



Development of myocardial infarction and ischemic stroke after acute upper gastrointestinal bleeding

Kexin Zheng^{1,2}, Xiangbo Xu^{2,3}, Xingshun Qi^{1,2}, Xiaozhong Guo^{1,2}

¹Postgraduate College, Jinzhou Medical University, Jinzhou 121001, China; ²Department of Gastroenterology, General Hospital of Northern Theater Command (formerly General Hospital of Shenyang Military Area), Shenyang 110840, China; ³Postgraduate College, Shenyang Pharmaceutical University, Shenyang 110840, China

Correspondence to: Xiaozhong Guo MD; Xingshun Qi, MD. Postgraduate College, Jinzhou Medical University, No.40, Section 3, Songpo Road, Linghe District, Jinzhou 121001, China. Email: guo_xiao_zhong@126.com; xingshunqi@126.com.

Abstract: Cardiovascular disease, mainly including coronary artery disease and stroke, is the leading cause of mortality and morbidity worldwide. The traditional risk factors of cardiovascular disease include smoking, alcohol abuse, hypertension, diabetes mellitus, hyperlipidemia, and psychosocial stress. Herein, we reported one patient who developed myocardial infarction and ischemic stroke after acute upper gastrointestinal bleeding and discussed the potential association between cardiovascular disease and acute upper gastrointestinal bleeding.

Keywords: Case report; myocardial infarction; ischemic stroke; acute upper gastrointestinal bleeding

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Introduction

Coronary artery disease and stroke are the leading causes of mortality and morbidity worldwide (1). Their incidence and prevalence are steadily rising in China (2). Coronary artery disease refers to narrowing of the coronary arteries secondary to a buildup in the walls of the arteries of plaque, and broken plaque may lead to myocardial infarction (3). Stroke is a neurological deficit attributed to acute focal injury of the central nervous system by a vascular cause, which is divided into ischemic and hemorrhagic stroke (4,5). Common risk factors of coronary artery disease and stroke include smoking, alcohol abuse, hypertension, diabetes mellitus, hyperlipidemia, and psychosocial stress (6,7).

The incidence of acute upper gastrointestinal bleeding is approximately 100/100,000 adults (8). It is a severe clinical symptom (9,10), which leads to hypoperfusion, hemodynamic compromise, ischemic stroke, and myocardial hypoperfusion (11). However, the episodes of myocardial infarction and ischemic stroke secondary to acute upper gastrointestinal bleeding are rare in clinical practice, but the management is often complicated in such patients (12).

In this paper, we introduced a patient admitted with acute upper gastrointestinal bleeding who developed both myocardial infarction and ischemic stroke during his hospitalization. We present the following article in accordance with the CARE guideline.

Case presentation

On June 27, 2016, a 73-year-old previously healthy male was admitted to our department due to persistent fatigue and anorexia for more than 1 month and melena for 1 day. He had a long-term history of taking compound aminopyrine phenacetin tablets. He had a long-term history of smoking with 20 cigarettes and drinking with 150 g liquor per day. He denied any history of liver cirrhosis, gastrointestinal bleeding, hypertension, diabetes mellitus, stroke, and coronary heart disease. Before his admission, laboratory tests at his local hospital demonstrated that white blood cell (WBC) was $18.4 \times 10^9/L$ (reference range, $3.5-9.5 \times 10^9/L$), neutrophil percentage (GR%) was 71.8% (reference range, 40–75%), hemoglobin concentration (HB) was 68 g/L (reference range, 115–175 g/L), platelet

