

Retraction

The article " Management and overview of postoperative chylothorax after congenital cardiothoracic surgery " is retracted by the Editor-in-Chief, on the request of corresponding author and co-authors who informed errors in data collection after departmental review and post hoc analysis.¹ The article is retracted because the results may be affected due to the errors.

REFERENCES

1. Bansal D, Chugh V, Bhushan R, Banday JM, Jhahria NS, Grover V, et al. Management and overview of postoperative chylothorax after congenital cardiothoracic surgery. *Int Surg J* 2020;7:107-10. DOI: <http://dx.doi.org/10.18203/2349-2902.isj20195953>.

Original Research Article

Management and overview of postoperative chylothorax after congenital cardiothoracic surgery

Dhananjay Bansal, Vaibhav Chugh, Rahul Bhushan*, Javed M. Banday, Narender S. Jhahria, Vijay Grover, Vijay K. Gupta

Department of Cardiothoracic Vascular Surgery, Atal Bihari Vajpayee Institute of Medical Sciences and Dr. Ram Manohar Lohia Hospital, New Delhi, India

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***Correspondence:**

Dr. Rahul Bhushan,

E-mail: rahulbhushan98@gmail.com

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ABSTRACT

Background: The aim of the study was to determine the incidence, risk factors, and outcomes for chylothorax in patients undergoing cardiothoracic surgery, with special emphasis on its management.

Methods: Total of 24 patients with post-operative chylothorax, operated from September 2015 to December 2018, was included in the study. Medical records were maintained, including daily records of drainage volumes and management.

Results: From September 2015 to December 2018, there were 24 cases of chylothorax in 600 congenital cardiothoracic surgeries-an incidence of 4.0%. Overall mortality rate was similar, but cases had longer postoperative hospital stays (median, 22 versus 8 days). Incidence of chylothorax was significantly higher with congenital cardiac procedures. Diagnosis was made at a median of 6 days after surgery. Duration of drainage was a median of 15 days, with 11 patients draining more than 30 days. Longer duration of drainage was associated with cavopulmonary anastomosis procedure. Nutritional management included low fat diet, enteral feeds enriched with medium-chain triglycerides, and parenteral nutrition. Three patients were treated with octreotide, 4 with thoracic duct ligation, and 1 with pleurodesis. Octreotide was associated with a variable effect on drainage. Thoracic duct ligation reduced, but did not stop drainage.

Conclusions: Chylothorax increases duration of hospitalization after cardiovascular surgery in children. Early diagnosis may reduce the duration of chylothorax. Nutritional strategies remain the cornerstone for management of postoperative chylothorax. The impact of octreotide and surgical intervention is limited when reserved for patients with severe or prolonged drainage.

Keywords: Chylothorax, Nutrition, Octreotide and thoracic duct ligation

INTRODUCTION

Over the years, many advances in cardio-thoracic surgery have improved patient survival. However, important morbidity continues to complicate the postoperative care of these patients.

Chylous pleural effusion or chylothorax, is a noticeable early postoperative complication, which is the

postoperative leakage of lymphatic fluid into the pleural space that may result from surgical disruption of the thoracic duct or one of its main tributaries, or increased pressure within the intrathoracic lymph system.¹⁻³ Patients usually remain asymptomatic until a large volume of chyle accumulates, when therapeutic drainage can lead to nutritional depletion, fluid and electrolyte loss, hypolipidemia and lymphocytopenia of T cells, which can contribute to immunodeficiency.^{4,7} The aim of

the study was to determine the incidence, risk factors, clinical spectrum and impact on outcomes of chylothorax in children undergoing cardiothoracic surgery, while further describing our experiences with treatment.

METHODS

A total of 24 patients under the age of 18 years diagnosed with chylothorax after cardiothoracic surgery at Atal Bihari Vajpayee Institute of Medical Sciences and Dr. Ram Manohar Lohia Hospital, New Delhi, from September 2015 to December 2018 were included in the study. Details including weight, clinical history, surgical course, complications, postoperative medical and surgical interventions, fluid intake and output, dietary intake, laboratory investigations, medications and chest tube drainage were recorded. The incidence of chylothorax was calculated together with 95% confidence limits (CL), and characteristics between patients with and without chylothorax were compared using X² and Kruskal-Wallis analysis of variance testing.

