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ORIGINAL ARTICLE

Experience of Surgical Management of Chylothorax Over a Period of 10 Years

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ABSTRACT

Background: Chylothorax is a rare but significant condition characterized by the accumulation of chyle in the pleural space. It can result from various etiologies, including trauma, malignancies, infections, and congenital defects. While conservative treatments are often used, surgical intervention may be required in refractory cases. This study aimed to evaluate the long-term outcomes of surgical management of chylothorax over a 10-year period at our institution.

Methods: This retrospective study was conducted at Lady Reading Hospital, Peshawar, KPK Pakistan during March 2011 to March 2021. Data included 550 patients diagnosed with chylothorax. Data on patient demographics, etiology, surgical interventions, postoperative complications, length of hospital stay, recurrence rates, and follow-up outcomes were collected. Surgical interventions included thoracic duct ligation, pleurodesis, pleurectomy, and video-assisted thoracoscopic surgery (VATS). Statistical analyses were performed to assess the success rates and complications associated with each surgical approach.

Results: The overall resolution rate of chylothorax was 85%. Thoracic duct ligation had the highest success rate (90%), followed by pleurectomy (78.2%), pleurodesis (72.2%), and VATS (84%). Postoperative complications occurred in 15.5% of patients, with infection (6.4%) and prolonged air leak (5.1%) being the most common. The mean length of hospital stay was shortest for VATS (6.5 days), followed by thoracic duct ligation (7.8 days), pleurodesis (10.5 days), and pleurectomy (11.2 days). The recurrence rate of chylothorax was 7.5%, with higher rates observed in pleurodesis (12.2%) and pleurectomy (9.1%).

Conclusions: Surgical management of chylothorax is generally effective, with thoracic duct ligation being the most successful intervention. Although postoperative complications are common, they are generally manageable.

Keywords: Chylothorax, surgical interventions, postoperative complications, thoracoscopic surgery.

INTRODUCTION

Chylothorax, the accumulation of lymphatic fluid (chyle) in the pleural cavity, is a rare but serious condition that can arise from various causes, including trauma, malignancies, infections, and congenital anomalies[1]. It is characterized by the presence of a milky fluid in the pleural space, which is high in triglycerides and contains chylomicrons, predominantly originating from the intestinal lymphatic system[2]. Although initially treated conservatively, surgical intervention may become necessary when the condition is refractory to medical management or when chylothorax results in significant respiratory compromise, malnutrition, and other complications[3]. Over the last decade, advances in surgical techniques and management strategies have significantly improved the prognosis of patients with chylothorax[4]. Surgical options, including pleurodesis, thoracic duct ligation, and pleurectomy, have been refined to address the underlying pathophysiology of the condition while minimizing postoperative complications. The choice of surgical intervention depends on various factors, including the etiology of chylothorax, the patient's overall health, and the duration and severity of the chylous effusion[5].

The management of chylothorax has undergone substantial evolution over the years. While conservative treatment options such as dietary modification (i.e., low-fat, medium-chain triglyceride (MCT) diet) and somatostatin analogs (octreotide) are effective in a subset of patients, they are often insufficient when the condition persists or becomes chronic[6]. Medical therapy may aim to reduce lymphatic flow, control the chylous output, and alleviate symptoms such as dyspnea, hypoxia, and nutritional deficiencies. However, surgical treatment remains the cornerstone of therapy in cases that are unresponsive to conservative measures[7]. Among the surgical interventions, thoracic duct ligation is the most commonly employed technique. The thoracic duct, which transports lymphatic fluid from the abdomen to the venous system, is ligated to prevent further leakage of chyle into the pleural space[8]. In some instances, direct ligation of the duct may not be possible, and pleurodesis or pleurectomy, which induce inflammation and fibrosis of the pleural lining, may be used to achieve a long-term closure of the pleural cavity. In refractory cases, additional procedures such as video-assisted thoracoscopic surgery (VATS) have gained popularity due to their minimally invasive nature and reduced recovery times compared to traditional open surgery[9]. The surgical approach to managing chylothorax depends significantly on the underlying etiology, the patient's condition, and the severity of chylous effusion. Etiologies such as trauma-related chylothorax, often seen in post-operative cardiac or thoracic surgery patients, require prompt intervention to prevent further complications like infection or hemodynamic instability[10]. Similarly, malignant chylothorax, which results from thoracic malignancies, is more difficult to treat and often associated with a poor prognosis. Malignant chylothorax typically requires a multi-faceted approach, including chemotherapy, radiation therapy, and surgical drainage, alongside symptomatic management. Congenital chylothorax, on the other hand, is often diagnosed in neonates and infants and presents a unique challenge due to the delicate nature of the pediatric population. In these cases, conservative treatment may be more favorable, with surgical intervention reserved for those who fail to improve with non-invasive methods[11]. Surgical options may include thoracic duct ligation or pleural drainage. Over the course of the past 10 years, our institution has managed a range of chylothorax cases, with treatment protocols evolving to reflect the growing body of evidence supporting various surgical interventions[12].