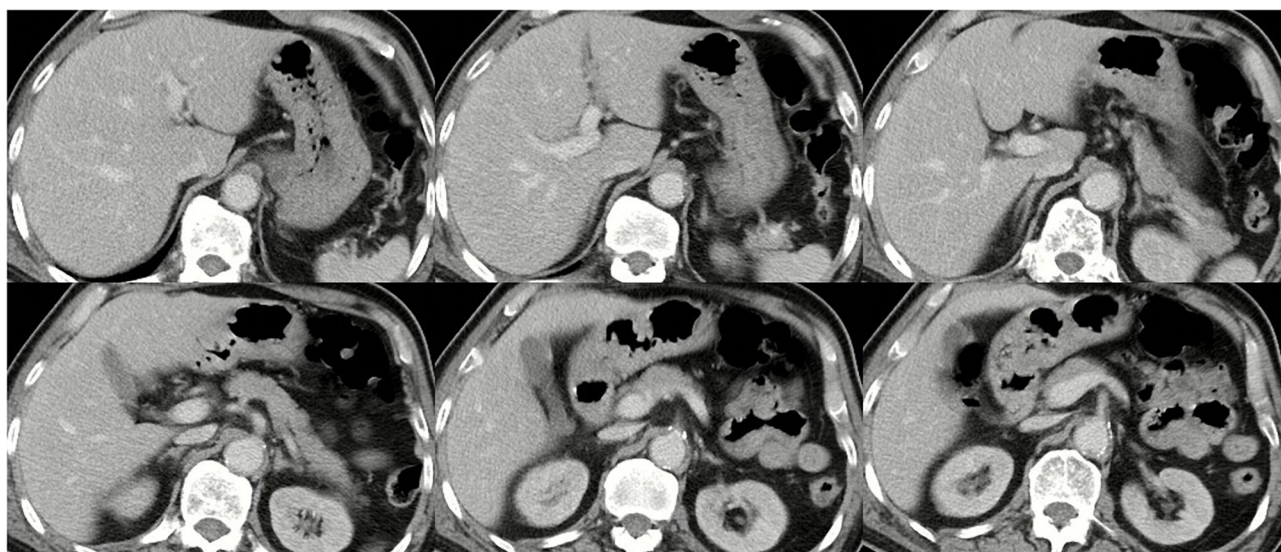


Figure 1 Contrast-enhanced abdominal CT demonstrating suspicion of liver cirrhosis and hepatic S2 segment nodule.

(PLT) was $128 \times 10^9/L$ (reference range, $125\text{--}350 \times 10^9/L$), blood glucose (BG) was 7.75 mmol/L (reference range, 3.89–6.11 mmol/L), total bilirubin (TBIL) was 6.1 $\mu\text{mol/L}$ (reference range, 5.1–20.0 $\mu\text{mol/L}$), direct bilirubin (DBIL) was 1.1 $\mu\text{mol/L}$ (reference range, 0–6.8 $\mu\text{mol/L}$), alanine aminotransaminase (ALT) was 22 U/L (reference range, 7–50 U/L), aspartate aminotransferase (AST) was 18 U/L (reference range, 13–40 U/L), alkaline phosphatase (AKP) was 48 U/L (reference range, 13–150 U/L), γ -glutamyl transpeptidase (γ -GT) was 43 U/L (reference range, 7–60 U/L), and albumin (ALB) was 33 g/L (reference range, 40–55 g/L). The liver function was within the normal range. Abdominal Doppler ultrasound demonstrated heterogeneous echo in liver and gallbladder multiple polyps. Taken the signs of UGIB including fatigue, anorexia, melena, and a decreased HB into consideration, the patient was diagnosed with acute upper gastrointestinal bleeding. Intravenous infusion of esomeprazole was given at his admission.

