerve. Patient was then put in Trendelenburgposition and positive pressure ventilation given, there was no evidence of further CL.Postoperative there was no CL and patient was subsequently discharged.

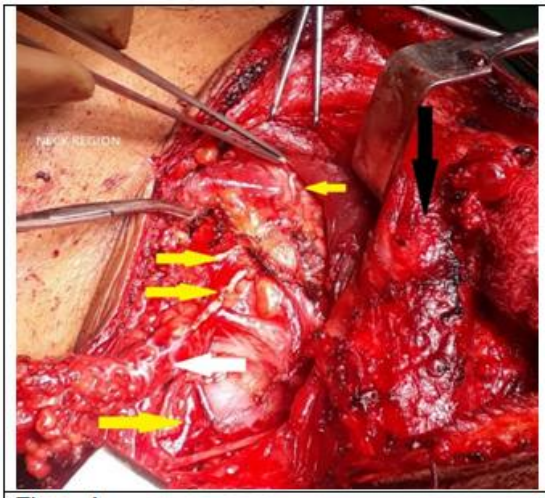

Figure 1.
Yellow Arrows: Leash of ducts
White Arrow: Chyle arrow
Black Arrow: Sternocleidomastoid (SCM)

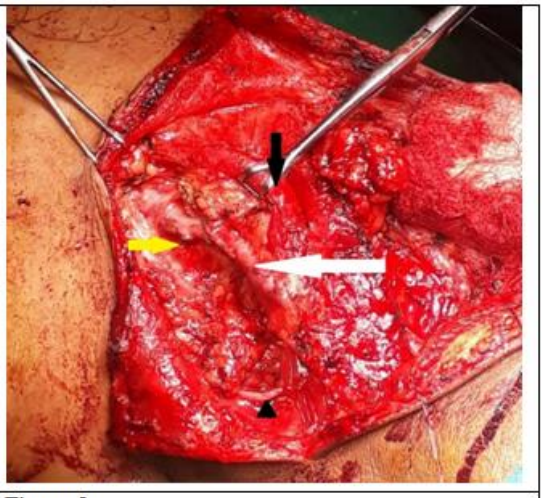

Figure 2.
Yellow Arrow: Sealed Thoracic Duct(TD)
White Arrow:External Jugular Vein(EJV)
Black Arrow: Sternocleidomastoid (SCM)

Comments: This case illustrates anatomical variations of thoracic duct along with principles of operative management of leash of thoracic ducts with innovation called LigaSuredevice.

Case 2 (right sided neck dissection)

A 38year old male presented with multiple neurofibromatosis with right cervical ulcero-proliferative growth for 2-3 years. Biopsy of mass revealed spindle cell lesion. IHC revealed low grade collagen rich spindle cell lesion. Patient received external beamradiotherapy to neck region by 6 MV photons with intensity modulated radiators with total dose of 56 Gy/ 28 cycles with due respect to normal tissue organ tolerance. Subsequently underwent wide local excision with pedicle flap reconstruction. At surgery while performing dissection we found TD terminating at the junction of the internal jugular and subclavian veins on right side of neck. The duct skeletonized, sealed and sectioned with the 5-mm LigaSure device. The patient was then put in Trendelenburg position and positive pressure ventilation given there was no evidence of CL. Postoperative there was no CL and patient was subsequently discharged.

