



A 14-Year-Old with Vomiting and Bumps on the Tongue

In *Bouncebacks*, which appears periodically in *JUCM*, we provide the documentation of an actual patient encounter, discuss patient safety and risk-management principles, and then reveal the patient's bounceback diagnosis. This case is from the book *Bouncebacks! Pediatrics*, by Michael B. Weinstock, Kevin M. Klauer, Madeline Matar Joseph, and Gregory L. Henry, and is available at www.anadem.com and www.amazon.com. Can you spot the red flags without knowing the outcome?

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Introduction

Note: The following is the actual documentation of the provider.

Initial Visit: 07/05/2013

Chief complaint: Vomiting, bumps on tongue

History of Present Illness

Patient is a 14-year-old male who presented with complaints of vomiting, dry mouth, and bumps on the tongue associated with trouble breathing and the feeling of heartburn. Nausea started last night with one episode of vomiting. Bumps developed over the past week and are painful. No complaints of fever, diarrhea, rhinorrhea, congestion, or other pain. ROS [review of systems] is pan-negative, including no weight loss, no urinary symptoms, and no recurrent infections [Table 1].

Past Medical History

Negative

Social history: Unimmunized

Family history: None on file

Medications: None

Allergies: NKDA [no known drug allergies]



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Parameter	Value
Time	19:46
Temperature	97.7°F oral
Pulse rate	92 beats/min
Respiration rate	17 breaths/min
Systolic blood pressure	111 mm Hg
Diastolic blood pressure	76 mm Hg
Oxygen saturation	100% on room air

Physical Examination

General appearance: Awake, alert, no distress, oriented ×3

Skin: Warm, well perfused, with no diaphoresis/rash
HEENT [Head, Eyes, Ears, Nose, and Throat]: Normocephalic, atraumatic; conjunctivae not injected, corneas clear, PERRL [pupils equal, round, reactive to light]; no sinus TTP [tenderness to palpation] or rhinorrhea; symmetric posterior OP [oropharynx] without exudate/erythema, tongue with yellowish-white plaques, moist mucous membranes

Neck: Supple, no lymphadenopathy

Lungs: Clear to auscultation, breath sounds equal and symmetric bilaterally, no wheezes/rales/rhonchi, no signs of respiratory distress

Heart: Regular rate and rhythm, normal S1 and S2, no murmurs/clicks/gallops

Abdomen: Soft, mild epigastric TTP, negative Murphy sign, no TTP over McBurney point

Extremities: Moves all extremities; no deformities, edema, or skin discoloration; normal peripheral perfusion/pulses

Orders/results (21:42): Zofran, 4 mg PO; magic mouthwash, 10 mL, swish and swallow. PO fluids tolerated in urgent care.

Diagnosis: (1) Gastritis. (2) Leukoplakia of tongue.

Disposition (22:08): Patient discharged to home stable. Prescriptions for Pepcid (20 mg PO) and Phenergan (25 mg PO). Instructed to follow up with PCP [primary-care provider]. Strict return precautions given. Appropriate discharge instructions provided in written form.

The Bounceback

1 day later, 07/06/2013.

23:10: Mom returns with patient, stating patient is lethargic, nonvocal, with eyes rolling back.

HPI [history of present illness]: Ongoing chest and

Parameter	Value
Time	23:13
Temperature	96.8°F oral
Pulse rate	148 beats/min
Respiration rate	26 breaths/min
Systolic blood pressure	127 mm Hg
Diastolic blood pressure	52 mm Hg
Oxygen saturation	98% on room air

abdominal burning with generalized body pain since this morning. No improvement with Pepcid. Progressively lethargic and unresponsive throughout day with visual hallucinations and nonsensical speech [Table 2].
ROS: +12-lb weight loss over past week, anorexia, no polyuria or polydipsia