On June 28, 2016, the patient was apathy accompanying with decreased computing capability. Laboratory tests demonstrated that WBC was $22.4 \times 10^9/L$, GR% was 85.6%, HB was 52 g/L, PLT was $86 \times 10^9/L$, BG was 5.79 mmol/L, TBIL was 5.7 $\mu\text{mol/L}$, DBIL was 2.1 $\mu\text{mol/L}$, ALT was 13.78 U/L, AST was 12.87 U/L, AKP was 49.49 U/L, γ -GT was 41.63 U/L, ALB was 23.8 g/L, blood urea nitrogen (BUN) was 47.25 mmol/L (reference range, 2.9–8.2 mmol/L), creatinine (Cr) was 267.63 $\mu\text{mol/L}$ (reference range, 44–133 $\mu\text{mol/L}$), creatine kinase (CK) was 318 U/L

(reference range, 38–174 U/L), CK-myocardial band (CK-MB) was 15 U/L (reference range, 0–24 U/L), hypersensitive C-reactive protein (hCRP) was 39.9 mg/L (reference range, 0–3 mg/L), hypersensitive troponin T (hs-TNT) was 0.054 ng/mL (reference range, 0–0.05 ng/mL), prothrombin time (PT) was 14.1 s (reference range, 11.5–14.5 s), and activated partial thromboplastin time (APTT) was 42.6 s (reference range, 28.0–40.0 s). Series of viral hepatitis were negative. Chest X-ray demonstrated enlarged heart and aortic sclerosis. Contrast-enhanced abdominal computed tomography demonstrated suspicion of liver cirrhosis and hepatic S2 segment nodule (*Figure 1*). Intravenous infusion of cefoperazone sodium sulbactam sodium was additionally given. Isosorbide dinitrate tablets were orally taken, and 1.5 units of red blood cell was transfused.

On June 29, 2016, his condition was stable without melena. An upper gastrointestinal endoscopy was performed after a written informed consent from the patient and his relatives was obtained. Upper gastrointestinal endoscopy demonstrated reflux esophagitis and multiple ulcers at the antrum (*Figure 2*). However, on the evening of June 29, 2016, his condition was suddenly exacerbated presenting with continuous pain under the xiphoid. The 18-lead electrocardiogram demonstrated ST-segment depression in leads V3–V6 and flat T-wave in leads I, II, III, aVL, aVF, V5, and V6 (*Figure 3*). Laboratory tests demonstrated that WBC was $16.4 \times 10^9/L$, GR% was 86.8%, HB was 58 g/L, PLT was $84 \times 10^9/L$, BG was 5.65 mmol/L, C-reactive

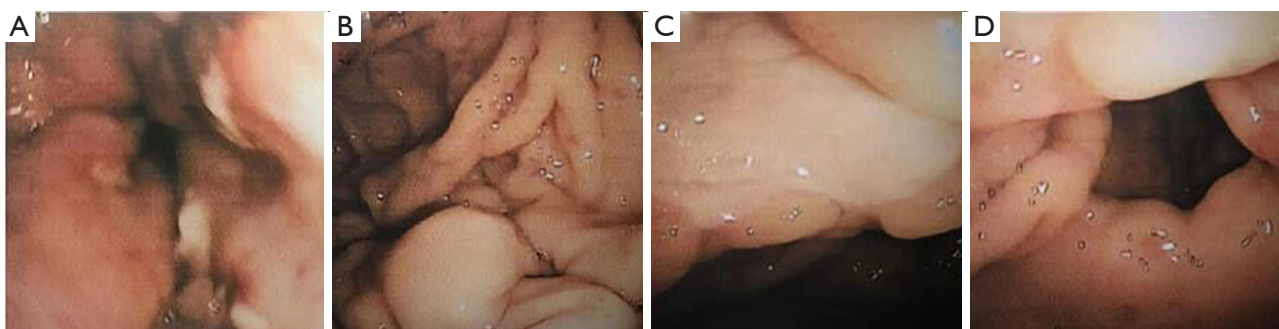


Figure 2 Upper gastrointestinal endoscopy demonstrating reflux esophagitis (A), normal fundus of the stomach (B), a 1.0 cm antral ulcer (C), and a 0.5 cm pyloric ulcer (D).