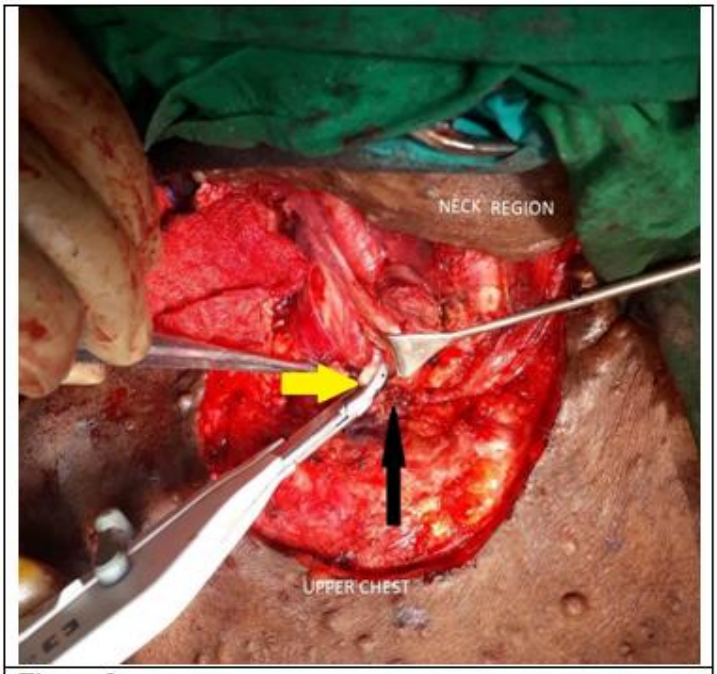

Figure 3
Yellow Arrow: Thoracic duct while sealing
Black Arrow: Transfixed lower end of IJV

Comments: This case illustrates that right sided thoracic duct may occur and need to be managed. In this case we sealed and sectioned the thoracic duct by Ligasure.

II. Discussion

Inadvertent injury to the TD can occur during a number of surgical procedures and can have serious consequences. A detailed understanding of the anatomy of the TD and its variations is important if these injuries are to be avoided. The TD can have multiple channels (40%) during its course through the mediastinum. In a small proportion of cases (6%), the TD does not cross to the left at the level of the fifth or sixth thoracic vertebra, and the lymphovenous connection is on the right side. Most variation occurs in and around the lymphovenous connection. Instead of draining into the internal jugular vein, the TD outlet can drain into the jugulo-venous angle (32%) or subclavian vein (18%). The duct can also terminate in multiple entry points (24%). Totalling the records of the different authors, we acknowledge that based on 339 observations of anatomical or surgical dissections the most frequent site of the duct terminal is the internal jugular vein, followed by the jugular-subclavian angle and thirdly by the subclavian vein. The other sites represent only 12.07% of the total and may be considered variations [11]. Ref:Table S1

Table 1

Comparison of the sites of thoracic duct ending in the series of different authors

Authors / Sites of thoracic duct ending	Parsons and Sargent ('09)	Davis ('15)	Shafiroff and Kau ('59)	Jdanov ('59)	Rocca-Rossetti ('61)	Archimbaud et al. ('69)	Kinnaert ('73)	Zorzetto et al. (this study)	Total
Internal jugular vein	34 (85.00) [1]	1 (4.80)	18 (60.00)	48 (47.70)	5 (35.80)	6 (16.70)	17 (36.20)	15 (29.42)	144 (42.49)
Jugulosubclavian angle	3 (7.50)	5 (23.80)	3 (10.00)	35 (35.40)	7 (50.00)	10 (27.80)	16 (34.10)	18 (35.30)	97 (28.62)
Angle of internal jugular vein with external posterior jugular vein	—	—	—	—	—	—	—	5 (9.80)	5 (1.48)
Subclavian vein	—	12 (57.10)	7 (23.30)	9 (9.20)	1 (7.10)	18 (50.00)	8 (17.00)	2 (3.92)	57 (16.82)
Angle of internal jugular vein with vertebral vein	—	—	—	—	—	—	—	1 (1.96)	1 (0.29)
Angle of internal jugular vein with suprascapular vein	—	—	—	—	—	—	—	1 (1.96)	1 (0.29)
Brachiocephalic vein	—	1 (4.80)	2 (6.70)	8 (7.70)	—	—	—	—	11 (3.25)
Internal jugular vein and jugulosubclavian angle	—	1 (4.80)	—	—	—	—	1 (2.10)	—	2 (0.59)
Internal jugular vein and subclavian vein	3 (7.50)	—	—	—	—	—	—	1 (1.96)	4 (1.18)
Internal jugular vein and vertebral vein	—	1 (4.80)	—	—	—	—	—	—	1 (0.29)
Internal jugular vein and brachiocephalic vein	—	—	—	—	—	—	—	1 (1.96)	1 (0.29)
Jugulosubclavian angle and suprascapular vein	—	—	—	—	—	—	—	1 (1.96)	1 (0.29)
Jugulosubclavian angle and subclavian vein	—	—	—	—	—	—	4 (8.50)	4 (7.84)	8 (2.36)
Cervical lymphatic chain	—	—	—	—	—	—	—	2 (3.92)	2 (0.59)
Internal jugular vein, subclavian vein and external jugular vein	—	—	—	—	—	2 (5.50)	—	—	2 (0.59)
Internal jugular vein, jugulosubclavian angle and subclavian vein	—	—	—	—	1 (7.10)	—	—	—	1 (0.29)
Transverse cervical vein	—	—	—	—	—	—	1 (2.10)	—	1 (0.29)
Total	40 (100.00)	21 (100.00)	30 (100.00)	100 (100.00)	14 (100.00	36 (100.00)	47 (100.00)	51 (100.00)	339 (100.00)