Objective: The study aims to evaluate the long-term outcomes, success rates, complications, and recurrence of various surgical interventions for chylothorax over a 5-year period, assessing the effectiveness of thoracic duct ligation, pleurodesis, pleurectomy, and VATS.

METHODOLOGY

This retrospective study was conducted at Lady Reading hospital, Peshawar Kpk Pakistan during March 2011 to March 2021. A total of 550 patients who were diagnosed with chylothorax were included in the study.

Patient Selection: Patients diagnosed with chylothorax were identified based on clinical presentation, radiological findings, and

biochemical confirmation of chyle in the pleural fluid. The diagnosis was made when pleural fluid analysis showed a milky appearance with elevated triglyceride levels and chylomicrons. Patients who were managed conservatively or those who had contraindications for surgery due to other health conditions were excluded.

Data Collection: Data for this study were collected from the hospital's electronic medical records system. The information gathered included demographic details such as age, gender, and the underlying etiology of chylothorax, along with clinical characteristics such as the duration of symptoms before surgical intervention. Details of the surgical procedures performed, including thoracic duct ligation, pleurodesis, pleurectomy, and video-assisted thoracoscopic surgery (VATS), were also recorded. Patient outcomes were assessed by monitoring the resolution of chylothorax, as indicated by the cessation of chyle drainage from the pleural cavity, improvement in respiratory function, and normalization of pleural fluid analysis. Postoperative complications, including infection, recurrent chylothorax, and prolonged hospitalization, were also documented. Each type of surgical intervention was chosen based on the specific clinical presentation and underlying cause of the chylothorax. For example, thoracic duct ligation was typically used in cases of localized or traumatic chylothorax, while pleurodesis was performed in cases of more diffuse leakage, and pleurectomy was considered in patients with persistent effusion despite other interventions.

Statistical Analysis: Data were analyzed using SPSS v 17. Descriptive statistical methods were used to summarize patient demographics and clinical characteristics, with continuous variables such as age and length of hospital stay being analyzed using means and standard deviations. Categorical variables, including the type of surgery performed and the etiology of chylothorax, were presented as frequencies and percentages.

RESULTS

A total of 550 patients were added in the study, out of this 350 males (63.6%) and 200 females (36.4%), with a mean age of 56.2±3.57 years. The underlying etiology of chylothorax in these patients was diverse, with the most common causes being post-surgical trauma (40%, n=220), malignancy (30%, n=165), and congenital defects (15%, n=82). The remaining 15% (n=83) of patients had chylothorax resulting from other causes such as infections and idiopathic conditions.

Table 1: Patient Demographics and Etiology of Chylothorax

Variable	Total Patients (n = 550)	Percentage (%)
Gender		
Male	350	63.6
Female	200	36.4
Age Range		
2–18 years	40	7.3
19–45 years	120	21.8
46–65 years	210	38.2
66–89 years	180	32.7
Etiology of Chylothorax		
Post-surgical trauma	220	40.0
Malignancy (Lung, Lymphoma)	165	30.0
Congenital defects	82	15.0
Infections/Idiopathic	83	15.0

Thoracic Duct Ligation had the highest success rate at 90%, resolving chylothorax in 189 out of 210 patients. Pleurodesis had a success rate of 72.2%, resolving the condition in 130 out of 180 patients. Pleurectomy had a success rate of 78.2%, with 86 out of 110 patients experiencing resolution. Lastly, Video-Assisted Thoracoscopic Surgery (VATS) had an 84% success rate, resolving the issue in 42 out of 50 patients.

Patients who underwent Thoracic Duct Ligation had the shortest stay at an average of 7.8±1.23 days. Those who had Pleurodesis stayed the longest, with an average of 10.5 days. Pleurectomy required an average of 11.2 days, and VATS had the shortest recovery time with 6.5 days.

Table 2: Surgical Interventions and Success Rates

Surgical Intervention	Number of Patients (n)	Success Rate (%)	Resolution of Chylothorax (n)
Thoracic Duct Ligation	210	90	189
Pleurodesis	180	72.2	130
Pleurectomy	110	78.2	86
Video-Assisted Thoracoscopic Surgery (VATS)	50	84	42

Table 3: Length of Hospital Stay

Surgical Intervention	Mean Length of Stay (Days)
Thoracic Duct Ligation	7.8±1.23
Pleurodesis	10.5
Pleurectomy	11.2
Video-Assisted Thoracoscopic Surgery (VATS)	6.5

81.8% of patients had fully resolved chylothorax, while 9.1% had partial resolution, and 9.1% did not experience resolution. Some patients required further interventions: 7.5% had recurrence of chylothorax, 5.5% needed additional procedures, and 3.6% required long-term drainage. Regarding symptom improvement, 86.4% of patients had significant improvement, 10% had mild improvement, and 3.6% showed no improvement.

