Case series of acute nutritional neuropathies after gastric bypass: A Guillain Barré syndrome mimic

Thy P. Nguyen,* Akhila Vijayakumar, Suur Biliciler, Kazim Sheikh

Department of Neurology, University of Texas Health Science Center at Houston, Houston, USA

Received: July 24, 2016 Accepted: October 16, 2016 Online Published: October 28, 2016
DOI: 10.5430/crcp.v4n1p37 URL: http://dx.doi.org/10.5430/crcp.v4n1p37

ABSTRACT

Gastric bypass procedures for morbid obesity are increasingly common in the United States. Neuropathy following gastric bypass surgeries is estimated at 6%. Most practitioners recognize this as a chronic complication due to nutritional deficiencies. We present three cases of severe, acute, nutritional neuropathy occurring after gastric bypass surgeries.

We retrospectively reviewed charts of three patients with acute to subacute neuropathies following gastric bypass surgeries presenting over one year to UTHealth. Data regarding clinical presentation, electrophysiology, diagnostic studies and outcomes are collected. We identified three patients with acute, disabling, ascending numbness and weakness. All patients had intractable vomiting and significant rapid weight loss. Electrodagnostic studies revealed axonal sensory-motor neuropathy. Cerebrospinal fluid (CSF) studies did not show albuminocytologic dissociation. Two patients were treated with immunomodulation. Nutritional deficiencies were identified as the etiology in all patients. Further reports and research may prevent unnecessary and costly immunomodulatory treatments.

Key Words: Nutritional, Guillain Barré syndrome, Peripheral neuropathy, All neuromuscular diseases, EMG

1. INTRODUCTION

Gastric bypass procedures for morbid obesity are increasingly common in the United States. Peripheral neuropathy following these procedures is estimated at 6%.1 Most neurologists recognize this as a chronic complication due to nutritional deficiencies. We present three cases of severe, acute, nutritional neuropathic disorder occurring after gastric bypass surgery. We discuss the challenges in distinguishing these cases from Guillain-Barré syndrome (GBS). Since this is a small case series, IRB approval was not required.

2. METHODS

We retrospectively reviewed charts of three patients with acute neuropathies we encountered in the Department of Neurology at University of Texas Health Sciences Center at Houston following gastric bypass surgeries over one year (2013-2014). As this is a case series of 3 patients treated by different practitioners; treatments, laboratory evaluations, diagnostic testing, follow up examinations and vitamin supplementation were not uniform. None of the patients had surgery at our institution. Each patient had their surgery at a different center. Therefore, neurologic complication rate could not be calculated. Additionally, there was no information regarding protocols for vitamin supplementation for each separate surgical center. Patients were all reportedly compliant with vitamin supplementation, but all developed intractable vomiting. Clinical, laboratory, imaging and electrophysiologic data were collected, when available (see Table 1).
### Table 1. Clinical Characteristics

<table>
<thead>
<tr>
<th>Patient</th>
<th>Patient 2</th>
<th>Patient 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progression to Nadir</td>
<td>6 weeks</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Pain</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Time Interval*</td>
<td>5 months</td>
<td>1 year and 9 months</td>
</tr>
<tr>
<td>Rate of Weight loss</td>
<td>100 lb/5 months</td>
<td>170 lb/8 months</td>
</tr>
<tr>
<td>Change in BMI</td>
<td>15.2</td>
<td>35.33</td>
</tr>
<tr>
<td>EBW Loss</td>
<td>84%</td>
<td>100%</td>
</tr>
<tr>
<td>TBW Loss</td>
<td>38%</td>
<td>58%</td>
</tr>
<tr>
<td>Cranial neuropathy</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>Respiratory compromise</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>Areflexia</td>
<td>Yes</td>
<td>Legs only</td>
</tr>
<tr>
<td>MRC SS NADIR</td>
<td>36</td>
<td>48</td>
</tr>
<tr>
<td>Vitamin B1, Normal 72-222 nmol/L</td>
<td>Low &lt; 2</td>
<td>Low 7.3</td>
</tr>
<tr>
<td>Vitamin B6</td>
<td>Low</td>
<td>Normal</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>Normal</td>
<td>Low</td>
</tr>
<tr>
<td>Copper</td>
<td>Normal</td>
<td>Low</td>
</tr>
<tr>
<td>Treatment**</td>
<td>IVIG</td>
<td>IVIG</td>
</tr>
<tr>
<td>Length of stay</td>
<td>14 days</td>
<td>39 days</td>
</tr>
<tr>
<td>Follow up MRC SS</td>
<td>52</td>
<td>52</td>
</tr>
</tbody>
</table>

