Heartbreaking Case of Acetaminophen Poisoning

Sony Jacob, MD; Prasad Cherian, MD; Christina Preusz, MD; Richard Kovacs, MD

A 23-year-old woman was brought to the emergency room after ingesting 50 g of acetaminophen. Her blood acetaminophen level was 158 mg/L, and she later developed fulminant hepatic failure. Sixty-three hours after ingestion, ECG displayed signs suggestive of acute ischemic injury (Figure 1A). Serum enzymes revealed a Troponin-I of 227.2 ng/mL. The patient’s declining clinical status precluded a cardiac catheterization study. She died within 72 hours of admission in spite of orthotopic liver transplantation. Autopsy revealed normal patent coronary arteries, and cardiac tissue histology displayed patchy subendocardial necrosis and hemorrhage in the ventricles and septum (Figure 1B and 1C) probably due to direct acetaminophen toxicity although functional coronary ischemia may also have played a role. The time of injury was estimated at 24 to 72 hours prior, which corresponded with the ECG abnormalities. Interestingly, the 2-dimensional echocardiogram of our patient demonstrated an interventricular septal thickness of 13 mm (normal, 6 to 11 mm) in the acute phase and its resolution within ~48 hours (follow-up echocardiogram showed a 9-mm interven-

Figure 1. A, Twelve-lead ECG with ST elevation in V1 to V3 and ST depression and T-wave inversion in V4 to V6. B, Low-power histology of the interventricular septal tissue using hemotoxylin and eosin stain. Note the subendocardial tissue showing areas of hemorrhage (arrow head), ongoing coagulation necrosis (arrow) with interstitial edema, myocyte hypereosinophilia, loss of nuclei, striations, and interstitial neutrophilic infiltrate, C. High-power magnification of the same area. These changes suggest a 1- to 3-day-old infarct.
tricular septum) (Figure 2B and 2C). In myocarditis, irrespective of the cause, transient interventricular septal thickening has been noted arising acutely from interstitial edema combined with eosinophilic infiltrates and may improve in the convalescent state.\(^1\)

In our case, the ECG, the echocardiogram, and the autopsy findings all point to myocardial damage perhaps due to direct or indirect acetaminophen toxicity. A few possible mechanisms could account for such cardiac toxicity. Obviously, the metabolic derangement caused by hepatic failure (eg, hyperkalemia, metabolic acidosis, and increase in serum free fatty acids) can trigger arrhythmias.\(^2\) However, acetaminophen may deplete sulfhydryl groups, causing interference with nitric oxide production and thus leading to coronary ischemia.\(^3\) In addition, the sulfhydryl deficit may interfere with endothelial-derived vascular relaxing factor, causing functional coronary ischemia.\(^3\) Furthermore, the acetaminophen moiety has direct toxic effects on the myocardium.\(^3,4\)

Although extensive myocardial damage may result from coronary artery disease, anomalous coronary anatomy, or both, our patient had neither on autopsy. Because the endocardial damage, both with the high levels of cardiac markers and the autopsy findings in our patient, was out of proportion to the postulated mechanism of functional coronary ischemia, it is reasonable to believe that the direct cardiac toxic effect of acetaminophen played a crucial role in the cardiac damage. Acetaminophen-induced cardiotoxicity may be immediate or delayed, and hence early administration of N-acetylcysteine is of paramount importance because it may be beneficial in reducing the functional coronary ischemia as well as the direct toxic effects, irrespective of the time of ingestion.\(^3,4\)

**Disclosures**

None.

**References**

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