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# Wernicke Encephalopathy in a Pediatric Patient with Avoidant Restrictive Food Intake Disorder: A Rare Presentation of Thiamine Deficiency

## Authors' Contribution:

Study Design A  
Data Collection B  
Statistical Analysis C  
Data Interpretation D  
Manuscript Preparation E  
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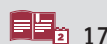
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<b>Patient:</b>	<b>Female, 12-year-old</b>
<b>Final Diagnosis:</b>	<b>Avoidant restrictive food intake disorder • thiamine deficiency in a preterm infant • Wernicke's encephalopathy</b>
<b>Symptoms:</b>	<b>Nausea • vomiting • abdominal pain • double vision • blurred vision • nystagmus and an abnormal gait</b>
<b>Clinical Procedure:</b>	—
<b>Specialty:</b>	<b>Gastroenterology and Hepatology</b>
<b>Objective:</b>	<b>Rare disease</b>
<b>Background:</b>	Wernicke encephalopathy is traditionally associated with chronic alcoholism, nutritional imbalance, prolonged intravenous feeding, hyperemesis, anorexia nervosa, and malabsorption syndromes. We report a case of Wernicke's encephalopathy in a 12-year-old girl with avoidant restrictive food intake disorder.
<b>Case Report:</b>	The patient had lost 45.4 kg of body weight due to self-imposed changes to her diet, before presenting with decreased oral intake for 2-3 weeks, intermittent nausea, crampy epigastric pain, and post-prandial emesis. Her weight on admission was 78.2 kg. She received intravenous fluids of dextrose 5% with normal saline while she initially attempted to eat, but the post-prandial emesis persisted. She developed a fear of vomiting, which led to even more severe food intake restriction. After a week, she began to report double vision and blurred peripheral vision, with physical findings of nystagmus and an ataxic gait. She was empirically started on thiamine after negative neurology workup, with improvement of her gait, blurry vision, and nystagmus. Thiamine deficiency was later confirmed.
<b>Conclusions:</b>	In patients with large amounts of weight loss presenting with neurological symptoms, Wernicke's encephalopathy must be considered in the differential diagnosis. Avoidant restrictive food intake disorder is rarely reported to cause Wernicke's encephalopathy. To the best of our knowledge, this is the first pediatric case demonstrating that Wernicke encephalopathy can occur in this type of eating disorder and not just in anorexia nervosa.
<b>Keywords:</b>	<b>Anorexia Nervosa • Avoidant Restrictive Food Intake Disorder • Thiamine Deficiency • Wernicke Encephalopathy</b>
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## Background

Wernicke encephalopathy (WE) is an acute life-threatening neuropsychiatric disorder caused by thiamine (Vitamin B1) deficiency and is characterized by the clinical triad of ophthalmoplegia, gait ataxia, and mental confusion. Thiamine deficiency due to alcohol intoxication remains the primary cause; however, nonalcoholic causes, although rare, exist. Eating disorders are another cause of thiamine deficiency. There has been 1 case report of avoidant restrictive food intake disorder (ARFID) causing WE in an adult patient [1]. ARFID is reported to cause thiamine deficiency in autistic children, but not causing WE [2]. There are multiple case reports of WE in adult and pediatric patients with anorexia nervosa [3-9] specifically, but none associated with ARFID in a child.

In this case report, we report a pediatric patient with ARFID who presented to our facility with gastrointestinal symptoms and subsequently developed WE, which presented as unexplained neurological symptoms.

## Case Report

A 12-year-old girl with no past medical history was admitted to the pediatric unit for rehydration secondary to decreased oral intake for the past 2-3 weeks, associated with intermittent nausea, crampy epigastric pain, and post-prandial emesis. Notably, she lost 45.4 kg of body weight over the past year via self-imposed dietary changes. She was rhino/enterovirus-positive and had unremarkable complete blood count, complete metabolic profile (CMP), lipase, magnesium, and phosphorus. X-rays of the abdomen, kidneys, ureter, and bladder and computed tomography (CT) of the abdomen and pelvis with IV contrast were normal.