*Time Interval indicates interval between gastric bypass surgery and onset of symptoms; Treatment indicates immunomodulatory treatment only, all patients received nutritional replacement; IVIG (intravenous immunoglobulin), MRC SS: Medical research council sum score. This is a sum of muscle grading of bilateral deltoids, biceps, wrist extensors, ileopsoas, quadriceps and tibialis anterior.

### 3. CASE REPORTS

#### 3.1 Case 1

A 24-year-old woman with Graves disease and morbid obesity underwent gastric bypass (Roux-en-Y) with complications of intractable vomiting requiring multiple hospitalizations. She also reported severe neuropathic pain during this time. She lost 100 pounds in 5 months, 84% of her excess body weight (EBW). Five months after the gastric bypass, she presented with rapidly progressive, flaccid, areflexic quadriparesis over a 6 week period. Medical research council sum score (MRC SS) is the sum of the strength muscle grading of bilateral deltoids, elbow flexion, wrist extension, hip flexion, knee extension and dorsiflexion. (A score of 60 would indicate normal strength.) MRC SS was 36 at the patient’s nadir and the patient was wheelchair bound. Electrodiagnostic studies showed severe, axonal, sensory-motor polyneuropathy (see Figure 1). Cerebrospinal fluid (CSF) studies did not show albuminocytologic dissociation. Serum thiamine levels were undetectable (< 2 nmol/L, normal range 78-185 nmol/L). Thiamine was repleted at 100 mg intravenous (IV) daily for 5 days followed by thiamine 100 mg orally thereafter. She concurrently underwent treatment with intravenous immunoglobulin (IVIG) at a dose of 2 g/kg administered over 5 days, for a presumed diagnosis of axonal Guillain Barre syndrome. She did not have significant improvement of strength at discharge. Subsequent thiamine serum testing 3 months after discharge was low normal at 81 nmol/L. Thiamine was checked at 6 month intervals while the patient was on oral supplementation. She had slow improvement in her strength over > 12 months. After 12 months, her MRC SS improved to 52 (see Table 1).

#### 3.2 Case 2

A 42-year-old woman with history of complicated gastric bypass requiring multiple, gastrointestinal surgical revisions presented with rapidly progressive ascending paresthesias and weakness over a 2 week period. She had intractable vomiting and diarrhea. She lost 170 pounds over an 8 month period, which was 100% EBW. Examination showed quadriparesis, absent reflexes in the legs and length-dependent sensory changes. MRC SS was 42 and the patient was wheelchair bound. (Bilateral deltoids, elbow flexion and wrist extension were 4/5 on MRC grading scale. Bilateral hip flexors were 3/5, knee extensors were 4/5 and dorsiflexion was 2/5.) Electrodiagnostic studies showed length-dependent, axonal, sensory-motor neuropathy. She did not have albuminocytologic dissociation. She was found to have low copper and thiamine. Copper was 34 nmol/L with a normal range of 72-166 nmol/L. Thiamine was 7.3 nmol/L with a normal range of 8.1-32.9 nmol/L. Thiamine was repleted with 100 mg IV daily dose followed by indefinite oral...
thiamine 100 mg dose. Copper was repleted initially with copper gluconate 6 mg orally and then changed to a dose of intravenous copper at 2 mg daily for 5 days, followed by 2 mg weekly for 8 weeks and then monthly copper thereafter. She was treated with IVIG at a dose of 2 grams per kilogram divided over 5 days for possible axonal form of Guillain Barré syndrome. Additionally, steroids were given at a rate of 1,000 mg IV daily × 5 days followed by oral prednisone taper for possible inflammatory etiology. She underwent nerve and muscle biopsy for possible vasculitic neuropathy. Her muscle biopsy showed several nonspecific esterase enhancing angular atrophic fibers of acute denervation and minute foci of endomysial inflammatory infiltrate. Her nerve biopsy showed moderate to severe loss of unmyelinated fibers, severe loss of myelinated fibers and severe ongoing Wallerian degeneration, consistent with axonal neuropathy (see Figure 2). She did not notice significant early improvement, but improved slowly over the following two years. Subsequent thiamine level at 1 year was normal, 30.8 nmol/L. Thiamine was checked on a yearly basis. Subsequent copper level was normal at 2 years, 94 nmol/L. Copper was checked on a 6 month to 1 year interval.