[1] The values in parentheses indicate the percentage relative to the number of cases.

On a few occasions the thoracic duct was not found on the left side of the neck (Table 2) and when this occurred in cadavers it was always found that the thoracic duct ended in the right internal jugular vein. It can be seen from Table 2 that failure to detect the thoracic duct on the left side of the neck was more frequent in living patients than in cadavers[12]. Ref: Table S2.

Table 2

Frequency of failure to detect the thoracic duct on the left side

Authors	Subjects	Total no. of dissections	% of thoracic ducts not ending on the left side
Parsons *et al.* (1909)	Cadavers	40	0
Davis (1915)		22	4·5
Correia, M. (1926)		32	0
Greenfield *et al.* (1956)		75	1·3
Kausel *et al* (1957)		50	2·0
Shafiroff *et al.* (1959)		30	0
Jdanov (1959)		100	0
Rocca Rosetti *et al.* (1961)	Living	14	0
Werner (1965)		79	2·5
Archimbaud *et al.* (1969)		38	5·3
Present series		49	4·1

CL has been reported after penetrating neck trauma [6,13]. Cervical node biopsy, cervical rib resection[14] and anterior cervical discectomy [15]. Knowledge of the anatomy and physiology of the lymphatic system has

clarified many of these issues. However, the optimal management of CL is still debatable.CL complications: Ref: Table S3

Table S3

SYSTEMIC COMPLICATIONS	Metabolic, Nutritional, Immunologic.
LOCAL COMPLICATIONS	Delayed wound healing, Seroma formation, Infection, Fistula formation, Flap necrosis.
LIFE THREATENING	Carotid blow-out [17,6,13], Chylothorax [14].

Untreated chylousdrainage patientsmay experience progressive weakness, dehydration, edema, or emaciation [13,16]. Wound healing complications can result from the disruption of the normal biochemical milieu. Within the wound bed, extravasated chyle provokes an intense inflammatory reaction, prompting the release of proinflammatory cytokines and tissue proteases that interfere with the healing process. The pressure of accumulated chyle beneath skin flaps may decrease tissueperfusion, resulting in flap necrosis. Systemic metabolic and immunologic derangements associated with CL may further compromise healing. A cervical CL can spread from the root of the neck into the mediastinum. With sufficient hydrostatic pressure, the collection of chyle may penetrate the pleural, forming a chylothorax, which presents clinically with shortness of breath, tachypnea, and chest pain[1].Chylothorax usually occurs after thoracic surgery or trauma [15]. It may also occur after neck dissection alone[18]. Laboratory values may reveal hyponatremia, hypochloremia, hypoproteinemia, or lymphopenia. Drain output can remain persistently high and may change to a milky white appearance once an enteral diet is begun[3,5,22]. Overlying skin flaps may appear indurated, edematous, or erythematous because of an inflammatory reaction from local chyle collection [3,19,10,20]. Delayed postoperative radiation therapy may be a consequence, due to a non-healing wound [21].