The patient was initially managed with intravenous fluids (IVF) dextrose 5% normal saline, pantoprazole 40 mg intravenous (IV) daily, and ondansetron 4 mg IV every 6 h as needed for nausea. Pediatric Gastroenterology was consulted on the day of admission (hospital day 1), who suspected gastritis secondary to viral illness, and requested re-review of the CT abdomen with radiology to rule out superior mesenteric artery syndrome given her weight loss.

Over the next week, the nausea and abdominal pain resolved but post-prandial emesis persisted. She believed her problem was "mental." After 7 days, just prior to nasogastric (NG) tube feeding, she had double vision and blurred peripheral vision. She had persistent nystagmus and an unsteady gait. Pediatric Neurology was consulted. Magnetic resonance imaging of the brain with gadolinium and lumbar puncture were unremarkable. The pediatric gastroenterologist recommended thiamine

supplementation of 100 mg IV every 24 h on hospital day 10 as a trial for Wernicke encephalopathy. Thiamine levels were also tested at the time of initial supplementation.

Administration of thiamine resulted in marked improvement of her double vision. The diagnosis of ARFID was brought up to the patient and her mother and both became very concerned and frightened about the health effects of ARFID. The patient started to eat a normal diet with encouragement and support from her mother. The NG tube was subsequently removed. On hospital day 13, thiamine level test results from a specimen taken prior to supplementation returned and revealed a value of 9 nmol/L (normal 74-222 nmol/L), confirming the suspicion of thiamine deficiency. Thiamine supplementation was increased to 500 mg IV 3 times a day (TID) for 4 days. By hospital day 16, her blurry vision resolved, with minimal nystagmus noted, and her gait was steadier. Thiamine replenishment was reduced to 250 mg IV daily for 3 doses until she was stable for discharge on hospital day 18 on oral thiamine 100 mg TID for 2 weeks and vitamin B complex daily.

During the follow-up visit with the pediatric gastroenterologist 2 weeks later, she showed further improvement of nystagmus. Thiamine supplementation was changed to 100 mg daily for 6 weeks. The patient was lost to follow-up afterwards.

The patient was followed by a nutritionist throughout the hospital course. Her weight 1 year before was 127 kg (BMI 46.6 kg/m<sup>2</sup>) and her admission weight was 78.2 kg (BMI 28.32 kg/m<sup>2</sup>). She reported losing weight by eliminating sugary snacks, reducing fried foods, and implementing portion control. Later discussion with her mother revealed that the patient had a restrictive diet and was eating very small portions of foods. The mother and patient denied inducing vomiting, bingeing, and purging behaviors or excessive exercising. In addition, the patient had poor oral intake for 2-3 weeks prior to admission and for the first week of admission.

## Discussion

In this case report, we present a 12-year-old girl admitted with nausea, vomiting, and abdominal pain for 2 weeks who subsequently developed double vision, blurred vision, nystagmus, and an abnormal gait. She was ultimately found to have severe thiamine deficiency and mild WE secondary to ARFID.

Thiamine (vitamin B1) is a water-soluble vitamin that is mainly stored in the liver, skeletal muscle, heart, kidneys, and brain [8]. It is hypothesized that the body's storage of thiamine is adequate for up to 18 days [9]. Active absorption occurs in the duodenum and requires magnesium as a cofactor. Thiamine is an essential vitamin and cofactor for numerous metabolic

pathways, including the oxidative degradation of carbohydrates, fatty acids, and amino acids and the production of adenosine triphosphate [9]. Without thiamine, pyruvate is unable to enter the tricarboxylic acid cycle, which leads to conversion of pyruvate to lactic acid. Glucose will exhaust any thiamine store and lead to accumulation of lactic acid, which can lead to cell death [10].