RESULTS

24 patients with postoperative chylothorax were identified from a total of 600 congenital cardiothoracic surgeries, giving an incidence of 4%. Postoperative length of stay in survivors was significantly longer for those with versus without chylothorax (median, 18 versus 8 days). Of the three surgeons operating during the study period, the incidence of chylothorax per surgeon was 2.8%, 4.3%, and 5.8%.

Table 1: Incidence of chylothorax by type of operation (n=24).

| Type of operation | N | Incidence (%) |
|----------------------------------|---|---------------|
| TOF/DORV | 6 | 25 |
| VSD | 6 | 25 |
| PDA | 2 | 8.3 |
| CoA | 2 | 8.3 |
| Os ASD | 1 | 4.16 |
| Op ASD | 1 | 4.16 |
| TGA | 1 | 4.16 |
| TAPVC | 1 | 4.16 |
| Complex lesions (Glenn/BT shunt) | 4 | 16.6 |

TOF=tetralogy of fallot, DORV=double outlet right ventricle, VSD=ventricular septal defect, PDA=patent ductus arteriosus, CoA=coarctation of aorta, Os ASD=secundum atrial septal defect, Op=primum, TGA=transposition of the great arteries, TAPVC=total anomalous pulmonary venous connection, BT=blalock-taussig shunt.

The patients were operated for various diagnosis including tetralogy of Fallot or double-outlet right ventricle in 6, patent ductus arteriosus in 2, coarctation of aorta in 2, atrial septal defect in 2, ventricular septal defect in 6, transposition of the great arteries in 1, total anomalous pulmonary veins in 1 and complex lesions in

4 patients (Table 1). 4 out of 24 patients were approached by thoracotomy, rest all by median sternotomy. Median duration of cardiopulmonary bypass was 126 minutes (range, 0 to 369) and median aortic cross-clamp time was 61 minutes (range, 0 to 469). Excluding 1 patient who died, median initial duration of stay in intensive care was 6 days (range 1 to 48), with 2 patients requiring readmission. The median total postoperative duration of hospital stay of the 23 survivors was 18 days (range, 7 to 78), not including the subsequent readmission of 2 patients for persistent chylothorax. 2 patients were reoperated for revision surgeries during hospital admission. Median duration of mechanical ventilation was 2 days (range 1 to 28) and 1 patient died without ever being extubated.

Table 2: Characteristics of clinical course for patients who underwent cavopulmonary connections versus all other patients.

| Characteristic | Cavopulmonary (n=4) median | Other (n=20) median |
|---|----------------------------|---------------------|
| | N (%) | N (%) |
| Day diagnosed | 6 (2) | 6 (1) |
| Pleural fluid characteristics at diagnosis | | |
| Triglyceride level (mmol/l) | 1.34 (0.71) | 1.35 (0.33) |
| White blood cell count (cells/mm ³) | 1800 (347) | 1411 (204) |
| Percent lymphocytes | 84 (8) | 87 (14) |
| Duration of drainage (days) | 28 (13) | 13 (5) |
| Maximum daily drainage (ml/kg) | 38 (10) | 35 (14) |

