ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 07, pp.53558-53561, July, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

A REVIEW ON CHYLE LEAK IN NECK DISSECTION

***Srikanth Bitra**

Senior Resident at DHRC Hospital New Delhi, India

ARTICLE INFO

Article History:
Received 24th April, 2017
Received in revised form
17th May, 2017
Accepted 08th June, 2017
Published online 22nd July, 2017

Key words:

Chyle, Chyle leak, Lymph duct injury,
Thoracic duct injury.

ABSTRACT

Chyle is a mixture of lymph from interstitial fluid and emulsified fat from intestinal lacteals. A substantial drainage of chyle can result in severe nutritional, metabolic, hemodynamic and immunologic derangement. Hence, this article is an attempt to overview the details of: (1) Anatomy of the lymphatic duct; (2) Diagnosis of the chyleleak; and (3) Management of the chyle leakage to prevent the possible complications.

Citation: Srikanth Bitra, 2017. "A review on chyle leak in neck dissection", *International Journal of Current Research*, 9, (07), 53558-53561.

INTRODUCTION

Chyle is a mixture of lymph from interstitial fluid and emulsified fat from intestinal lacteals. (Loe, 1946) Spiro *et al* reported an incidence of chyle to be 1.9% (16/823). (Spiro *et al*., 1990) Chylous leakage occurs in 1%~2.5% of radical neck dissections, with the majority (75%~92%) occurring on the left side. (HenriItte *et al*., 1996) Chyle is rich in proteins, fat-soluble vitamins, electrolytes and leukocytes, and a substantial drainage of chyle can result in severe nutritional, metabolic, hemodynamic and immunologic derangement. (Rodgers *et al*., 1992)

Anatomy of the lymphatic duct

The primary function of the thoracic duct is to transport body's digestive fat from the intestine to the venous system, as well as the excess tissue fluid, extravasated proteins, and large macromolecules from the interstitial spaces. Fluid passes from the intestinal lymphatic to the cisterna chyli, a lymphatic sac located anterior to the second lumbar vertebra, and then through the thoracic duct to empty into the venous system, in the region of the left jugular andsubclavian veins. The thoracic duct drains intestinal chyle and receives lymph from the left side of head and neck and most of the body, except for the right upper limb, right lung, right side of the heart, and the convex surface of the liver, which are drained by the right lymphatic duct. Both the thoracic duct and the right lymphatic duct have numerous valves throughout their length, which maintain the unidirectional flow of chyle, especially at the lymph–venous junction to prevent the reflux of blood into the lymphatic system. With regards to the cervical region, at the level of the transverse process of the seventh cervical vertebra, the thoracic duct turns laterally and runs anterior to the vertebral artery, the sympathetic trunk, the phrenic nerve, and the scalenus anterior, separated from these structures by the prevertebral layer fascia. Passing behind the carotid sheath, it descends anterior to the origin of the left subclavian vein, artery and terminates near the junction of internal jugular and subclavian veins. This typical pathway, however, occurs in only 65% of the population, because of embryological variation, which generally consist of anomalous and irregular crossover course of duct. These possible anatomical variations are the main reason making the thoracic duct more susceptible to damage during surgical procedures than right lymphatic duct.

Diagnosis

The diagnosis of a chyle leak is a clinical one based on the presence of milky white drainage. This drainage typically increases with high fat meals and resolves with fasting. Laboratory testing can be used as an adjunct with examination of the fluid for triglycerides, cholesterol, protein, lipid electrophoresis, cell counts and pH. (Staats *et al*., 1980; Sassoon and Light, 1985; Huggins *et al*., 2010; Maldonado *et al*., 2009) (Table: I) Ultrasound and CT scanning candefine the

Corresponding author:* **Srikanth Bitra,
Senior Resident at DHRC Hospital New Delhi, India.

presence of fluid accumulation in the neck, chest, and abdomen. The exact site or sites of leak from the thoracic duct cannot be accurately imaged, however, without opacification of the lymphatic system. Lymphangiography opacifies the thoracic duct and demonstratesfoci of leak more frequently in high-output states. It may fail to show a right thoracic duct leak. If this is suspected from the time of surgery then a right upper limb lymphangiogram is necessary to demonstrate the right duct. (Sachs *et al*., 1991)