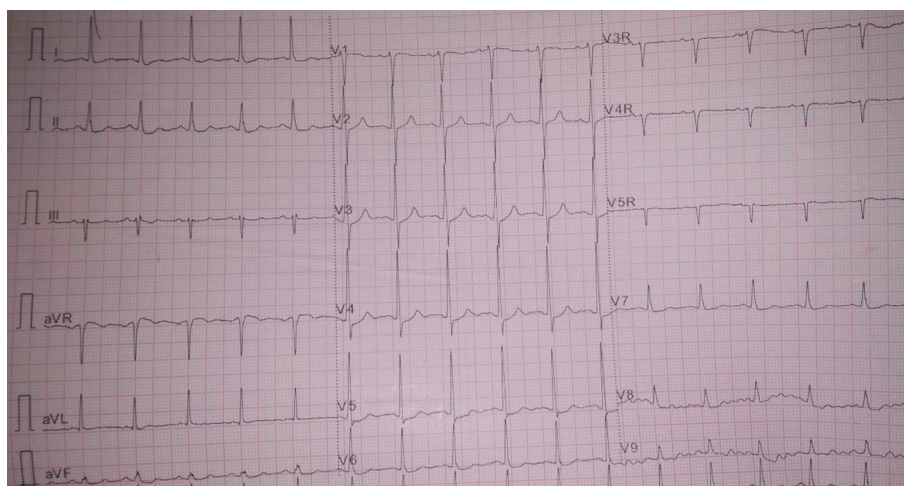


Figure 3 The 18-lead electrocardiogram demonstrating ST-segment depression in leads V3-V6 and flat T-wave in leads I, II, III, aVL, aVF, V5, and V6.

protein (CRP) was 113.2 mg/L (reference range, ≤ 10 mg/L), CK was 1,613 U/L, CK-MB was 32 U/L, hCRP was 85.7 mg/L, and hs-TNT was 0.036 ng/mL. Taken the typical signs of myocardial infarction including continuous pain under the xiphoid and an increased hs-TNT into consideration, cardiologist considered that non-ST elevation myocardial infarction wasn't excluded. Antithrombotic and interventional therapy weren't recommended under his current condition. Intravenous infusion of isosorbide mononitrate was prescribed. Additionally, 2 units of red blood cell was transfused.

On June 30, 2016, his pain under the xiphoid slightly improved with limb weakness. Laboratory tests demonstrated that WBC was $15.0 \times 10^9/L$, GR% was 82.3%, HB was 66 g/L, PLT was $78 \times 10^9/L$, BG was 5.14 mmol/L, CRP was 42.6 mg/L, CK was undetectable, CK-MB was

42 U/L, hCRP was 87.9 mg/L, hs-TNT was 0.036 ng/mL, and N-type B-terminal natriuretic peptide (NT-proBNP) was 3,930 pg/mL (reference range, 0–125 pg/mL). Magnetic resonance of brain demonstrated multiple cerebral infarction and brain stem infarction. Taken the signs of cerebral infarction including limb weakness and decreased computing capability into consideration, the patient was diagnosed with ischemic stroke. Torasemide was intravenously injected, and 2 units of red blood cell was transfused.

On July 1, 2016, his condition was temporarily stable without melena anymore. Laboratory tests demonstrated that WBC was $10.5 \times 10^9/L$, GR% was 75.4%, HB was 82 g/L, PLT was $93 \times 10^9/L$, BG was 5.32 mmol/L, TBIL was 7.7 $\mu\text{mol/L}$, DBIL was 2.8 $\mu\text{mol/L}$, ALT was 16.84 U/L, AST was 44.25 U/L, AKP was 57.16 U/L, γ -GT was

57.04 U/L, ALB was 26.9 g/L, BUN was 14.49mmol/L, Cr was 141.09 μ mol/L, CK was 1153U/L, CK-MB was 25 U/L, hCRP was 80.5 mg/L, and hs-TNT was 0.033 ng/mL. There was a significantly increased HB and decreased CK. Intravenous infusion of cefoperazone sodium sulbactam sodium, torasemide, and esomeprazole were continuously given.