- **Examination:** GCS [Glasgow Coma Scale] 8, dry mucous membranes, no acetone on breath, Kussmaul breathing
- **Orders/actions:**
 - **23:15:** Glucose >600 mg/dL; 1-L IVF [intravascular fluid] bolus; ECG [electrocardiogram]: sinus tachycardia; IV access and blood work obtained
 - **23:45:** 1-L IVF bolus
 - **00:04:** Physician report called to nearest children's hospital PICU [pediatric intensive care unit] for transfer; insulin drip started per their consultation
- **Laboratory tests (00:21):**
 - **ABG [arterial blood gases]:** pH, 6.87; Pco₂, 26 mm Hg; HCO₃, 5 mmol/L
 - **CBC [complete blood cell] count:** WBC [white blood cell] count, 33.3/mm³ with 12% bands; H/H [hemoglobin and hematocrit], 16.6 g/dL and 52%
 - **BMP [basic metabolic panel]:** Na, 132 mmol/L; K, 7.1 mEq/L; Cl, 98 mEq/L; HCO₃, 5 mmol/L; BUN, 44 mg/dL; Cr, 2.5 mg/dL; glucose, 942 mg/dL; Mg, 4.1 mEq/L; phosphorus, 9.0 mg/dL

Diagnosis: (1) DKA [diabetic ketoacidosis]. (2) Severe electrolyte derangement. (3) Acute renal failure.

Disposition (00:58): Patient transferred to nearest children's hospital PICU

Hospital course: Four-day hospital stay marked by prolonged AMS [altered mental status] and fluctuating GCS

score, with difficulty transitioning from insulin drip to subcutaneous insulin and PO tolerance. Treated with both NS [normal saline] and D5NS [dextrose 5% in normal saline]; serial laboratory tests showed progressive improvement in metabolic derangements. Head CT [computed tomography] and EEG [electroencephalography] on HD2 [hospital day 2] showed no intracranial abnormalities and generalized encephalopathy, respectively. Transferred to the floor on HD3 following improvement in mental status, subcutaneous insulin, and PO tolerance. Discharged without neurologic deficits and baseline mental status on HD4.

Final diagnosis: (1) DKA. (2) Acute kidney injury. (3) New-onset DM [diabetes mellitus].

Discussion

Diabetes Mellitus in Children: General

Diabetes (type 1 more so than type 2) is one of the most common endocrine and chronic diseases in childhood and adolescence. The incidence of diabetes in children is increasing worldwide, making early recognition and proper treatment crucial to reducing morbidity and mortality caused by delayed diagnosis. Duration of symptoms prior to diagnosis can vary from a few days to several months.¹⁻³ The gradual onset of diabetes in children is more common than previously realized, with approximately half of children with newly diagnosed diabetes reporting symptoms lasting for more than a month.^{4,5} However, clinical presentation is most acute in children younger than 5 years of age, in whom early diagnosis is especially difficult.^{1,6,7} Delay in diagnosis is relatively common, with mistakes in diagnosis occurring from misinterpretation of symptoms^{5,6} or from the general belief that diabetes is rare in children.^{3,7} Therefore, increased awareness by both the public and provider is needed for improved outcomes.

Difficulty of Diagnosing

Despite physicians' familiarity with diabetes, catching new-onset diabetes before it reaches the severity of DKA remains difficult. In children, the onset may be acute or gradual. Although it can be diagnosed simply with a bedside glucose test or urinalysis, it must first be suspected. Clinical features in children can be nonspecific and challenging to notice in younger children, especially those younger than 5 years of age.^{1,4,6,7} There is a consistently recognizable cluster of symptoms that are present weeks before patients develop DKA, but parents or guardians are often unaware that these are concerning symptoms.^{3,5,8} Diabetes-specific symptoms such as polyuria

and polydipsia are often not mentioned by parents or guardians and must be elicited by the health-care provider when obtaining a medical history.⁶ The patient may be brought in for what the parents or guardians consider more concerning symptoms, causing the provider to overlook diabetes symptoms.^{3,7} In studies, somewhere between 20% and 38.8% of children with newly diagnosed diabetes were found to have at least one related medical visit before the diagnosis, suggesting that providers are missing opportunities for early diagnosis and DKA prevention.^{2,6,8}

Presenting Symptoms

Clinical features are usually equivocal and vague, requiring a high index of suspicion for proper diagnosis. Polydipsia and polyuria are the main symptoms of diabetes in all age groups, occurring in up to three-quarters of school-age children, whereas nocturnal enuresis in a previously "dry" child is the earliest symptom in 89% of children older than 4 years.^{1,6} Weight loss is more common in adolescents than in younger children.¹ Lethargy and constipation secondary to dehydration are also frequently seen. Dehydration of unclear etiology is often observed in infants and young children.⁷