Chylothorax was found bilateral in 16 patients (66.66%), with additional pericardial effusion in 4 patients (25%). Post-operatively chylothorax was diagnosed after a median time of 6 days (range, 1 to 22), with a median amount of 18 ml/kg (range, 2 to 38 ml/kg). Bilateral chest drainage was found to be associated with greater maximum drainage. The maximum amount of drainage for chylothorax after cavopulmonary or systemic-pulmonary connection procedure was not significantly different from other surgeries (Table 2). Diagnosis was confirmed after laboratory testing of the fluid demonstrating chylomicrons in 21 patients (88%) and triglyceride concentration above 1.1 mmol/l in 20 (83%; median, 1.38 mmol/l). Cell counts in fluid in 20 patients showed total white blood cell counts above 1,000 cells/mm³ in 13 (64%; median, 1,753 cells/mm³), with a percentage of lymphocytes above 80% in 10 patients (50%; median 89%). The characteristics of chylous drainage from patients after cavopulmonary connection procedures were not significantly different from those after other surgeries (Table 2). Median duration of drainage in 23 patients was 15 days (range, 5 to 41), with 6 patients draining 30 days or more. One patient died

during initial hospital stay at 30 day after surgery owing to ventilator associated pneumonia and persistent chylothorax. Cavopulmonary procedures were found to have drained for longer period. 6 patients drained more than 30 days including 4 patients for complex congenital procedures, 1 patient for ventricular septal defect and 1 patient for tetralogy of Fallot repair.

Management of chylothorax

Patients were managed both nutritionally and surgically. Nutritional management included the low fat diet for 3 patients and medium-chain triglycerides rich feeds for 20 patients. Patient who died was given parenteral nutrition with small volumes of expressed breast milk. Total parenteral nutrition was used for 6 patients. Octreotide was used in 3 patients who had higher or unchanged drainage patterns. Two of these patients were also treated with thoracic duct ligation. Two additional patients had thoracic duct ligation without octreotide treatment. Thoracic duct ligation resulted in drainage cessation in only 1 of the 4 patients undergoing this procedure. The impact of therapy was seen as the daily drainage decreased with duration from surgery. The use of octreotide showed a greater decline in daily drainage. However, recurrence was found when it was temporarily stopped. Thoracic duct ligation tended to reduce, but not stop drainage.

DISCUSSION

There is no clear consensus in literature about the best management of chylothorax. Various series have shown pleural space evacuation, low-fat & medium chain triglyceride enriched feeds, enteric rest, and parenteral nutrition to be the primary modalities for treating chylothorax, but limited number of patients in each series precludes interpretations as to the protocol most effective for treatment.^{1,2,4,8-11}

Medium-chain triglycerides are directly absorbed into the circulation through enterocytes thereby reducing lymphatic flow to allow healing of the damaged lymphatic vessels. Octreotide, a somatostatin analog, reduces leakage by increasing lymphatic vessel contraction.¹² With the weak contractility of lymphatic, it has been thought that octreotide may be more beneficial for use with mild to moderate flow chylothoraces.¹² The surgical management for postoperative chylothorax most commonly involves ligation of the thoracic duct, commonly through thoracotomy.

Although overall incidence of chylothorax was found similar to other recent studies i.e., 4.7%, a higher incidence of chylothorax was observed in TOF or DORV and VSD repair in our study, mainly attributable to higher number of cases operated at our center with this diagnosis.¹² Otherwise, highest incidence was found with cavopulmonary or systemic-pulmonary connections, which would elevate superior vena cava pressure,

resulting in higher risk for chylothorax. Beghetti and associates, reported an increased incidence of chylothorax with Blalock-Taussig shunt procedures.¹ We did not isolate Blalock-Taussig shunt procedures because too few procedures were performed in the time interval studied.

CONCLUSION

Our study shows that both nutritional and surgical strategies have their role in management. In our series, most patients (17 of 24, 71%) responded to the use of low fat (3/24 in our series) or medium chain triglyceride enriched diets (14/24 in our series) as first-line therapy. Octreotide, a somatostatin analog, was used in 3 patients in this series as a second-line therapy, which has been found useful in many studies.¹²⁻¹⁴ In our study, it was found variably effective, may be due to the late application in patients with relatively higher daily drainage of chyle.

Four patients in our study were managed surgically, involving thoracic duct ligation. One of these patients subsequently died. Other was later offered pleurodesis before drainage was stopped. The high mortality rate of these patients seems to indicate that thoracic duct ligation should be reserved for patients with poor prognosis.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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