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Therapeutic Plasma Exchange to Alleviate Ventricular Tachycardia After Diphenhydramine Ingestion

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Introduction

- During Covid-19 pandemic, children have experienced increased incidence of stress, anxiety, depression, substance abuse and suicide attempts
- Diphenhydramine (Benadryl) is frequently implicated in intentional ingestion due to easy access

Diphenhydramine

- Diphenhydramine is a first-generation H1 antagonist
- In the CNS, it can cause sedation and seizures
- In the heart, it blocks sodium and potassium channels resulting in sinus tachycardia, QRS prolongation, torsades de pointes and ventricular tachycardia

Presentation to ED

- 13-year-old girl presents to ED with confusion following 1500 mg of diphenhydramine ingestion (29.5 mg/kg)
- She has a brief seizure that resolves with midazolam
- Telemetry concerning for PVC's, bigeminy and ventricular couplets. EKG shows abnormal QTc 534 ms
- Patient admitted to Pediatric Intensive Care Unit due to altered mental status, hypotension and rhythm abnormalities

PICU course

- Additional seizures lead to endotracheal intubation for airway protection
- Continues to have increasing ventricular ectopy nonresponsive to sodium bicarbonate and magnesium sulfate bolus
- Vasoactive drips initiated for persistent hypotension

- Rhythm deteriorates to non-sustained ventricular tachycardia with a pulse (Fig. 1)
- Lidocaine, calcium gluconate, sodium bicarbonate administered without improvement
- Started on intralipid infusion to emulsify the serum diphenhydramine
- Continues to have intermittent ventricular arrhythmias and resultant hypotension on epinephrine and nor-epinephrine
- Echocardiogram showed dilated LV with moderate dysfunction, EF 39% and SF 21%
- Consideration for ECMO vs. Therapeutic Plasma Exchange (TPE) to remove protein bound diphenhydramine molecules

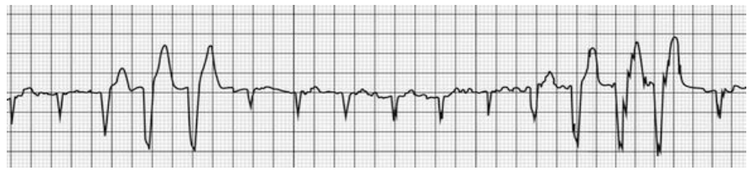

Fig 1:Non-sustanined ventricular tachycardia

Therapeutic Plasma Exchange

- TPE removes harmful substance from circulation by separating blood components (Fig. 2), removing the plasma and returning the remaining blood components to the patient
- We performed a 1.7x plasma volume exchange with 5% albumin and fresh frozen plasma as replacement fluid using Spectra Optia device (Fig. 3)

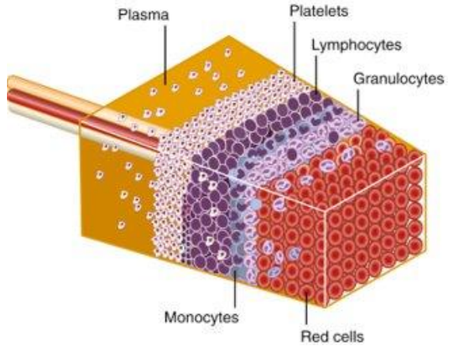

Fig 2:Components of blood separated during plasmapheresis

Fig. 3: Spectra Optia device for plasmapheresis

Results

- Serum diphenhydramine levels decreased from 1300 ng/ml to 770 ng/ml after TPE
- Blood pressure, vasoactive requirement improved, and rhythm abnormalities resolved after TPE
- Echocardiogram on following day showed normal cardiac function

Conclusion

- TPE may be considered as a therapeutic option in centers without ECMO capabilities or for patients who continue to decline with standard management
- TPE also offers a lower procedural risk compared to VA-ECMO
- To the best of our knowledge, use of TPE in diphenhydramine toxicity has not been reported in medical literature

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