On the morning of July 5, 2016, his condition was suddenly exacerbated again presenting with hematemesis and melena. Immediate laboratory tests demonstrated that WBC was $13.3 \times 10^9/L$, GR% was 62.5%, HB was 79 g/L, PLT was $113 \times 10^9/L$, BG was 11.57 mmol/L, BUN was 12.95 mmol/L, and Cr was 166.40 μ mol/L. Intravenous infusion of esomeprazole, somatostatin, and hydroxyethyl starch were given. Thrombin and Yunnan Baiyao were orally taken, and 2 units of red blood cell was transfused.

On the afternoon of July 5, 2016, his condition was stable without gastrointestinal bleeding. But the patient and his relatives decided to discharge because of unaffordable medical expenses. Unfortunately, he died on July 12, 2016.

Discussion

Acute upper gastrointestinal bleeding is a serious complication with a mortality of 3–14% (13). It is more severe in cirrhotic patients than in patients without liver cirrhosis (14). However, this patient did not perform liver biopsy. Only a suspected diagnosis of liver cirrhosis was made. Then, this patient did not have clear sign of portal hypertension, such as splenomegaly and varices. Herein, the potential reason of gastrointestinal bleeding may be gastric ulcer. On the other hand, laboratory tests demonstrated that the levels of BUN and Cr were significantly increased. However, the patient didn't meet the criteria of hepatorenal syndrome (15). And his renal function was improved after treatment. Herein, the patient should be diagnosed with pre-renal renal hypoperfusion secondary to gastrointestinal bleeding (16). In this case, the possible causes for developing myocardial infarction and ischemic stroke after acute upper gastrointestinal bleeding are as follows. First, hypoperfusion secondary to massive acute gastrointestinal bleeding led to the ischemia of various organs, including heart and brain (11,17). Second, this patient had a long-term history of smoking and alcohol abuse. Smoking is a risk factor of cardiovascular disease, which causes endothelial dysfunction and atherogenesis (18,19). Although 1–2 drinks per day are a negative risk factor of myocardial infarction and ischemic stroke, harmful drinking (consuming ethanol ≥ 61.0 g per

day for men) significantly increases the risk of death from cardiovascular disease (20–22). Third, this patient had an advanced age, which is a major risk factor of cardiovascular disease (23). He was more vulnerable to suffer from severe acute upper gastrointestinal bleeding episode than young adult. Fourth, cardiac embolism was also a risk factor of ischemic stroke (24). This patient was diagnosed as ischemic stroke after a diagnosis of myocardial infarction, therefore myocardial infarction might be a potential cause for ischemic stroke. After that, his magnetic resonance of brain demonstrated multiple cerebral infarction and brain stem infarction.

Acute upper gastrointestinal bleeding, myocardial infarction, and ischemic stroke are all leading causes of death worldwide (25). This patient developed severe upper gastrointestinal bleeding followed by myocardial infarction and ischemic stroke. This represents a clinical challenge, because antithrombotic therapy, which should be employed for myocardial infarction and ischemic stroke, such as aspirin and heparin, is often contraindicated in a patient with acute bleeding, and hemostatic therapy, which is employed for controlling bleeding, may be harmful in a patient with myocardial infarction and ischemic stroke (26,27). This patient refused further treatment and died several days after discharge. The survival is closely associated with age, severity of ischemic events, and treatment (28). This patient could not receive effective antithrombotic and interventional therapy for myocardial infarction and ischemic stroke, thereby leading to an unsatisfactory outcome.

In conclusion, our case reminds the clinicians of a possibility of developing of cardiovascular disease episode after acute upper gastrointestinal bleeding. Further well-designed studies are needed to explore the association between cardiovascular disease and gastrointestinal bleeding and to identify the high-risk population.

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Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/acr-19-198>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The patient in our manuscript died after discharge. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). We tried our best to contact with the next of kin of the patient by telephone, but we failed. We just reviewed the case to share a rare clinical experience in this case report.

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