

## Case Report

# Stroke and Seizure following a Recent Laparoscopic Roux-en-Y Gastric Bypass

John Y. Choi, MD<sup>1</sup>; Terry K. Scarborough, MD, FACS<sup>2</sup>

<sup>1</sup>Department of Neurology and <sup>2</sup>Department of Surgery, University of Texas Health Science Center, Houston, TX, USA

Laparoscopic Roux-en-Y gastric bypass (LRYGBP) has been an available operation for weight loss for the past decade, and bariatric surgery is increasing in the United States. Careful patient screening and follow-up have been the cornerstone for success against the complexities of morbid obesity. Neurologic complications have occurred, such as polyneuropathy and Wernicke-Korsakoff syndrome. We report an 18-year-old female with morbid obesity, steatohepatitis, tobacco, recreational drug, and oral contraceptive use who at 4 months after LRYGBP experienced a generalized seizure and stroke. She was diagnosed with an acute ischemic stroke, possibly venous infarction. Her postoperative course had been complicated by malnutrition and dehydration, apparently related to nausea from chronic cholecystitis. She had a possible protein-S deficiency. Rare neurologic complications emphasize the importance of postoperative surveillance in these patients.

*Key words:* Gastric bypass, laparoscopy, bariatric surgery, morbid obesity, stroke, complication

## Introduction

Wittgrove et al<sup>1</sup> in 1994 first described laparoscopic Roux-en-Y gastric bypass (RYGBP) in a case series as a bariatric operation with possible benefits in reducing length of stay, pain, and wound complications. With the high incidence of morbid obesity in the United States, the number of surgeries aimed at helping these individuals has greatly increased.<sup>2</sup>

Reprint requests to: John Y. Choi, MD, 6431 Fannin, MSB 7.124, Houston, TX 77030, USA. Fax: (713) 500-0660; e-mail: John.Y.Choi@uth.tmc.edu

Surveillance is necessary for possible malnutrition and dehydration postoperatively.<sup>3</sup> Described neurologic sequelae from malnutrition include polyneuropathy<sup>4-6</sup> often related to vitamin B<sub>12</sub> deficiency<sup>7</sup> and Wernicke-Korsakoff syndrome, responsive to thiamine supplementation.<sup>4,6,8-11</sup> We report a young woman who developed malnutrition and dehydration 3 months after her obesity surgery, followed by a generalized seizure and an ischemic stroke.

## Case Report

An 18-year-old right-handed Caucasian woman underwent laparoscopic RYGBP for morbid obesity in June 2003, with admission weight 145.4 kg, height 1.75 m, and body mass index (BMI) 47.3 kg/m<sup>2</sup>. Postoperative recovery was uneventful. There was a history of depression and tobacco, oral contraceptive, and recreational drug use, and steatohepatitis was found at the operation.

Six weeks postoperatively, she was readmitted to hospital for malnutrition related to nausea. She was diagnosed with chronic cholecystitis and cholelithiasis. Her weight had dropped to 118.4 kg with BMI 38.5. A nasojunal feeding tube was placed for nutritional support. A small bowel contrast study showed no stricture or leakage. Her serum albumin was 2.8 g/dl, and she had a microcytic anemia with hemoglobin 11.7 g/dl. She underwent laparoscopic cholecystectomy during this hospitalization.

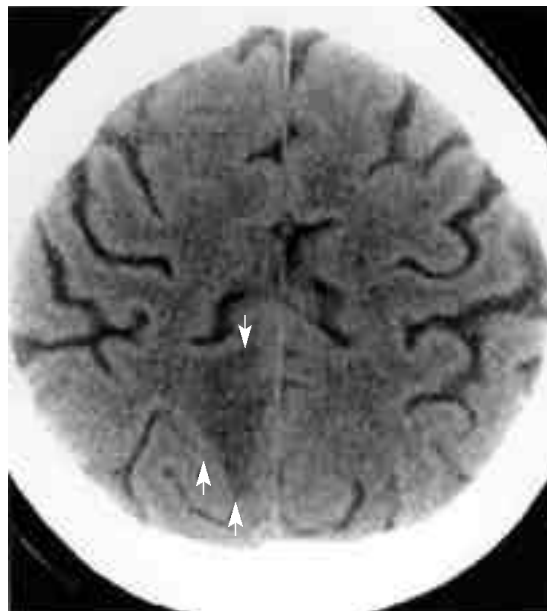
Five weeks later, she was readmitted a third time for malnutrition and dehydration. Her weight was

now 99.8 kg with BMI 32.5. During this hospitalization, she was talking on the telephone to her mother, when she suddenly screamed out “I am seeing a rainbow” (which was the aura of a seizure). Her head turned to the left, followed by a generalized seizure for 1 1/2 minutes including tongue biting. She had a 5-minute post-ictal phase. She was treated with I.V. fosphenytoin, which was converted to leviacetam for oral therapy. Brain CT scan showed a right parietal lobe hypodensity.

She denied a history of deep venous thrombosis or miscarriages, nor did she have family history of these or strokes. She had been a smoker of 1 pack per day for 2 years, but quit 2 months prior to this admission. She had used marijuana as well as crack in the past but denied any use for 1 month before this third hospitalization. She had noted tingling involving both of her feet over the past week. Physical examination was unremarkable, and neurological examination was normal. Her ALT (SGPT) / AST (SGOT) were elevated at 166 / 120 U/L respectively (upper limits of normal 35 U/L each), with normal alkaline phosphatase and total bilirubin values.