A} PREVENTION:

The best treatment for CL is prevention. [3,19,16,10,20]

- Knowledge of variations in anatomy of TD and its relations with other neurovascular structures in the neck.Chylous fistula is a bilateral threat, and the same care should be observed on right as on left side. [3]
- A dissection to identify the duct is believed to result in a greater chance of iatrogenic injury and is generally not recommended. [20] If the duct is seen undamaged and separate from the oncologic resection, it should be left undisturbed. [10]
- Myers and Dinerman [7] recommend the posterior approach to radical neck dissection for management of the thoracic duct. This technique leaves the lymphatic tissue lateral to the carotid artery low in the neck as the last area to be cleared. Serial clamping and ligation are done as this tissue is removed. In general, clamping and ligating all divided tissue when dissecting in this region may help to minimize the occurrence of a leak[13].
- Meticulous dissection of the supraclavicular region prevents the complication of CL [21]. The most common location of injury to major lymphatic channels is at the base of the neck during dissection lateral to the carotid sheath[3,16,10].
- After every neck dissection, put the patient in Trendelenburg position and ask the anaesthetist to provide Valsalva manoeuvre. This helps identify any latent leaks if present.

B} Intra-operative Managements:

Prior irradiation although a beneficial treatment modality for decreasing the size of oncological masses is not without its side effects and the presence of metastatic lesions at the confluence of the IJV and subclavian vein [22] make for a more challenging surgical dissection and significantly greater risk of iatrogenic CL [1] Unfortunately, intraoperative diagnosis of lymphatic vessel injury can be difficult due to the usual fasting state of patients prior to surgery, which reduces lymphatic production and transport. Identification of an intraoperative CL is made by careful scrutiny of supraclavicular portion of the wound. If at any time during dissection one sees a watery or creamy fluid, an immediate search for the source must be made. Occasionally after the dissection has progressed superiorly, one will see a whitish clotted material pooled in supraclavicular fossa which also indicate CL[3].Some importantmanoeuvre's, including the Valsalva manoeuvre via continuous airway pressure during intubation to increase intrathoracic pressure or manual abdominal compression to increase intra-abdominal pressure, and simple neck extension, can be used to improve visibility of the TD[5].Placing the patient in Trendelenburg's position and observing the wound while applying a prolonged positive pressure breath can be used to check for CL after completion of a neck dissection[3,16,10,20]. The same precautions must be practiced on the right side because up to 25% of chyle fistulas occur on this side[3].All efforts should be made to stop a CL when TD discovered intraoperatively. TD injuries can be controlled either at the site of duct laceration or at an intact site upstream [23,24,25] Ref: Table S4.

Table S4

At TD**INJURY**site	**Over sewing** the duct stump with a continuous 3-0/4-0 silk suture by placating the adjacent fascia over the injured duct [3,10,16].
At **INTACT**site of TD	Dissected, Sealed, and Sectioned with Liga-Sure, **without** clipping