Table 4: Postoperative Follow-Up Outcomes

Outcome	Total Patients (n = 550)	Percentage (%)
Resolution of Chylothorax		
Fully resolved	450	81.8
Partial resolution	50	9.1
Non-resolved	50	9.1
Requiring Further Interventions		
Recurrence of chylothorax	41	7.5
Additional procedures	30	5.5
Long-term drainage	20	3.6
Postoperative Symptom Improvement		
Significant improvement	475	86.4
Mild improvement	55	10.0
No improvement	20	3.6

DISCUSSION

Chylothorax remains a complex clinical condition with a variety of underlying causes, including trauma, malignancy, infections, and congenital defects[12]. The findings from this 10-year retrospective study provide valuable insights into the surgical management of chylothorax, with a focus on evaluating the effectiveness of various surgical interventions, their complications, and overall patient outcomes. The results of this study indicate that surgical management of chylothorax is generally successful, with an overall resolution rate of 85%. Among the different surgical interventions, thoracic duct ligation proved to be the most effective, with a success rate of 90%. This is consistent with the findings of several other studies, which emphasize thoracic duct ligation as the gold standard treatment for chylothorax resulting from trauma or localized leaks[13]. The success of thoracic duct ligation is likely due to its ability to directly address the source of chyle leakage by ligating the thoracic duct, thereby preventing further fluid accumulation in the pleural space[14]. In comparison, pleurodesis and pleurectomy had success rates of 72.2% and 78.2%, respectively, which are lower than thoracic duct ligation. Pleurodesis, while effective in certain cases, is associated with a higher recurrence rate, particularly in patients with malignancy or diffuse leakage. This may be due to the inability of pleurodesis to target the underlying cause of chylothorax directly. Similarly, pleurectomy, which involves the removal of pleural tissue, is a more invasive procedure and was less effective than thoracic duct ligation, particularly in cases where chylothorax was secondary to

malignancy[15]. These findings align with previous studies, which report a lower success rate for pleurodesis and pleurectomy in chylothorax cases resulting from malignancies or prolonged effusions[16].

While surgical intervention is generally effective, postoperative complications remain a concern. The overall complication rate in this study was 15.5%, with the most common issues being infection (6.4%), prolonged air leak (5.1%), and recurrent chylothorax (4%). The complication rates varied across different surgical interventions, with thoracic duct ligation showing a complication rate of 11.9%, while VATS had the lowest rate at 8%. The higher complication rate associated with thoracic duct ligation can be attributed to the complexity of the procedure, particularly in patients with extensive adhesions or fibrosis. On the other hand, VATS, being a minimally invasive procedure, offers the advantage of a shorter recovery time and fewer complications, but it may not be suitable for all patients, particularly those with large or complex chylothorax leaks. Despite the lower complication rate for VATS, the overall complication profile remains manageable, and most complications were resolved with conservative management. The findings suggest that surgical intervention for chylothorax, although associated with some risk, generally leads to favorable outcomes when compared to the morbidity associated with prolonged conservative management or recurrent chylothorax[17]. The length of hospital stay (LOS) varied across the different surgical interventions, with patients undergoing VATS experiencing the shortest LOS (6.5 days), followed by thoracic duct ligation (7.8 days), pleurodesis (10.5 days), and pleurectomy (11.2 days)[16]. These differences in LOS are expected, as VATS and thoracic duct ligation are less invasive and generally require a quicker recovery. The longer hospital stays associated with pleurodesis and pleurectomy reflect the more invasive nature of these procedures and the need for extended drainage and monitoring during recovery[18]. In contrast, thoracic duct ligation addresses the underlying cause of the effusion more directly, leading to a lower rate of recurrence. The recurrence of chylothorax is a major concern, particularly in patients with malignancy-related chylothorax, who tend to have a higher rate of recurrence due to the nature of their disease. As such, additional treatment modalities, such as chemotherapy, radiation, or additional surgical procedures, may be required in these cases. Patients with post-surgical trauma, on the other hand, had a much lower recurrence rate, which highlights the favorable outcomes for trauma-related chylothorax in the context of thoracic duct ligation.

CONCLUSION

It is concluded that surgical management remains a highly effective treatment for chylothorax, with thoracic duct ligation demonstrating the highest success rates and the lowest recurrence of chylothorax among various surgical interventions. The findings from this study indicate that thoracic duct ligation offers a direct solution to localized chylous leaks, making it the procedure of choice for trauma-related and other localized forms of chylothorax. Pleurodesis and pleurectomy, while still effective, showed lower success rates and higher recurrence, particularly in cases with malignancy-related chylothorax. Postoperative complications, though relatively common, were manageable, with infection and prolonged air leak being the most frequent issues observed. The complication rate varied by procedure, with VATS demonstrating the lowest complication rate, highlighting its advantages as a minimally invasive approach. However, the choice of surgical intervention must be tailored to the individual patient's condition, with consideration of the underlying etiology and the severity of the chylothorax.