Figure 1. Electrodiagnostic figures show length-dependent, axonal, sensory-motor neuropathy with normal F-waves
Figure 2. **2A.** Modified gomori trichrome stain. Bar = 100 µm. Angular fibers and grouped atrophy are noted; **2B.** Plastic section of nerve, toluidine blue stain. Bar = 20 µm. There is active degeneration of multiple nerve fibers undergoing different stages of axonal degeneration. Severe loss of myelinated nerve fibers are noted; **2C:** Nonspecific esterase stains show angular atrophic fibers are present. Bar=50 µm.

3.3 Case 3

A 22-year-old woman underwent gastric bypass for obesity. Her surgery was complicated by intractable vomiting. She lost 100 pounds over 4 months. Four months after the surgery, she presented with ascending quadriplegia, numbness and pain over 3 weeks. Neurologic examination showed flaccid, areflexic quadriplegia and length-dependent sensory changes. MRC SS was 30 at nadir during hospitalization. (Bilateral deltoid, elbow flexion, iliopsoas, knee extension were 3/5. Bilateral dorsiflexion was 1/5. Bilateral wrist extension was 2/5.) She required total assistive care from family members at the time of her admission. Electrodiagnostic studies showed severe, presumed axonal sensory-motor neuropathy (all responses absent). Her thiamine level was undetectable < 20 nmol/L (normal range 78-185 nmol/L). Thiamine was repleted at a dose of 100 milligrams intravenous for 1 day followed by thiamine 125 mg oral dose for 26 days. Patient was lost to follow up to neurology clinic and therefore regular thiamine intervals were not evaluated. One year later, her thiamine level was checked by a different service which showed a low level of thiamine of 56 nmol/L. She did not receive immunomodulatory treatment and was lost to follow up after the initial hospitalization.

4. RESULTS

All patients had intractable vomiting and significant rapid weight loss. Additionally, cranial nerves and respiratory muscles were spared. Electrodiagnostic studies showed length-dependent, sensorimotor axonal neuropathy with absent sural sensory responses in all patient (see Figure 1). CSF studies performed in 2 of 3 patients (patient 1 and 2) did not show albuminocytologic dissociation. MRI spine performed in 2 of 3 patients (patient 1 and 2) showed no evidence of nerve root enhancement and was otherwise non-contributory.

All patients had thiamine deficiency +/- vitamin B6 or copper deficiency (see Table 1). Clinical improvement lagged significantly compared to normalization of nutrient measurements in the blood. Case 1 and case 2 were treated with IVIG as well as nutritional replacement. There was no acute response to IVIG and both patients improved slowly over the subsequent 2 years (see Table 1). Case 3 was lost to follow-up.

5. DISCUSSION

Neuropathic disorders are one of the most common complications reported after bariatric surgeries. Neurologists recognize this neuropathy as insidious onset and chronic complication of gastric bypass surgery. However, severe, acute neuropathic disease is under-recognized and associated with significant morbidity. Rapid weight loss, intractable vomiting, gastrointestinal complications and nutritional deficiencies may lead to this form.[1] The presence of significant pain, lack of cranial nerve/respiratory involvement, absence of albuminocytologic dissociation, electrophysiologic findings, and absence of nerve root enhancement on imaging may distinguish these neuropathies from GBS. By the second week, elevated protein in CSF can be seen in 80% of patients with GBS.[2] Cranial neuropathies occur in up to 62% of GBS patients.[3] Nerve root enhancement is up to