Regarding her hypercoaguable evaluation, she had a total protein-S of 57% (normal 58%-146%). Additional work-up included PT, PTT, INR, fibrinogen level, factor V Leiden, diluted Russel viper venom, antithrombin III levels, protein C levels, phospholipid antibodies, lupus anticoagulant, anticardiolipin antibodies, beta 2 glycoprotein I antibodies, and factor II prothrombin 20210A mutation, which were all negative or normal. Total cholesterol was 143 mg/dl, triglycerides 203 mg/dl, HDL 30 mg/dl, and LDL 72 mg/dl. Her hemoglobin A1C, TSH, free T4, HIV, and vitamin B<sub>12</sub>/folate/homocysteine levels were negative or normal.

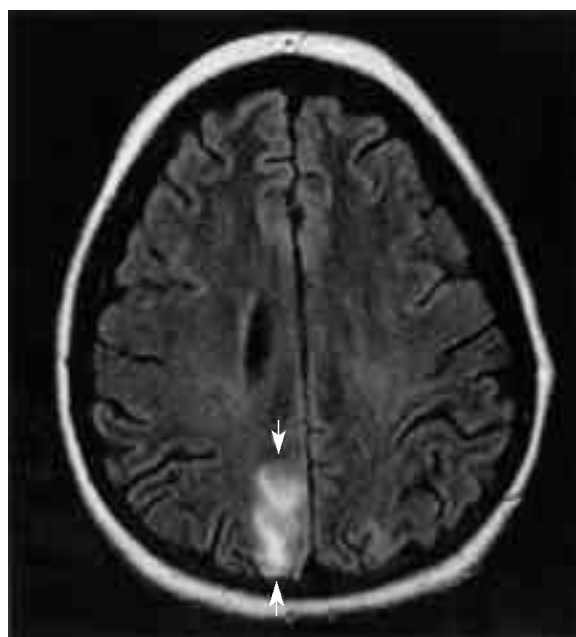
Her non-contrast brain CT scan showed a hypodensity in the right parietal region, consistent with a subacute ischemic stroke (Figure 1). Her brain MRI/MR angiogram (MRA) showed a non-enhancing lesion on FLAIR (Figure 2), T2-weighted and T1-weighted sequences, consistent with a recent infarction. Vasogenic edema was seen in the right parasagittal posterior parietal lobe. Diffusion magnetic resonance imaging (MRI) was also positive. The findings were interpreted as either cerebral ischemia related to an embolus to the posterior pericallosal artery or a venous infarction related to a cortical venous thrombosis. The superior sagittal



**Figure 1.** Non-contrast brain CT scan with a right parietal hypodensity consistent with a subacute infarct (arrows).

and transverse sinuses were patent on magnetic resonance (MR) venogram.

Her transthoracic echocardiogram showed normal chamber sizes, without thrombus, masses, or evidence of right-to-left shunting. The ejection fraction was 55%-59%. Her carotid arteries were normal on



**Figure 2.** Axial Brain MRI.FLAIR image shows the infarction with vasogenic edema (arrows).

MRA. Lower extremity dopplers were negative, and electroencephalogram (EEG) was normal. She underwent neuropsychological testing, which showed mild cognitive deficits related to information processing, but otherwise intact attention and language skills. The adolescent-psychiatry service was consulted regarding her care. She was transferred on antiplatelet therapy to the in-patient rehabilitation service. Her weight on entering the rehabilitation floor in October 2003 (4 months after the RYGBP) was 94.8 kg with BMI 30.9. After 1 week on the rehabilitation service, she was discharged home without obvious neurological deficits. She has been medically stable now 6 months since discharge.

## Discussion

This is the first case that we are aware of reporting a stroke after recent gastric bypass surgery. The presentation of seizure with the onset of a stroke has been reported in 10% of all stroke patients.<sup>12</sup> Several mechanisms for her stroke must be considered. A likely possibility is dehydration resulting in a small cortical venous infarction. For diagnosis, MR venograms are used for screening purposes, and cerebral angiograms remain the gold-standard for diagnosis. In this case, the small size of vessel involvement rendered both of these tests insensitive in making the diagnosis.

She may also have a protein-S deficiency as a contributor for the stroke. Protein-S is a plasma protein that prevents coagulation and exists in two states, active (free) and inactive (C4b binding protein-bound). Testing for total and free protein-S is reasonable for a suspected pro-thrombotic state. This protein deficiency can be an inherited defect, but can also be an acquired deficiency from malnutrition, inflammatory bowel disease, nephrotic disease, liver dysfunction, or disseminated intravascular coagulation.

In addition, she was taking oral contraceptives, which have a well-known association with thrombosis.

She had a history of drug abuse. Cocaine is known to cause a vasculitis leading to ischemic strokes as well as hemorrhagic strokes.<sup>13</sup> She had no systemic

symptoms to suggest vasculitis with a normal intracranial MRA, and she denied any recent use of illicit drugs. For patients with a high index of suspicion for vasculitis, cerebral angiogram and brain tissue biopsy are the gold-standard diagnostic tests.<sup>14</sup>

Key diagnostic considerations for stroke include evaluation of the carotid bifurcations for vessel blockage, intracranial vessels including the cerebral sinuses, and cardio-embolic sources. Screening for right-to-left shunting via a patent foramen ovale or pulmonary arteriovenous malformation should also be done. A complete discussion of evaluation for stroke in the young adult is beyond the scope of this article, and the reader is referred to other sources.<sup>15</sup> She also had clinical features of a peripheral neuropathy and was given thiamine supplementation.

In summary, this patient suffered a neurologic insult but fortunately had minimal residual deficits. This case reinforces the importance of careful screening in gastric bypass surgery regarding conditions that may affect outcome such as recreational drug use. Close postoperative monitoring for malnutrition and dehydration is indicated, particularly in a person who may have multiple risk factors for a pro-thrombotic condition.

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