The sites of duct laceration should be identified and ligated with suture even though needles should not be placed directly through the duct because of its fragile nature and tendency to leak at suture sites. Also,the extremely thin thoracic duct wall tying off itself has been shown to be less effective due to the frail nature of the thoracic duct wall [26].Thoracic duct LigaSurecoagulation followed by its division to ascertain the discontinuity is not mandatory [27].Traditionally, clips have been used, but they are subject to displacement [28]. In younger children, clips may also tear tiny structures such as the thoracic duct and may interfere with each other if repeated applications are required in small working spaces. The Liga-Sure is a computer-controlled bipolar diathermy system designed to seal blood vessels up to 7 mm in diameter by fusing collagen and elastin. There are no specific manufacturer's recommendations regarding the lymphatics. However, Liga-Sure appears safe and effective on lymphatics in inguinal lymphadenectomy procedures [29]. Furthermore, Novitsky et al. demonstrated its efficiency in sealing thoracic duct in a porcine model [30]. The 5-mm Liga-Sure instrument is a straight grasper-dissector with dissecting, sealing, and cutting capabilities. Reliable thoracic duct sealing was achieved in both cases with minimal sticking, charring, or lateral thermal spread. This is, to the best of our knowledge, the first report of use of Liga-Sure for thoracic duct sealing in neck region. Even with control of all visible leakage sites, these patients are at high risk of postoperative chylous fistula [3,31,16,32]. This may be due to unidentified injuries to other contributions of the duct or additional terminations [10]. After surgery, medical management strategies should be initiated if a chylous fistula is treated intraoperatively.

C} Post-operative Management:

A diagnosis of CL is often delayed because of postoperative swelling and bloody drainage. The treatment protocol should be decided according to the operative findings, and postoperative drainage volume and content. The first 3 days after an operation is the critical period for evaluation. When the color of the drainage fluid postoperatively becomes milky-like, CL should be suspected. The content of the drainage can be tested by switching the patient to a low-fat diet. If a rapid decrease in drainage occurs, CL may be taken as presumptive evidence. In a laboratory examination, when the serum has triglycerides of > 100 mg/dl or chylomicron greater than 4%1, CL should be highly suspected. Rodgers et al studied normative values for uncomplicated drainage after neck dissection. This study concluded that, when the diagnosis is clinically difficult, a drainage fluid triglyceride level above 100 mg/dL, or greater than the serum level, would support the diagnosis of chyle fistula [4]

I] Conservative Management: Crumley and Smith [3] in 1976 suggested that all patients do not need immediate operative intervention, and a trial of medical management is warranted. At the first indication of chylous fistula, nasogastric feedings should be stopped and intravenous feedings used[3]. Medical management consists of interventions that promote spontaneous fistula closure by diminishing chyle flow i.e. adequate drainage, pressure dressings, serial aspirations, bedrest in the semi-Fowler position, and nutritional modifications have all been used successfully.

Conservative Measures

1. Activity:Because chyle flow is propelled by physical activity, patients with CL should be restricted to bed rest. The head of bed should be elevated (30–40◦) [3] and stool softeners provided to reduce intrathoracic and intraabdominal pressure with bowel movement.
2. Diet:With potential high-volume fluid shift with protein and electrolytes loss, patients with CL need to be monitored for dehydration and malnutrition. Fluid balance and electrolytes should be checked daily and albumin weekly [3]. Intravenous fluids should be administered to achieve euvolemic and electrolytes replenished as needed. Dietary management plays a crucial role in the nonsurgical management. All patients with suspected CL should be transitioned to a non-fat diet, low-fat diet, or medium-chain fatty acid (MCFA) diet [33]. In general, a MCFA diet with protein, metabolic mineral mixture, and multivitamin supplementation is preferable to a non-fat diet [34]. Because shortand medium-chain fatty acids are largely water soluble and absorbed via the portal venous circulation rather than the gastrointestinal lymphatics, this special diet bypasses the gastrointestinal lymphatic system, resulting in decreased chyle flow at the CL site, allowing the thoracic duct injury to heal faster. Despite this, a MCFA diet does not stop chyle production entirely. Orlistat, a pancreatic lipase inhibitor, interferes with lipid metabolism in the duodenum and prevents lipid absorption and may be given as an adjunct to decrease chyle production [35]. Alternatively, patients can be made NPO if the drain

output is low and suspected duration of chyle leak is short. NPO is rarely implemented today, as alternative superior dietary options are available that do not contribute to ongoing hypovolemia and malnutrition. Patients with persistent or high output CL will likely require total parental nutrition (TPN), which bypasses the lymphatic system completely [3, 36]. While more effective than a MCFA diet at reducing chyle production, the use of TPN must be carefully weighed against its need for central venous access, potential complication of increase infection risk, and metabolic disturbances and high cost [37]. The TPN can be discontinued after the closed drainage volume decreases to < 10 ml/day. [21]

