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Inpatient Insulin Management for Severe Hypertriglyceridemia in Pediatrics

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Inpatient Insulin Management for Severe Hypertriglyceridemia in Pediatrics

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Introduction

- Severe hypertriglyceridemia (SHTG) is defined as triglyceride (TG) >= 1000 mg/dL.
- SHTG increases the risk of developing acute pancreatitis.
- Insulin activates lipoprotein lipase which accelerates chylomicron degradation leading to a rapid decrease in TG levels.
- There is a paucity of pediatric standard of care for insulin use to treat SHTG.
- **Objective:** To develop a protocol to standardize SHTG management using insulin infusion and decrease the duration of SHTG resolution while preventing hypoglycemia.

Methods

- Endocrinology, Evidence-Based Practice, Hospital Medicine, Critical Care, Gastroenterology, Pharmacy, and Nursing met to develop the protocol.
- Pediatric and adult literature were reviewed, and the protocol (Figure 1) was based on consensus as evidence was limited.
- Retrospective chart review of patients with SHTG during the protocol implementation and from the year prior, for comparison, were reviewed. This study was determined exempt by our institution's IRB.

Results

- The protocol was used in 3 patients and compared to 4 patients the year prior to protocol implementation. Characteristics in Table 1.

Figure 1

Aims:
- Decrease TG level with the use of insulin.
- Dextrose infusion in parallel to prevent hypoglycemia and/or maintain euglycemia.

Initial management:
- Check BMP, TG, lipase and CBC
- Begin insulin drip and IVF
  - Insulin at 0.1 unit/kg/hr
  - D10NS with 20 mEq/L of potassium acetate and 20 mEq/L of potassium phosphate at 1.5x maintenance
- NPO
- Pain control as needed
- Consider Endocrine and/or GI consult

Further management:
- Monitor POC BG
  - Check 15 minutes after insulin start and after any insulin rate change
  - Hourly, once stable
- Check BMP and TG every 6 hours
- Clinical assessment for fluid overload
- Insulin drip
  - Increase rate in increments of 0.05 unit/kg/hr about q6h as tolerated
- If chloride > 115 mmol/L, IVF switch to D10 ½ NS with 20 mEq/L of potassium acetate and 20 mEq/L of potassium phosphate

Criteria to discontinue insulin drip and IVF
- TG < 500 mg/dL
- For TG 500-1000 mg/dL- discuss with Endocrine
- Start clear liquid diet and advanced to low fat diet as tolerated
  - If tolerating oral intake, then discontinue IVF

Criteria for discharge
- TG < 1000 mg/dL
- Tolerating oral intake

*Once oral intake resumed, rebound TG up to 1000 mg/dL is expected

Table 1

Table 1.Patient Characteristics	With protocol	Without protocol
Number of patients with SHTG	3	4
Etiology of SHTG		
Known T1D in DKA	0	1
New T1D in DKA	0	1
Known T2D	0	1
New T2D	1	1
PEG- asparaginase	1	0
Unknown (lost to follow-up)	1	0
Triglyceride (mg/dL)		
Prior to insulin	1001-1168	1194-7357
At time of insulin discontinuation	257-396	415-864
Insulin		
Rate (unit/kg/hour)	0.1-0.25	0.1-0.4
Duration (hours)	13-245	9-222
Presence of hypoglycemia	None	Multiple

Discussion

- **Patient with protocol use:** None had DKA. The maximum rate of insulin was 0.25 unit/kg/hr and was achieved for the PEG-asparaginase patient who was on 20% dextrose given the presence of central line.
- **Patient without protocol use:** The 2 Type 1 diabetes (T1D) also presented in DKA, where insulin infusion was continued after DKA resolution due to persistent SHTG. It is worthwhile noting that the new diagnosis of diabetes had a shorter resolution of SHTG between 9-38 hours compared to the known diabetes.

Conclusion

- A protocol to standardize the management of SHTG using insulin infusion was developed.
- Despite no difference in IV insulin infusion duration, patients with SHTG where the protocol was used did not have hypoglycemia.
- The protocol has been used on a limited number of patients since implementation to be able to evaluate its effectiveness.

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