ISSN 2331-2726  E-ISSN 2331-2734
AIDP variant of GBS and acute nutritional neuropathy. How-
ernutritional neuropathies from the de-
myelinating form of GBS, which is most common in North
America. However, electrodiagnostic findings cannot solely
rule out axonal variants of GBS or critical illness neuropa-
thy. Therefore, careful analysis of clinical and diagnostic
data is paramount. We believe that the improvement in these
cases may be due to correction of nutritional deficiencies,
rather than immunomodulatory treatment. The differences
in our patients compared to the Guillain Barré syndrome
patients would include axonal form of neuropathy, lack of
albuminocytologic dissociation, lack of nerve root enhance-
ment, prominent pain, protracted recovery and intractable
vomiting directly related to gastric bypass procedure. The
gradual/protracted recovery over 2 years likely reflects the
extent of axonal injury during subacute phase and its sub-
sequent repair.
Nutritional deficiencies after gastric bypass are well-
recognized.[6,7] However, there are no standardized guide-
lines across centers on vitamin and mineral supplemen-
tation.[8] Recently, the importance of thiamine supplemen-
tation after gastric bypass has been recognized. The body’s
stores of thiamine can be depleted within a few weeks.[9]
There are many case reports of Wernicke encephalopathy
and thiamine deficiency neuropathy following gastric bypass
surgeries in the literature. Most authors suggest thiamine
supplementation doses of 100-125 milligrams of thiamine
following gastric bypass. However, once thiamine deficiency
complications have been established, some authors recommend
very high doses of thiamine treatment of up to 500 mg
three times daily IV for short periods of time.[10]

6. CONCLUSIONS
It is important to recognize that nutritional neuropathies af-
after bariatric surgeries can present acutely and with severe
moribidity. We presented the challenges in distinguishing
GBS from this acute nutritional neuropathy. These cases
highlight features which may allow distinction between
AIDP variant of GBS and acute nutritional neuropathy. How-
ever, there is no single factor that allows the exclusion of
an axonal variant of GBS. However, the similar features in
our 3 cases and the preceding pain prior to the onset of the
rapidly progressive weakness may be clues that a nutritional
neuropathy may mimic axonal GBS. Careful consideration
of clinical presentation, CSF analysis, imaging and electro-
physiologic data are important in these patients. In our case
series, we were able to identify nutritional deficiencies in all
patients. However, prior reports of acute neuropathies oc-
curring after gastric bypass surgery may not have identified
any micronutrient deficiencies, which further complicates
making this diagnosis.[6,7]

When encountering an acutely presenting severe neuropathy
in a patient following gastric bypass, the differential diagno-
sis would include immune-mediated neuropathies (Guillain
Barre syndrome), nutritional deficiency neuropathies and
some infectious etiologies (west nile virus, tick paralysis).
There are no diagnostic guidelines published for this clinical
scenario. We would recommend diagnostic studies to include
electromyography/nerve conduction studies, lumbar punc-
ture, vitamin serologies, imaging (if clinically indicated),
anti-ganglioside antibodies and infectious studies (depend-
ing on clinical scenario).
As obesity and gastric bypass surgery rates increase, the inci-
dence of this acute neuropathic complication may increase.
Routine screening at 6 month intervals and supplementa-
tion of thiamine, vitamin B12, B6, D, E, folate, calcium,
magnesium, phosphorus, selenium and copper have been
previously recommended.[6] Standardized guidelines for
vitamin/micronutrient supplementation across all surgical
centers should be implemented.

ACKNOWLEDGEMENTS
All authors contributed towards the article by making sub-
stantial contributions to conception, design, acquisition of
data, or analysis and interpretation of data. Thy Nguyen was
involved in the conception, design, writing and supervision
of the manuscript. Thy Nguyen and Akhila Vijayakumar
were involved in the initial draft of the manuscript and data
collection. Suur Biliciler and Kazim Sheikh were involved
with revisions of the manuscript.

CONFLICTS OF INTEREST DISCLOSURE
The authors declare no competing interests.

REFERENCES
study of peripheral neuropathy after bariatric surgery. Neurology.
[2] Van der Meché FG, Van Doorn PA, Meulstee J, et al. GBS consen-
sus group of the Dutch Neuromuscular Research Support Centre.
Diagnostic and classification criteria for the Guillain-Barré syn-

Published by Sciedu Press


