Case Reports

Chronic digoxin toxicity and significantly elevated BNP levels in the presence of mild heart failure

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We present a case of patient with chronic digoxin toxicity with minimal evidence of heart failure, but a significantly elevated B-type natriuretic peptide (BNP) levels.

A 78-year-old woman was brought to an ED by her daughter with complaints of nausea, increasing dyspnea on exertion, and lower extremity edema for approximately 2 weeks. The patient denied chest pain, fevers, chills, vomiting, diarrhea, or abdominal pain.

The patient’s medical history was significant for moderate to severe congestive heart failure, coronary artery disease status after bypass graft in 1994, diabetes mellitus, hypertension, hypothyroidism, dementia, depression, dyspepsia, and osteoarthritis. The patient was taking a significant number of medications including 0.125 mg of digoxin daily, with which she was reportedly compliant.

Physical examination revealed a thin elderly woman in moderate distress. Vital signs were significant for a bradycardia with a rate of 50 beats per minute and tachypnea with a rate of 30 breaths per minute. The patient was afebrile, had a normal blood pressure, and normal room air oxygen saturation by pulse oximetry. Head, eyes, ears, neck, and throat examination was unremarkable except for mild jugular venous distension. Lung examination revealed mild crackles at the bases, tachypnea without retractions, and good air exchange. Cardiac examination revealed a bradycardia, which was regular, and a systolic murmur. There were no rubs or gallops. The remainder of the examination was unremarkable except for mild bilateral lower extremity pitting edema. Peripheral pulses were normal.

Diagnostic studies included an electrocardiogram, which demonstrated a sinus bradycardia with a left bundle-branch block and no other ST-T wave changes. Portable chest radiograph showed cardiomegaly, surgical clips, and no frank infiltrates. Initial laboratory data included hyperkalemia with a potassium of 7.0 mmol/L, elevated blood urea nitrogen/creatinine over baseline at 105/2.5 mg/dL, a metabolic acidosis with respiratory compensation, an unremarkable complete blood count, normal cardiac enzymes, and an elevated digoxin level at 4.2 ng/mL. The BNP level was reported as greater than 1300 pg/mL (the upper limit of the assay at the time).

Given the apparent chronic digoxin toxicity from which the patient was symptomatic, the decision was made in consultation with a cardiologist to administer Digibind. Shortly after administration, the patient experienced a brief run of ventricular tachycardia which was spontaneously terminated before any antiarrhythmic agents could be given. The patient was then transferred to the cardiac intensive care unit.

The patient was started on intravenous (IV) rehydration in the cardiac intensive care unit for her acute renal insufficiency and received treatment for hyperkalemia. The patient proceeded to have a complicated hospital course demonstrating signs of fluid overload despite later attempts at diuresis. She developed multiple right upper extremity deep venous thromboses secondary to an indwelling...
peripherally inserted central catheter line. A transthoracic echocardiogram showed severely depressed left ventricular function, increased left ventricular end-diastolic pressure, moderate pulmonary hypertension, and elevated right atrial pressure. This represented a worsening of findings when compared with a transthoracic echocardiogram done 7 months prior, which showed moderate to severe left ventricular dysfunction. Because of the extremely poor prognosis, end-of-life issues were discussed, and she elected to sign a “do not resuscitate”/“do not intubate” order. The patient died 10 days after this admission.

As the echocardiogram was not performed at the time of the initial ED evaluation, it is unclear whether objective findings consistent with worsening congestive heart failure were present on arrival.

A review of the medical literature reveals no previous case reports of digitalis toxicity (acute or chronic) and elevated BNP levels. However, there have been a few studies demonstrating a direct effect of digitalis on BNP. One such project was completed at the Shiga University of Medical Science in Otsu, Japan [1]. This study measured BNP and atrial natriuretic peptide levels in patients with CHF after therapeutic administration of digitalis. Although this was a small population (total of 13 patients), the study showed an increase from 628 to 689 pg/mL at 1 hour after receiving IV digitalis versus placebo. This increase was despite a decrease in pulmonary capillary wedge pressure, which the authors concluded suggests a possible direct action of digitalis on cardiac natriuretic peptides.

A second study published in 2001 measured BNP, atrial natriuretic peptide, and cGMP (cyclic guanosine 3c, 5c-monophosphate) levels in CHF patients after therapeutic IV followed by oral administration of digoxin [2]. The population for this study consisted of 25 patients, and again, the authors demonstrated a statistically significant increase in BNP levels in digoxin patients versus placebo (130 vs 227 both 3 hours after IV and 3 days after oral administration).

As the role of BNP as a marker for congestive heart failure continues to evolve, it will become increasingly important to identify factors which could affect an accurate interpretation [3]. This case highlights a possible confounding variable of digitalis toxicity when interpreting the results of BNP levels during the evaluation of patient with signs and symptoms suggestive of a heart failure exacerbation. Given preliminary research suggesting an independent effect of digitalis administration on serum BNP concentration, a future study examining BNP levels in patients presenting with digitalis toxicity would be useful. Caution should be exercised in interpretation of BNP levels in patients with heart failure on digoxin.

References