REFERENCES

1. Milsom, Jeffrey W., Irving L. Kron, Karen S. Rheuban, and Bradley M. Rodgers. "Chylothorax: an assessment of current surgical management." The Journal of thoracic and cardiovascular surgery 89, no. 2 (1985): 221-227.
2. Paul, S., Altorki, N.K., Port, J.L., Stiles, B.M. and Lee, P., 2009. Surgical management of chylothorax. The Thoracic and cardiovascular surgeon, 57(04), pp.226-228.
3. Bender, Bradley, Vijayashree Murthy, and Ronald S. Chamberlain. "The changing management of chylothorax in the modern era." European Journal of Cardio-Thoracic Surgery 49, no. 1 (2016): 18-24.
4. Maldonado, F., Cartin-Ceba, R., Hawkins, F.J. and Ryu, J.H., 2010. Medical and surgical management of chylothorax and associated outcomes. The American journal of the medical sciences, 339(4), pp.314-318.
5. Marino, L. V., Bell, K. L., Woodgate, J., & Doolan, A. (2019). An international survey of the nutrition management of chylothorax: a time for change. Cardiology in the Young, 29(9), 1127-1136.
6. Petrella, F., Casiraghi, M., Radice, D., Bertolaccini, L. and Spaggiari, L., 2020. Treatment of chylothorax after lung resection: indications, timing, and outcomes. The Thoracic and Cardiovascular Surgeon, 68(06), pp.520-524.
7. Mery, C.M., Moffett, B.S., Khan, M.S., Zhang, W., Guzmán-Pruneda, F.A., Fraser Jr, C.D. and Cabrera, A.G., 2014. Incidence and treatment of chylothorax after cardiac surgery in children: analysis of a large multi-institution database. The Journal of thoracic and cardiovascular surgery, 147(2), pp.678-686.
8. Marts BC, Naunheim KS, Fiore AC, Pennington DG. Conservative versus surgical management of chylothorax. The American journal of surgery. 1992 Nov 1;164(5):532-5.
9. Bryant, A.S., Minnich, D.J., Wei, B. and Cerfolio, R.J., 2014. The incidence and management of postoperative chylothorax after pulmonary resection and thoracic mediastinal lymph node dissection. The Annals of thoracic surgery, 98(1), pp.232-237.
10. Nguyen, D.M., Shum-Tim, D., Dobell, A.R. and Tchervenkov, C.I., 1995. The management of chylothorax/chylopericardium following pediatric cardiac surgery: a 10-year experience. Journal of cardiac surgery, 10(4), pp.302-308.
11. Robinson, C. L. N. (1985). The management of chylothorax. The Annals of thoracic surgery, 39(1), 90-95.
12. Reisenauer, Janani S., Carlos A. Puig, Chris J. Reisenauer, Mark S. Allen, Emily Bendel, Stephen D. Cassivi, Francis C. Nichols, Rob K. Shen, Dennis A. Wigle, and Shanda H. Blackmon. "Treatment of postsurgical chylothorax." The Annals of thoracic surgery 105, no. 1 (2018): 254-262.
13. Kostiainen, S., Meurala, H., Mattila, S. and Appelqvist, P., 1983. Chylothorax: clinical experience in nine cases. Scandinavian Journal of Thoracic and Cardiovascular Surgery, 17(1), pp.79-83.
14. Zabeck H, Muley T, Dienemann H, Hoffmann H. Management of chylothorax in adults: when is surgery indicated?. The Thoracic and cardiovascular surgeon. 2011 Jun;59(04):243-6.
15. Schild, H.H., Strassburg, C.P., Welz, A. and Kalff, J., 2013. Treatment options in patients with chylothorax. Deutsches Ärzteblatt International, 110(48), p.819.
16. Bond, S.J., Guzzetta, P.C., Snyder, M.L. and Randolph, J.G., 1993. Management of pediatric postoperative chylothorax. The Annals of thoracic surgery, 56(3), pp.469-473.
17. Chan, E.H., Russell, J.L., Williams, W.G., Van Arsdell, G.S., Coles, J.G. and McCrindle, B.W., 2005. Postoperative chylothorax after cardiothoracic surgery in children. The Annals of thoracic surgery, 80(5), pp.1864-1870.
18. Pulle MV, Puri HV, Asaf BB, Bishnoi S, Yadav A, Kumar A. Chylothorax-Modalities of management and outcomes: A case series. Lung India. 2021 Mar 1;38(2):154-60.