WE is an acute and reversible neurologic disorder due to thiamine deficiency, traditionally associated with chronic alcoholism. Multiple clinical scenarios can precipitate it, including nutritional imbalance, prolonged intravenous feeding, hyperemesis, anorexia nervosa, and malabsorption syndromes. Thiamine deficiency diagnosis in nonalcoholic patients is often delayed. Early stages of deficiency can result in gastrointestinal abnormalities such as slow gastric emptying, nausea, and vomiting [9]. Therefore, it is reasonable to consider thiamine deficiency in a patient who has had nutritional deficiency for over 2-3 weeks, as was the case with this patient. The classic triad of WE is altered mental status, ataxic gait, and ophthalmoplegia, but the triad is present in only 16% of cases of WE [11]. Although diagnosis of WE is made clinically, systematic reviews suggest that Caine's operational criteria have a higher sensitivity than the classic triad [12,13]. Caine's criteria use a broader definition of clinical symptoms than the classic triad, while emphasizing the importance of malnutrition. The criteria for WE require 2 of 4 following [13]:

1. Dietary deficiencies.
2. Oculomotor abnormalities.
3. Cerebellar dysfunction.
4. Altered mental state or mild memory impairment.

On admission, our patient reported weight loss of 45.4 kg and later developed nystagmus. Therefore, she met the criteria proposed by Caine for diagnosis of WE.

Our patient also met the ARFID criteria. Based on DSM-V, ARFID is an eating or feeding disturbance manifested by persistent failure to meet appropriate nutritional and/or energy needs associated with 1 (or more) of the following [14]:

1. Significant weight loss (or failure to achieve expected weight gain or faltering growth in children).
2. Significant nutritional deficiency.
3. Dependence on enteral feeding or oral nutritional supplements.
4. Marked interference with psychosocial functioning.

Exclusion of other eating disorders is also required to meet the ARFID criteria. She had a feeding disturbance, significant weight loss, nutritional deficiency of thiamine, and lacked body dysmorphism. Psychiatry evaluation did not find her to have anorexia, with her history of food restriction as her diet. Our patient met the above criteria and was determined to have ARFID.

She was started on thiamine supplementation 2 days after developing neurologic signs. Delay in treatment may have resulted from unawareness of the Caine criteria and relative underdiagnoses of WE in the pediatric population [11]. Using Caine's criteria could lead to earlier diagnosis and treatment of WE.

Imaging may be used to support the clinical diagnosis of WE. Positive brain MRI findings demonstrate hyperintense signaling of the periventricular regions of the thalamus, hypothalamus, mammillary bodies, periaqueductal region, fourth ventricle, or midline cerebellum [9]. These regions require higher ATP for energy and NADPH for reductive biosynthesis reactions of fatty acid synthesis and protection of the cell from the damages of reactive oxygen species so that cells can maintain tissue integrity and function. Our patient's MRI did not demonstrate intracranial enhancing or signal abnormalities. This suggests that normal brain imaging studies cannot rule out WE, possibly limiting its clinical benefit. MRI findings alone cannot be used to diagnose WE.

Treatment for WE in adults involves intensive therapy with 500 mg IV thiamine 3 times daily for 2-3 days, then 250 mg IV daily for 3-5 additional days or until symptoms resolve or improvement plateaus. It is given with other B vitamins [15]. Daily oral thiamine 100 mg should be continued after parenteral treatment until the patient is no longer at risk. Initial doses below 250 mg per day apparently may not restore vitamin status, improve clinical signs, or prevent death. In particular, when patients with WE are inappropriately treated with low doses of thiamine, the biochemical abnormalities caused by thiamine deficiency can lead to irreversible brain damage and death [9]. Reports have shown significant dosing differences in the pediatric population, and treatment varies according to associated conditions, from 50 to 100 mg IV daily [15]. Our patient was initially treated with pediatric dosing and then adult dosing due to her weight.

Our patient received dextrose 5% in normal saline IVF with 20 mEq of potassium chloride to prevent dehydration. Thiamine supplementation was started on hospital day 10. In retrospect, administration of IV fluids with dextrose without replenishing thiamine stores may have been an exacerbating factor triggering worsening symptomatic thiamine depletion, resulting in the appearance of neurological symptoms. Thiamine is given before or with IV administration of glucose so as not to precipitate WE [9]. It is also prudent to correct deficiencies in other vitamins and minerals, particularly niacin and magnesium [15].

## Conclusions

To the best of our knowledge, this is the first case report of ARFID causing WE in a pediatric patient. ARFID should be

suspected in patients with marked weight loss who do not meet the criteria for anorexia. Detailed history taking is important. Physicians and particularly pediatricians should consider WE in children with eating disorders who present with neurological symptoms.

