CLINICAL VIGNETTE

Digitalis Toxicity in the Setting of Renal Impairment

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Introduction/Background

Digoxin is a cardiac glycoside whose primary mechanism of action is through the inhibition of the cardiac myocyte sodium/potassium ATPase. The medication has historically been utilized in the treatment of heart failure with reduced ejection fraction, atrial fibrillation and other cardiac arrhythmias. However, digoxin is well-known to have a narrow therapeutic index with an array of neurological, gastrointestinal, cardiac and visual side effects. With the emergence of alternative therapies, the clinical use of digoxin and the incidence of digoxin toxicity has declined.[1] However, as the below case illustrates, it is important to promptly identify the side effects to minimize toxicity.

Case

A 44-year-old-man with heart failure with reduced ejection fraction (EF 10-20%) status post ICD placement, atrial fibrillation, and hypertension was admitted with acute decompensated heart failure. On admission, he was short of breath with orthopnea and paroxysmal nocturnal dyspnea with elevated BNP (7,636) and dilated IVC on bedside ultrasound. Notably, he had been taking digoxin 125 mcg for approximately one month for inotropic support after a recent admission for cardiogenic shock.

Diuresis was initiated with improvement in his symptoms over several days. However, his creatinine fluctuated, initially reaching a peak of 2.66 from a baseline of 1.20. With aggressive diuresis, the patient's kidney function improved his baseline suggesting a cardiorenal etiology of his acute kidney injury. However, his creatinine, subsequently increased, reaching a peak of 1.97, suggesting overdiuresis given his hypovolemic examination. Despite fluctuations in kidney function, the daily dosage of digoxin remained at 125 mcg.

After nearly two weeks of hospitalization, the patient became acutely confused with abdominal pain, nausea and vomiting. On bedside examination, he was diaphoretic and anxious but otherwise had stable vital signs with a normal heart rate (70-80), respiratory rate (18-22), oxygen saturation (99-100%) and mild hypertension (MAP 90-95). His mental status waxed and waned, at times being able to answer questions appropriately and other times unable to track or respond to questioning. The patient also reported visual hallucinations consisting of "yellow spots of light" that had been occurring for several days.

Additional laboratory testing remarkable for acute hyperkalemia (5.9), elevated liver function tests (Alkaline phosphate 300, AST 104, ALT 131, T Bili 3.9, D Bill 1.7), and elevated digoxin level (2.2). Repeat ECGs remained stable. Digitalis toxicity was suspected given nausea, vomiting, altered mental status, hyperkalemia, and visual hallucinations which was confirmed with a supra-therapeutic digoxin level. Digi-Fab was administered to reverse the effects.

Shortly after the administration of Digi-Fab, the patient reported improvement in his subjective symptoms and visual hallucinations. However, labs later that evening revealed an acutely elevated lactate (18.6) and hypoglycemia (<10). The patient was transfered to the ICU for additional diuresis and a D10 infusion.

With additional diuresis and discontinuation of the digoxin, the patient had resolution of his clinical symptoms and laboratory abnormalities resolved.

Discussion

Digoxin toxicity can develop after acute overdose or chronic medication usage.[2] Characteristics of digoxin toxicity include anorexia, nausea, vomiting, altered mental status, hyperkalemia, xanthopsia and other ocular symptoms.[2-3] Severe cases, can result in fatal arrhythmias including ventricular tachycardia, atrioventricular block, and ventricular ectopy.[3-4] Digoxin has a relatively narrow therapeutic index (0.5-2.0) and lower serum concentrations (0.5-0.9) are recommended to avoid toxicity.[5]

Our patient, developed classic symptoms associated with digoxin toxicity, including nausea, vomiting, altered mental status, hyperkalemia, and xanthopsia. While an elevated digoxin level of 2.2 was observed, this specimen was obtained more than six hours from the previous administration and may be an unreliable representation of the serum concentration. We suspect his serum concentration was acutely increased given the medication had not been adjusted for his kidney function, which had greatly fluctuated prior to this presentation. On recognition of these symptoms, Digi-Fab was promptly administered with subsequent resolution in his symptoms.

It remains unclear how the episode of hypoglycemia following Digi-Fab administered correlated to this event. The patient had

low blood sugars earlier in the morning (60-70) so it remains possible that with his acute nausea and vomiting he became hypoglycemic. There has been no other literature to suggest a correlation between digoxin toxicity and hypoglycemia.

Conclusion

This episode of digoxin toxicity had hallmark characteristics including nausea, vomiting, hyperkalemia, xanthopsia, and altered mental status. These symptoms occurred despite only a mild elevation (2.2) in the patient's therapeutic digoxin level. The elevated level likely occurred in the setting of fluctuating renal function without renal adjustment of the medication. The recognition of the digitalis toxicity presentation in the setting of an elevated digoxin level should prompt consideration of the administration Digi-Fab.

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