Lymphoscintigraphy: This is achieved by injecting technetium 99m-labelled filtered sulphur colloid into the hand or foot and imaging the body using a gamma camera. The technique can confirm a chyle leak by identifying regional 'hot spots' and it may be useful in surgical planning especially if lymphangiography is not possible or available. One disadvantage of lymphoscintigraphy is that it does not provide fine anatomical detail. (Bybel *et al*., 2001) Lymphangiography and lymphoscintigraphy are generally limited to patients with uncertain diagnosis after other workup, for recurrent leaks, and when major anatomic anomalies are suspected. (Maldonado *et al*., 2010)

Management

Management may involve:

(1) Intraoperative recognition of injury with repair
(2) Conservative postoperative interventions
(3) Management using interventional radiology
(4) Re-exploration of the wound with repair

Intraoperative recognition of injury with repair

Prevention of chyle leaks at operation by identification of at-risk patients, meticulous surgical technique and knowledge of the relevant anatomy of the thoracic duct and its variations is vital. (Roger, 1976; Lucente *et al*., 1981) Damage to the thoracic duct may be difficult to visualise intra-operatively, and several authors have advocated patients ingesting high-fat-content substances preoperatively to allow for better identification. (Roger, 1976; Lucente *et al*., 1981) A request to the anaesthetist to apply positive pressure ventilation, raising intra-abdominal pressure, may allow small leaks to be revealed. (Roger, 1976) It has been suggested that half of all chyle leaks respond to conservative measures.

Conservative and medical management of chyle leak

Medical management is the first line of management. This may incude bed- rest, pressure dressing, parental nutrition, special diet, somatostatin and sclerotherapy. Octreotide can be started in a dose of 100 µg subcutaneously every 8 hours for 5 days in cases with low-output leaks and for 7 days in cases with high-output leaks. Chyle leak usually stops within 5 days of starting octreotide in the low-output cases and within 7 days in the high-output cases. (Jain *et al*., 2015) Sclerotherapy using tetracycline has been reported twice in the literature. Injection of tetracycline/ Doxycycline into the supraclavicluar wound has been shown to be a successful method of treating chylous fistula. (Dilip Srinivasan *et al*., 2007) Etilefrine stimulates the sympathetic nervous system to inhibit chyle production and limit lymph flow in the thoracic duct by constricting thoracic duct smooth muscle [Guillem *et al*., 2004];

Management strategies of chyle leaks: non-surgical and nutritional support

The nutritional management of CLs is based on the theory that reducing chyle flow allows the leak to heal itself. Factors known to increase chyle flow include activity, a fatty diet and high intestinal absorption. Diet low in fat and rich in medium-chain triglycerides (MCT). MCT are absorbed directly into the portal circulation rather than transported in lymph, and therefore do not affect chyle flow. Parental nutrition (PN) is the most comprehensive method of delivering calories and vitamins to a patient, while bypassing the lymphatic system. However, to allow complete bowel rest, patients must remain nil by mouth (NBM), which may not be ideal. Additionally, PN is expensive and requires long-term vascular access for delivery. This can create complications, notably the risk of introducing infection via the access line, which can have serious ramifications in potentially immunocompromised patients. Because of this and because of the lack of evidence that PN is superior, Enteral nutrition (EN) tends to be favoured as initial therapy for CLs. However, PN is warranted in some situations, including non-functioning gastrointestinal tracts, high chyle output (>1000ml/day) or failure of CLs to resolve on EN.

Enteral Nutrition (EN): EN is preferential for patients with CLs of less than 1000 ml/day. It is also helpful in patients who cannot take sufficient food by mouth, or are unable to comply with afat-free diet. Enteral nutrition in CLs requires a specialised feed formula (either MCT-based or low-fat elemental), designed to reduce chyle flow. Most EN formulas contain sufficient vitamins, minerals and essential fatty acids to meet patients' daily requirements. The downsides of EN include the cost of the formula—which is cheaper than PN, but remains expensive—and the method of delivery. A naso-gastric tube cannot remain in situ for long periods and some patients cannot tolerate them. Nonetheless, the evidence suggests EN is an effective and safe option in managing CLs.

Oral feeding with MCT supplementation

Oral feeding with MCT supplementation should be considered for well-nourished patients willing to adhere to a fat-free diet. The benefits of this approach are the lack of access lines and feeding tubes, which allows the patient to feel 'normal' and non-medicalised. However, a fat-free diet is difficult to maintain as many fruits, vegetables and nominally fat-free products still contain fats. Additionally, fat is a major calorie-source and, if removed, calories must be consumed elsewhere to prevent malnutrition. Larger meals, extra snacks and vitamin supplements may be necessary, and close monitoring of nutritional status by the supervising physician is imperative. Finally, MCT supplements are unpalatable and can cause gastrointestinal side effects. In reality, many patients are managed with a combination of oral and enteral feeding, depending on their nutritional status and tolerance of oral diet. (McCray and Parrish, 2011; Smoke and DeLegge, 2008; Lagarde *et al*., 2005; Anna C Bibby and Nick A Maskell, 2014).

