

Adolescent Bariatric Surgery and Thiamine Deficiency: What Do We Know So Far?

We read with great interest the recent article by Armstrong-Javors et al¹ published in the December 2016 issue of *Pediatrics* that describes a case of Wernicke encephalopathy (WE) 2 months after Roux-en-Y gastric bypass (RYGB). The authors report a rare case of WE resulting from thiamine deficiency in a 15-year-old white girl who underwent RYGB. According to the article, WE was suspected because of the progressive neurologic symptoms (nystagmus, irritability, ataxia) and frequent vomiting. The aforementioned case is important because it reports not only a rare but also an acute complication after bariatric surgery with notably increased mortality and morbidity. Furthermore, this review revealed that the overwhelming majority of the cases of WE after bariatric surgery occurred during recent years. There are 3 solid reasons for the aforementioned increase.

Firstly, adolescent obesity has dramatically increased worldwide in recent decades, and the prevention strategies for obesity are failing. Because pharmacological and behavioral treatment options have had mainly poor results in the treatment of obesity, bariatric surgery has emerged as an alternative treatment option. Bariatric surgery in adult populations has proved effective with superior outcomes in terms of weight loss and remission of obesity-associated comorbidities; however, long-term results and complications after bariatric surgery in obese adolescents are not yet available. According to Armstrong-Javors et al,¹ there are only 9 definitive adolescent cases of WE after bariatric surgery reported in the literature. Our review of the literature revealed that there is also a dramatic increase of the published cases of WE after bariatric procedures in adult populations during recent years.^{2,3} Because bariatric surgery in pediatric patients has been

used increasingly within the last few years, there is a consequential rise in complications, mainly severe micronutrient deficiency, protein-calorie malnutrition, gastrointestinal obstruction, and pulmonary embolism.

Secondly, RYGB is the most commonly performed procedure in adolescents with obesity in the United States, and the risk of severe micronutrient deficiencies after malabsorptive procedures such as RYGB is significantly higher than restrictive bariatric procedures such as sleeve gastrectomy and laparoscopic adjustable gastric band. The RYGB reduces the absorption of thiamine mainly because it bypasses the duodenum and more than 30 cm of jejunum beyond the ligament of Treitz. Moreover, small intestinal bacterial overgrowth because of altered gut ecology is associated with the development of thiamine deficiency and WE.⁴ Last but not least, the majority of patients undergoing bariatric procedures do not receive adequate and appropriate nutrition supplements, including supplemental vitamin B₁, not only after but also before the operation, and for this reason, these patients are more likely to develop WE.⁵

Overall, bariatric surgery in adolescents should be offered only within authorized adolescent obesity prevention programs provided by interdisciplinary adolescent obesity teams, and only within specialist centers, to minimize detrimental complications and improve outcomes. Furthermore, patients and family should be informed and educated about the risks and benefits, expected complications, potential eating behavior changes, careful nutritional follow-up, and lifelong requirement for multivitamin supplementation.

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CONFLICT OF INTEREST: The authors have indicated they have no potential conflicts of interest to disclose.

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doi:10.1542/peds.2017-1633A

Authors' Response

Thank you for your thoughtful commentary. Although we agree with most of your discussion, especially your conclusion that adolescent bariatric surgery should be performed in multidisciplinary adolescent centers, there are a few points that we would like to emphasize.

Firstly, most bariatric procedures performed in adolescents in the United States and worldwide today are sleeve gastrectomy (SG) rather than Roux-en-Y gastric bypass (RYGB) procedures. Although there are limited statistical data in adolescents, this transition from bypass to sleeve procedures seems to be mirroring that of the adult population. Although 37% of weight reduction surgeries in 2011 were RYGBs and 18% were SGs, by 2015,

only 23% were bypass procedures and 54% were SGs.¹

Theoretically, the risk of Wernicke encephalopathy (WE) should be higher after RYGB compared with SG, a restrictive procedure in which the stomach volume is reduced without bypassing the duodenum. There are, however, several reported cases of both adolescent and adult patients developing WE after SG.²⁻⁵ A recent case series demonstrated that preoperative thiamine (Vitamin B₁) levels in 7 patients who underwent SG fell significantly postoperatively, although only 2 of these patients developed WE.² The risk factors for developing WE after RYGB and SG appear similar and include nausea, vomiting, and medication noncompliance. Additionally, the limited reports on WE after SG demonstrate a similar time from surgery to first presentation and variable weight loss at presentation. Thus, impaired absorption of thiamine can occur even in the absence of significant postoperative weight loss.³ Lastly, the significant challenge some adult patients have

with medication and dietary compliance underscores the even larger barriers that adolescents face postoperatively.³⁻⁵

We believe that the most important points of this article involve prevention and early recognition of this easily treatable condition. Thiamine supplementation should be used in all adolescent patients before and after bariatric surgery. Furthermore, members of the bariatric team as well as the adolescent and their family should be aware of the symptoms of WE and the need for immediate treatment. Anecdotally, adolescents appear to be at greater risk of postoperative WE than adults. Prevention remains the best therapy for WE in both adolescent and adult weight loss surgery patients.

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CONFLICT OF INTEREST: The authors have indicated they have no potential conflicts of interest to disclose.

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doi:10.1542/peds.2017-1633B

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Pediatrics 2017;140;

DOI: 10.1542/peds.2017-1633B originally published online July 31, 2017;

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Pediatrics 2017;140;

DOI: 10.1542/peds.2017-1633B originally published online July 31, 2017;

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/140/2/e20171633B>

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