3. Wound Care: Pressure dressings are intended to tamponade the leaking vessel or vessels and to prevent chyloma formation. If gravity drainage is used, a pressure dressing with serial aspirations should be used [3,10]. Criticisms of this intervention include the difficulty in placing an effective dressing and the possibility of compromising skin flap blood supply [19,20,32]. A pressure dressing is simple and clinically practical [12,13,19,38]. However, due to the fact that the supraclavicular neck region has no solid base to support it, a pressure dressing is not suitable for application [21]. Skin flap viability can also be threatened by chyloma formation. Chyle can cause an intense inflammatory reaction in addition to elevating the skin flaps. A chyle collection may predispose to chylothorax development [8,16,19,31]. Before 1970, chyle fistulas were frequently managed with open packing[8,39,40]. Open wound packing with iodoform gauze was advocated. The general consensus is that if clear, small amounts of fluid are present, open drainage can be used, followed by an injection of tetracycline [41]. Closed-vacuum drainage systems have been used more recently to prevent these accumulations [19,20,31,32]. If the CL exceeds 1 L on postoperative day 3, closed drainage should be performed to reduce the time-consuming dressing changes. However, closed drainage must not aspirate material from directly over the leakage area. The patient should also be instructed not to change position too often[21].

4. Somatostatin and Octreotide:Somatostatin is a neuroendocrine hormone discovered in 1973, with numerous effects on the digestive and lymphatic systems [42]. Ul´ıbarb and colleagues [43] were the first to describe the use of somatostatin for the treatment of CL from thoracic duct injury during a supraglottic laryngectomy in 1990. Somatostatin decreases chyle production via reduction of gastric, pancreatic, and intestinal secretions [44-46]. It constricts smooth muscles in splanchnic and lymphatic vessels to decrease lymph production [45] and lymph flow [47], respectively. Somatostatin's major drawback is its short half-life, which requires continuous intravenous infusion. This problem was solved with the development of octreotide, somatostatin's long-acting analog, which permitted administration with long-lasting subcutaneous injections [48]. Octreotide has gained considerable popularity in the management of CL, first in thoracic surgery and more recently with head and neck surgery. Octreotide is a cost-effective therapy for iatrogenic CL that significantly decreases morbidity, length of stay, and need for surgical intervention [48].To date, there are no consensus guidelines on the optimal octreotide treatment dose and duration in CL management. Octreotide dosage ranged from 100 μg subcutaneous every 8 to 12 hours to 200 μg subcutaneous every 8 hours [49]. Time from initiation of octreotide therapy to CL cessation ranged from 1 to 15 days, and total octreotide treatment duration varied widely from 3 to 24 days. In general, octreotide was administered an additional 1-2 days after CL cessation to ensure complete resolution. Octreotide should be prescribed with caution in patients with pre-existing cardiovascular and hepatic disease [48]. Octreotide has emerged as a powerful adjunct in the conservative management of CL and should be a part of the armamentarium of every head and neck surgeon. However, not every CL will respond completely to octreotide therapy alone. Conservative management is more likely to succeed when the volume of drainage is low or is decreasing over time, and the cervical incision and intraoral flap remain healthy [21]. Definitive management in refractory cases involves ligation of the thoracic duct [49] however, conservative therapy for at least 1 to 2 weeks is recommended prior to taking this course. For recalcitrant chyle leak or circumstances that preclude re-exploration, CL can be addressed distantly with thoracic duct catheterization and embolization or thoracoscopic thoracic duct ligation. The services available at each medical institution may differ and should be considered when deciding on the best management plan[1].