Management using interventional radiology

Percutaneous lymphangiography-guided cannulation and embolization of the thoracic duct represents a minimally invasive treatment procedure that can be used in the

management of thoracic duct leaks unresponsive to conservative treatment. (Modern Management of Chylous Leak Following Head and Neck Surgery: A Discussion of Percutaneous Lymphangiography, 2008) This technique is successful in approximately 70% of cases in which the thoracic duct can be cannulated. (Marcon *et al*., 2011)

Surgical management of chyle leak

Indications for a surgical intervention (duct repair) include persistent fistulae in spite of conservative treatment, significant leakage or associated complications. Some authors propose a limit in quantity (>1 litre per day for 5 days) or time of drainage (>2 weeks) for conservative treatment, but there is no international consensus. (Al-Sebeih *et al*., 2001; Bae *et al*., 2007; Tallon-Aguilar *et al*., 2010)

Local procedures

A clavicular periosteal flap of the appropriate size and length for the area to be solution of fibrinogen and aprotinin and a solution of thrombin and calcium. The two solutions need to be poured into separate syringes and then mix in situ by injecting them from two syringes on to the site. The previously prepared clavicular periosteal flap should be placed over the area to which the fibrin glue had been applied pressed with gauze for a few minutes, and the margins to be sutured with absorbable sutures at several points. The skin should be sutured and pressure is to be applied directly to the supraclavicular fossa with a large pad and sticking plaster (Elastoplast). (Yoshimura and Kondoh, 2002) Omohyoid muscle was cut from its hyoid bone attachment. The superior belly of the muscle was rotated into the area of the chyle leak. The muscle was used to plug and cover the area of the leak and sutured in place with absorbable sutures. (Li Zhengjiang *et al*., 2007) DeGier and colleagues advocated a pectoralis major muscle flap for delayed flap coverage of chyle leakage. (HenriItte *et al*., 1996) Leo Chenga *et al* described 2 cases of chyle leak which were managed using local soft tissue and adjuctive treatment with a self-adhesive sealant film, TissuePatchTM is a synthetic, self-adhesive, absorbable surgical sealant and barrier which is used to seal and reinforce wounds against the leakage of air, blood, and fluid. (Leo Chenga *et al*., 2014)

Distant procedures

Thoracoscopic ligation of the thoracic duct: Thoracoscopy has been used successfully for the treatment of chylothorax where it is as effective as open thoracotomy but avoids the significant morbidity associated with a major thoracic procedure. Thoracoscopic ligation has proved successful with minimal complications and a high success rate. It does, however, require a thoracic surgery service and specialised anaesthesia.[27]

REFERENCES

Al-Sebeih K, Sadeghi N, Al-Dhahri S. 2001. Bilateral chylothorax following neck dissection: a new method of treatment. *Ann OtolRhinolLaryngol*., 110(4):381–384.

Ammar K, Tubbs RS, Smyth MD, *et al*. 2003. Anatomic landmarks for the cervical portion of the thoracic duct. *Neurosurgery*, 53:1385–1387.

Anna C Bibby and Nick A Maskell. 2014. Nutritional management in chyle leaks and chylouseffusions. *Br J Community Nurs*., 19(10):S6-8.

Bae JS, Song BJ, Kim MR, Park WC, Kim JS, Jung SS. 2007. Bilateral chylothoraces without chyle leakage after left-sided neck dissection for thyroid cancer: report of two cases. *Surg Today*, 37(8):652–655.

Bybel B, Neumann DR, Kim BY, Amin K, Rice T. 2001. Lymphoscintigraphy using 99mTc filtered sulfur colloid in chylothorax: a case report. *J Nucl Med Technol.,* 29:30–1.

Cha EM. and Sirijintakarn P. 1976. Anatomic variation of the thoracic duct and visualization of mediastinal lymph nodes: a lymphographic study. *Radiology*, 119:45–48.

Dilip Srinivasan, J. Green, H. Pandya, A. Brown. 2007. Management of chyle leak with tetracycline sclerotherapy. *British Journal of Oral and Maxillofacial Surgery,* 45(7):7.

Guillem, P., I. Papachristos, C. Peillon, J.P. Triboulet. 2004. Etilefrine use in the management of postoperative chyle leaks in thoracic surgery. *Interact Cardiovasc Thorac Surg.,* 3:156–160.

