Nutritional Management of Postoperative Chylothorax in a Pediatric Patient with Hypoplastic Left Heart Syndrome Case Report

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Background

Chylothorax is the accumulation of chyle, milky fluid composed of lymph, fats, protein, and fat-soluble vitamins, within the thoracic or pleural cavity resulting from thoracic duct leakage.[1] This condition can arise from thoracic duct injury, increased systemic pressure in the superior vena cava, and following the Fontan procedure for hypoplastic left heart syndrome.[1,5] Clinical manifestations include respiratory distress (coughing, shortness of breath, and chest pain), chyle accumulation in the pleural cavity, and elevated triglyceride and lymphocyte cell counts.[4] Medical nutrition therapy (MNT) from registered dietitians is instrumental in chylothorax management and treatment. Dietary intervention includes strict fat restriction to reduce chyle formation; however, long term fat restriction without proper management can lead to essential fatty acid deficiency (EFAD). EFAD can result in poor wound healing, dry skin/rash, poor growth, and neurological dysfunction in the long-term. To prevent EFAD, patients need a medium-chain triglyceride (MCT) enriched diet and low intake of essential fatty acids. This case report reviews the nutritional considerations for chylothorax treatment in a pediatric patient and highlights proactive nutrition interventions to prevent EFAD.

Nutrition Considerations

- Initial Diagnosis: 24-72 hour fat modified diet to reduce the consumption of long-chain triglycerides (LCT) to decrease chyle output. If unsuccessful in reducing chyle output, chest tube will be placed.[3,4,5]
- Fat Restriction: Pediatric patients must receive <10 grams of fat per day, or < 30% of calories from fat per day.[1]
- Protein Needs: Chyle losses can require higher protein needs due to the high abundance of protein present in chyle.
- Micronutrient Needs: Chyle losses can require increased electrolyte needs and micronutrient needs. Specifically, patients have higher fat-soluble vitamins (A, D, E, K) needs.[5] High levels of zinc and calcium are bound to albumin, therefore increasing the needs of these minerals.[3]
- EFAD: Patients require MCT enriched diets. Patients should maintain 2-4% of calories from essential fatty acids (omega 3 & 6).[1]

Case Report

Case Summary

- 5-year-old male presenting to hospital with respiratory distress and lethargy but received further evaluation due to complex medical history.
- ECHO showed bilateral pleural effusion.
- Past medical history: Hypoplastic Left Heart Syndrome (HLHS), Post Norwood, Glenn, and Fontan Procedures; History of recurrent effusions

Assessment

Anthropometrics

- Height: 101 cm
- Weight: 14.7 kg
- Z-score: -0.33 (37%ile BMI) **does not meet criteria for malnutrition*

Nutrition Focused Physical Exam (NFPE)

- Appears thin, no visible muscle/fat wasting, no signs of rash/dry skin

Labs

- Triglycerides in extracellular fluid: 154 mg/dL
- Lymphocyte cell count: >80%

Food/Nutrition History

- Home diet appropriate for age
- Hospital Course: Regular diet → low fat diet

Nutrition Diagnosis

Impaired nutrient utilization related to new onset chylous effusion as evidenced by requirement for low fat diet providing <30% of calories from long-chain fats and elevated triglycerides of 154 mg/dL.

Intervention

The main nutritional goals of care were:

1. Reduce chylous effusions via chest tube placement
2. Maintain weight and growth trajectory
3. Oral intake meet 75-100% of estimated calorie and protein needs
4. Prevent EFAD
5. Nutrition Prescription: Initiate low fat diet for four weeks when chest tube output is <10-20 ml/day and there is no visible chyle.

Estimated Nutrition Needs: 74-90 kcal/kg (DRI x 1.2-1.5), 1.5-2.0g protein/kg, <10g LCT/ day, multivitamin with DEKA plus, 1240 mL/day (Holliday-Segar)

Recommended distribution of fat: 3g fat/meal (x3/day) & 0.5g fat/snack (2x/day)

Recommend MCT-based products if poor oral intake: Boost Breeze, Carnation Breakfast Essentials with Skim

Nutrition Education: Family education on chylothorax diet to ensure diet adherence

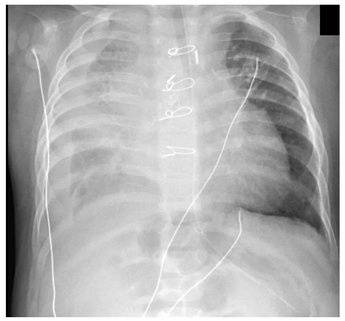
Outcomes

- Patient discharged on low fat diet for four weeks
- Outpatient Visit: Patient followed up on day 14 of low-fat diet → No signs of pleural effusions, EFAD, TG of 33 mg/dL (↔). The patient resolved chylothorax.

Chylothorax on Echocardiogram

Chest Tube Output Level	Recommended Nutrition Intervention
< 20 ml/kg/day	Continue fat-modified diet
< 20 ml/kg/day for 4-5 days	Initiate chylothorax diet (fat-modified diet)
> 20 ml/kg/day	Nothing per mouth with or without total parental nutrition
> 10 ml/kg/day for 7+ days while NPO	Consider secondary interventions

Table 1. Route of Nutrition Determined by Chest Tube Output



Discussion and Application

- Pediatric patients with chylothorax should maintain a strict low-fat diet to resolve chylothorax.
- Parent/caregiver nutrition education comprehension and dietary adherence is essential in dietary intervention in pediatric population.
- Nutrition focused physical exams are necessary for monitoring the development of signs and symptoms for EFAD in a pediatric patient.
- Barriers: Pediatric patients with strong taste preferences can create difficulty for ensuring adequate caloric intake.
- In the future, consider utilization oral nutrition supplements sooner (Boost Breeze, Carnation Breakfast Essentials, MCT- based formulas).

Conclusion

This case report highlights the importance of timely nutrition interventions in a pediatric patient with a complex medical history. To ensure high-quality patient care, registered dietitians and the healthcare team must utilize scientific, evidence-based guidelines to inform the care plan. Initiating the chylothorax diet, a strict, low-fat diet, and ensuring parent and caretaker comprehension of education and dietary intervention adherence is essential in the care of a pediatric patient.

References

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