5. Topical Agents:Sclerosing agents such as OK-432 or tetracycline administered at the time of surgery or postoperatively through drainage tubing or percutaneous injection can generate fibrosis to seal a CL [51, 52]. Should the CL persist, however, the surgical field obliteration by the sclerosing agent makes reoperation considerably more challenging. Furthermore, sclerosing agents should be used with care, as it could potentially injure surrounding structures in the wound bed. Phrenic nerve paralysis after doxycycline sclerotherapy for CL has been reported [53]. Cyanoacrylate adhesives, fibrin glue [54–56], and polyglactin (Vicryl) mesh [55] have been placed at the time of surgery, with success, for controlling visible CL.

II] Operative Management: Graunnlaugsson et al. suggested that re-exploration should be performed in patients with any of the following complications:

(1)Suggested criteria for re-exploration range from outputs of >500 mL/day to >1000 mL/day output for 5 days [57, 3, 58, 59]. Generally speaking, surgical intervention should be decided upon within first 4-5 days of a CL, when prompt response to medical management is absent [4]
(2) severe metabolic and nutritional complications
(3) coexisting chylothorax with respiratory compromise
(4) low-output fistulas of long duration (> 14 days) [5].

If chylothorax is present, the patient's respiratory and metabolic conditions should be closely monitored. At the time of re-exploration, local inflammation from extravasated chyle can make thoracic duct identification difficult [1]. Exploration of the wound is recommended when performing an operation with microscopic and microsurgical ligature of the lacerated Duct [21] Operative intervention included ligation, placement of oxidized cellulose, and open wound drainage. Operative intervention includes ligation of the leak,often supported with fibrin glue. Finding the leaking site or sites was facilitated by feeding the patient heavy cream 2 hours before surgery. If a focal leakage site was not found, gel-foampled-gets soaked with thrombin and plasma were used, often in conjunction with a muscle flap or surgical glue (methyl-2-cyanoacrylate). when the above techniques were unsuccessful. Enteral nutritional modification was used perioperatively. Medical management is less successful if patients have received preoperative radiation. Non-specified intravenous nutritional modification and pressure dressings were continued after surgery.

III] Distant Management:

In certain instances, when there is a persistent CL after surgical reexploration or when re-exploration may not be ideal because of distorted anatomy or tenuous in the case of a microvascular free flap, the head and neck surgeon may seek the assistance of his interventional radiology or thoracic-foregut colleagues for distant management of a thoracic duct leak. Percutaneous transabdominal cannulation of the thoracic duct at the cisterna chyli with lymphography and selective distal embolization with coils or tissue adhesive is a safe and minimally invasive technique for the treatment of CL that do not respond to conservative management, with a reported success rate of 45–70% [60]. Given the relative low morbidity and reasonable success rate, this may be a viable alternative to surgical exploration, if one's facility has the appropriate equipment and personnel. The major drawback to this method is that it can be time-consuming and often require multiple attempts [61]. For patients with failed surgical ligation, thoracoscopic ligation can be an effective salvage procedure that addresses the thoracic duct proximally [52]. Exposure and ligation of the thoracic duct are performed through a right sided thoracoscopic approach, through which the thoracic duct is ligated at the supradiaphragmatic hiatus between the aorta and azygous vein [59, 62].

III. Conclusion:

Detailed understanding of anatomy of thoracic duct and knowledge of its variation's will help surgeons to avoid inadvertent injuries. Chylous fistula is a bilateral threat and same care should be taken on right as on left. Coagulation and section of the thoracic duct withthe LigaSuredevice appears to be a simple, effective, and safe therapeutic option for chyle leak in cervical region. In case of CL early diagnosis and aggressive treatment essential to avoid local and systemic complications that prolongs hospitalization.

Reference:

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