Chronic digoxin toxicity in elderly British Columbians

A number of factors common in the elderly make them vulnerable to acute kidney injury and subsequent digoxin toxicity.

Case

An 85-year-old female presented to emergency after a syncopal episode. She complained of having the flu and had been feeling unwell for several days. Six months earlier, she was prescribed digoxin 0.125 mg daily for atrial fibrillation. Other medications included furosemide, ramipril, metoprolol, ASA, and warfarin. A serum digoxin level, 1 month prior to admission, was within the therapeutic range at 1.6 nmol/L. During the ensuing period she developed a significant reduction in her renal clearance from baseline. Her labs on admission included serum digoxin 6.0 nmol/L (post-distributional), SCr 167 μmol/L (estimated GFR 26 mL/min), potassium 4.5 mmol/L. The patient appeared dehydrated with an ECG showing third-degree heart block and a heart rate of 30 bpm. The patient recovered uneventfully after treatment with fluids and four vials of digoxin-specific Fab antibody fragments (Digibind). Upon discharge she continued to take the same dose of digoxin and 1 month later presented again to emergency with weakness, fatigue, bradycardia, and hypotension. Her post-distributional serum digoxin level was 8.8 nmol/L, SCr 269 μmol/L (estimated GFR 16.7 mL/min), potassium 4.6 mmol/L. She recovered after treatment with five vials of Digibind and was discharged with instructions to stop taking digoxin.

Discussion

Digoxin is commonly prescribed in the elderly for management of atrial fibrillation and congestive heart failure at doses between 0.0625 mg and 0.25 mg once daily.[1] Digoxin has a narrow therapeutic window with post-distributional therapeutic serum concentrations ranging from 0.5 to 2.5 nmol/L. Serum levels of approximately 1.3 nmol/L are recommended for optimal benefit in heart failure.[2] Symptoms of digoxin toxicity include visual disturbances, gastrointestinal symptoms, ataxia, weakness, hyperkalemia, bradycardia, and atrial or ventricular dysrhythmias.[3]

Symptoms of digoxin toxicity include visual disturbances, gastrointestinal symptoms, ataxia, weakness, hyperkalemia, bradycardia, and atrial or ventricular dysrhythmias.

Digoxin is eliminated by the kidneys and toxicity typically occurs in patients who develop declining renal function due to age or other factors. Older patients have decreased renal reserve and often take medications such as ACE inhibitors, NSAIDs, or diuretics, which may adversely alter renal function. Older people have a decreased thirst drive which may lead to dehydration and pre-renal azotemia that is further exacerbated by any intercurrent illness associated with reduced oral intake. Many older people with acute kidney injury experience a combination of these factors.

Digibind is an effective antidote for digoxin toxicity. In British Columbia Digibind administration is centralized through the Drug and Poison Information Centre (DPIC) at the BC Centre for Disease Control, a division of the Provincial Health Services Authority. Physicians call DPIC for a consultation with a medical toxicologist and, if Digibind is required, an appropriate dose is released via the hospital pharmacy. This program standardizes treatment for digoxin-poisoned patients across the province, resulting in optimal care and reduced costs. It also allows for collection of epidemiological data on digoxin toxicity, which is unique among North American health care jurisdictions.

From 2009 to 2010, DPIC was consulted on 107 cases of digoxin toxicity, 97 involving patients older than 65 years of age. Of the elderly patients, 90 required Digibind and subsequently recovered uneventfully. Seven patients were treated conservatively without Digibind.

Summary

Digoxin toxicity in British Columbia occurs most commonly in the elderly, causing illness in patients and a significant cost to the health care system. Decreased renal reserve, vulnerability to dehydration, and adverse renal effects from other typically prescribed medications make this population vulnerable to acute kidney injury and subsequent digoxin toxicity. In patients for whom digoxin therapy is efficacious, using the lowest therapeutic dose along with monitoring of serum digoxin levels and renal function

This article is the opinion of the BC Centre for Disease Control and has not been peer reviewed by the BCMJ *Editorial Board.*

every several months may help to optimize therapy and reduce toxic events.

—Robert Gair, BSc (Pharm), CSPI, Poison Information Pharmacist, BC Drug and Poison Information Centre (DPIC)
—Debra Kent, PharmD, DABAT, Clinical Supervisor, BC DPIC
—Roy Purssell, MD, FRCPC, ABEM Medical Director, BC DPIC
—Michael Copland, MD, FRCPC, Medical Director, Kidney Services, Vancouver Coastal Health

References

1. Cadario BJ, Leathem AM (eds). Drug Information Reference. 5th ed. Vancouver, BC: The BC Drug and Poison Information Centre, 2003:426-433.
2. Arnold JM, Liu P, Demers C, et al. Canadian Cardiovascular Society consensus conference recommendation on heart failure 2006: Diagnosis and management. Can J Cardiol. 2006;22:23-45.
3. Hack JB. Cardioactive steroids. In: Nelson LS, Lewin NA, Howland MA, et al. (eds). Goldfrank's Toxicologic Emergencies, 9th ed. New York: McGraw Hill, 2011:936-945.

Continued from page 459

us what our priorities are. As we listen to one another and the trust develops, we're finding out that quite often our priorities are the same."

Dr Ken Burns, a long-time family physician with a full-service practice in Maple Ridge and physician lead of Ridge Meadows Division of Family Practice, says the Division has turned things around for him and his colleagues. "Things have improved on a number of levels," he says. "We've regained the collegial rapport among doctors in the community. We've also formed relationships with people from Fraser Health and the ministry, and because they're sitting across the table from us, they're not 'those people from Victoria' anymore. We all realize that we have much in common, and on this basis we can move forward on projects that will do so much good in our community because there's trust and people are willing to pitch in and help one another."

For more tips about collaborative decision making, please visit the Divisions BC website at www.divisionsbc.ca/provincial/collaboration.

—Brian Evoy, PhD
Executive Lead,
Divisions of Family Practice

Reference

1. Benkler Y. The unselfish gene. Harvard Business Review July 2011. Accessed 5 October 2011. http://hbr.org/2011/07/the-unselfish-gene/ar/1.