Other important symptoms include irritability, blurred vision, and fatigue. Symptoms are often mixed with other misleading complaints such as headache, abdominal pain, dizziness, and rapid breathing.⁹ In this case, the patient presented with all of the classic yet vague symptoms of early DKA: abdominal pain, nausea, vomiting, and anorexia. The abdominal pain in such children is most often vague in nature and diffuse. Common misdiagnoses in the weeks leading up to diagnosis include gastrointestinal, urinary, and respiratory disorders.^{4,6,8}

Atypical Presentations

Providers are more aware of common yet nonspecific symptoms of diabetes; however, they are less aware of the infrequent yet specific symptoms such as enuresis and thrush.^{1,5} Although it might be difficult to elicit the symptom of polyuria, parents or guardians tend to be more aware of enuresis, which is secondary to polyuria. In this case, the mother finally recalled, after being asked multiple times, that her son had polydipsia and polyuria. The other overlooked symptom in this patient was thrush. When patients present in DKA, it is often found that candidiasis (oral and perineal) was detected during a prior visit with a PCP.^{2,4,7}

In this case, we have an adolescent male complaining of dry mouth and painful bumps on his tongue that were

noted to be yellowish-white plaques. The plaques of leukoplakia are bright white, usually found on the buccal mucosa, gums, and sides of the tongue, and like thrush, they do not easily rub off. *Candida* is common in infants and adolescent females, but young females and boys should not be predisposed to it, so a diagnosis of thrush or stomatitis should prompt concern that diabetes is present.⁷ Candidiasis is rarely the first and only sign of diabetes. Oral irritation, sore throat, and mouth plaques more often coexist with typical diabetes signs yet are recognized only as stomatitis or isolated candidiasis.

A key aspect in this case was that the patient had abdominal pain *plus* oral symptoms. A crucial piece to making the diagnosis of diabetes is being cognizant of the multiple symptoms and having a heightened awareness of the subtle signs of diabetes and DKA. Had more time been spent investigating the patient's oral symptoms, the information would have revealed that the oral lesions did not develop in relation to the emesis. Instead, as already noted, the oral lesions preceded the emesis by almost 1 week, which could have alerted the provider to look for a more unifying diagnosis that would explain these seemingly unrelated diagnoses of gastritis and leukoplakia.

High-Risk Patients

Early diagnosis of diabetes is needed to avoid progression to DKA. The prevalence of DKA at the time of diagnosis in the pediatric population ranges from 10% to 70%.² Children can develop dehydration and acidosis within 24 hours of first presentation, with children younger than 5 years being at greatest risk. The leading cause of mortality and morbidity in children with type 1 diabetes mellitus is DKA.⁴

Risk factors for children presenting in DKA include the following^{1-3,6-9}:

- Age <5 years, particularly <2 years
- New-onset diabetes
- Type 1 diabetes mellitus
- Delayed diagnosis of diabetes
- No family history of diabetes
- Low socioeconomic status
- Low-level education of parents or guardians
- Low body mass index
- Being part of an ethnic minority group
- Lack of private health insurance

Conclusion

The early diagnosis of diabetes will lead to better outcomes and likely avoid DKA on a subsequent presentation. To achieve this, however, the provider must maintain a high

degree of suspicion for the presence of diabetes. The type of patient described here is frequently seen in the urgent care setting, particularly because such patients appear to be relatively well on initial presentation, without vital sign abnormalities or very alarming symptoms. A significant percentage of patients with new-onset diabetes present to a provider before developing DKA, and their condition is misdiagnosed when the provider addresses only one symptom or a few symptoms rather than seeking a unifying diagnosis of seemingly nonrelated symptoms. Next time a child presents with discordant and vague symptoms, consider diagnoses beyond self-limiting illnesses and remember that children with diabetes do not always appear sick on initial presentation. With increased awareness of this disease, a simple blood or urine test can allow for early diagnosis and prompt treatment.

Keep these points in mind:

- Polyuria and polydipsia are pathognomonic for diabetes, and parents or guardians or the patient may require repeated prompting before the presence of these conditions is elicited.
- Painful oral plaques are classic for candidiasis. It is not normal for preadolescent girls or males past infancy to develop plaques in isolation, so the presence of plaques should raise concern that there is a more pernicious cause.
- Phenergan can alter mental status, making the diagnosis of DKA more difficult.
- Do not give insulin until electrolyte levels are known, because hypokalemia is a real risk.
- An insulin bolus is not recommended in children, because it is associated with increased risk for cerebral edema. ■

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