Thiamine deficiency should be on the differential diagnosis with patients who have malnutrition or alcoholism. Detection of thiamine deficiency relies on relevant history and physical exam findings and follow-up with laboratory testing for confirmation [1]. The Caine criteria could be implemented as a screening tool for these patients. If there is a suspicion, immediate treatment with thiamine is essential.

## References:

1. Smith CM, Komisar JR, Wasserman BR, Kincaid BR. Got 2 good eyes but you still can't see: An atypical case of Wernicke's encephalopathy. *Prim Care Companion CNS Disord.* 2021;23(3):20102780
2. Yule S, Wanik J, Holm EM, et al. Nutritional deficiency disease secondary to ARFID symptoms associated with autism and the broad autism phenotype: A qualitative systematic review of case reports and case series. *J Acad Nutr Diet.* 2021;121(3):467-92
3. Bahat H, Reisler G, Brandriss N, et al. Thiamine deficiency in adolescents with eating disorders: A prospective cohort study. *Nutrients.* 2020;12(5):1396
4. Brown K, Everwine M, Nieves J. A Case of Wernicke encephalopathy secondary to anorexia nervosa complicated by refeeding syndrome and takotsubo cardiomyopathy. *Am J Case Rep.* 2021;22:e929891
5. Saad L, Silva LF, Banzato CE, et al. Anorexia nervosa and Wernicke-Korsakoff syndrome: A case report. *J Med Case Rep.* 2010;4:217
6. Altinyazar V, Kiylioglu N, Salkin G. Anorexia nervosa and Wernicke Korsakoff's syndrome: Atypical presentation by acute psychosis. *Int J Eat Disord.* 2010;43(8):766-69
7. Peters TE, Parvin M, Petersen C, et al. A case report of Wernicke's encephalopathy in a pediatric patient with anorexia nervosa – restricting type. *J Adolesc Health.* 2007;40(4):376-83
8. Safran JT, Bodaghi M, Sherwin NK, Wallace JR. Wernicke's encephalopathy in adolescents with anorexia nervosa. *Psychiatry Res Case Rep.* 2023;2(1):100091
9. Oudman E, Wijnia JW, Oey MJ, et al. Preventing Wernicke's encephalopathy in anorexia nervosa: A systematic review. *Psychiatry Clin Neurosci.* 2018;72(10):774-79
10. Patel S, Topiwala K, Hudson L. Wernicke's encephalopathy. *Cureus.* 2018;10(8):e3187
11. Osiezagha K, Ali S, Freeman C, et al. Thiamine deficiency and delirium. *Innov Clin Neurosci.* 2013;10(4):26-32
12. Busti AJ, editor. Why alcoholics should receive vitamin B1 (thiamine) by IV before any glucose infusions. *EBM Consult.* Available from URL: <https://www.ebmconsult.com/articles/thiamine-administration-before-iv-glucose-alcoholics#:~:text=Therefore%2C%20thiamine%20should%20be%20given,to%20structures%20in%20the%20brain>
13. Vasconcelos MM, Silva KP, Vidal G, et al. Early diagnosis of pediatric Wernicke's encephalopathy. *Pediatr Neurol.* 1999;20(4):289-94
14. Lian X, Wu M, Fan H, et al. Wernicke's encephalopathy due to malnutrition and parenteral nutrition in a patient with cerebral infarction: A case report. *Medicine (Baltimore).* 2020;99(16):e19799
15. Caine D, Halliday GM, Kril JJ, Harper CG. Operational criteria for the classification of chronic alcoholics: Identification of Wernicke's encephalopathy. *J Neurol Neurosurg Psychiatry.* 1997;62(1):51-60
16. Substance Abuse and Mental Health Services Administration. DSM-5 Changes: Implications for child serious emotional disturbance. 2016 Jun. Table 22, DSM-IV to DSM-5 Avoidant/Restrictive Food Intake Disorder Comparison. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK519712/table/ch3.t18/>
17. Lallas M, Desai J. Wernicke encephalopathy in children and adolescents. *World J Pediatr.* 2014;10(4):293-98