HenriItte HW, de Gier AJMB, Bruning Peter F, Theo Gregor R, Hilgers Frans JM. 1996. Systematic approach to the treatment ofchylous leakage after neck dissection. *Head Neck*, 18(4):347-351.

Huggins J.T. 2010. Chylothorax and cholesterol pleural effusion. *Semin. Respir. Crit. Care Med.*, 31:743. [PubMed]

Jain A, Singh SN, Singhal P, Sharma MP, Grover M. 2015. A prospective study on the role of octreotide in management of chyle fistula neck. *Laryngoscope,* 125(7):1624-7.

Lagarde SM, Omloo JMT, de Jong K *et al*. 2005. Incidence and management of chyle leakage after esophagectomy. *Ann ThoracSurg*., 80(2): 449–54.

Leo Chenga, Catherine K. Laua, Gary Parker. 2014. Use of TissuePatch™ sealant film in the management of chyle leak in major surgery. *British Journal of Oral and Maxillofacial Surgery*, 52(1):87–89.

Li Zhengjiang, Thiraviam Sabesan, Tang Pingzhang, VelupillaiIlankovan. 2007. Omohyoid Muscle Flap in Prevention of Chyle Fistula. *Journal of Oral and Maxillofacial Surgery*, 65(7):1430–1432.

Loe LH. 1946. Injuries to the thoracic duct. *Arch Surg.,* 53:448–55.

Lucente, F.E., T. Diktaban, W. Lawson, H.F. 1981. Biller Chyle fistula management *Otolaryngol Head Neck Surg.,* 89(4):575–578.

Maldonado F, Carlin-Ceba R, Hawkins FJ, Ryu JH. 2010. Medical and surgical management of chylothorax and associated outcomes. *Am J Med Sci*., 339:314-8.

Maldonado F., Hawkins F.J., Daniels C.E. 2009. Pleural fluid characteristics of chylothorax. *Mayo Clin Proc*., 84(2):129–133. [PubMed]

Marcon, F., K. Irani, T. Aquino, *et al*. 2011. Percutaneous treatment of thoracic duct injuries. *SurgEndosc*., 25:2844–2848.

McCray S, Parrish CR. 2011. Nutritional management of chyle leaks: an update. *PractGastroenterol*., 94:12–32.

Modern Management of Chylous Leak Following Head and Neck Surgery: A Discussion of Percutaneous Lymphangiography-Guided Cannulation and Embolization of the Thoracic Duct Review Article Otolaryngologic *Clinics of North America,* 2008;41(6):1231-1240.

Rodgers GK, Johnson JT, Petruzzelli GJ, Warty VS, Wagner RL. 1992. Lipid and volume analysis of neck drainage in patients undergoing neck dissection. *Am J Otolaryngol.,* 13: 306–309.

Roger, L. J.D.S. 1976. Crumley Postoperative chylous fistula prevention and management. *Laryngoscope*, 86(6): 805–813.

Sachs PB, Zelch MG, Rice TW, *et al*. 1991. Diagnosis and localization of laceration of the thoracicduct: usefulness of lymphangiography and CT. *AJR Am J Roentgenol*., 157:703–5.

Sassoon C.S., Light R.W. 1985. Chylothorax and pseudochylothorax. *Clin. Chest Med.*, 6:163. [PubMed]

Smoke A. and DeLegge MH. 2008. Chyle leaks: consensus on management? *NutrClinPrac*., 23(5): 529–32.

Spiro JD, Spiro RH, Strong EW. 1990. The management of chyle fistula. *Laryngoscope*, 100: 771–774.

Staats B.A., Ellefson R.D., Budahn L.L. 1980. The lipoprotein profile of chylous and nonchylous pleural effusions. *Mayo Clin. Proc*., 55:700. [PubMed]

Tallon-Aguilar L, Perez-Andres M, Lopez-Porras M. 2010. Bilateral chylothorax after thyroid surgery. *Arch Bronconeumol*., 46(10):564–565.

Thoracoscopic Thoracic Duct Ligation Shair U. Ahmed, MD, Manu S. Sancheti, MD, and Allan Pickens, MD. 2012. Operative Techniques in Thoracic and Cardiovascular *Surgery*, (17)4: 292–301.

Yoshimura, Y. and T. Kondoh, 2002. Treatment of chylous fistula with fibrin glue and clavicular periosteal flap. *British Journal of Oral and Maxillofacial Surgery*, 40(2):138–139.

****