Case Report / Olgu Sunumu

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Beyond the Expected: Importance of Recognizing Intussusception in Diabetic Ketoacidosis

Beklenenin Ötesinde: Diyabetik Ketoasidozda Unutulmaması Gereken Bir Tanı: İnvajinasyon

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Abstract

Diabetic ketoacidosis (DKA) generally presents as an initial manifestation of Type 1 diabetes mellitus, particularly in children. While symptoms like abdominal pain, vomiting, and nausea are commonly associated with DKA, clinicians should also consider rare situations such as intussusception. Intussusception, a rare clinical diagnosis in adolescents, can result from lead points and metabolic changes. This case report highlights the occurrence of intussusception in an adolescent with DKA and explores the potential mechanisms linking these two conditions.

Keywords: Diabetic ketoacasosis, adolescent, intussusception

Öz

Diyabetik ketoasidoz (DKA) genellikle özellikle çocuklarda Tip 1 diabetes mellitusun ilk belirtisi olarak ortaya çıkar. Karın ağrısı, kusma ve bulantı gibi semptomlar genellikle DKA ile ilişkilendirilirken, klinisyenler invajinasyon gibi nadir durumları da göz önünde bulundurmalıdır. Ergenlik dönemi için nadir bir klinik tanı olan invajinasyon, öncü noktalar ve metabolik değişikliklerin bir sonucu olabilir. Bu olgu sunumu, DKA'lı bir ergende invajinasyon oluşumunu vurgulamakta ve bu iki durumu birbirine bağlayan potansiyel mekanizmaları incelemektedir.

Anahtar Kelimeler: Diyabetik ketoasioz, ergen, invajinasyon

Introduction

Type 1 diabetes mellitus is a prevalent chronic condition in childhood, and its incidence varies according to age, sex, geography, and ethnicity.[1] While polyuria and polydipsia are persistent symptoms lasting for several days, abdominal pain, nausea, and vomiting frequently emerge as notable presenting complaints. The severity of abdominal pain can mimic characteristics of an acute abdomen.[2] In the clinical evaluation of patients with diabetes, clinicians are urged to exercise caution and diligence in discerning the etiology of abdominal pain, particularly in cases where the discomfort persists because it may herald an underlying disease process.

Intussusception refers to a condition wherein a proximal segment of the intestine invaginates into the distal segment, resulting in intestinal obstruction, a potentially life-threatening event.[1] Although this condition is commonly observed in childhood, particularly in individuals aged below 2 years, it is not typically anticipated in older age groups.[3] The prevailing notion suggests that organic lesions acting as lead points are often responsible for causing intussusception in adults.[4] However, metabolic disorders, including acidosis, thyroid hormone imbalance, and hyperglycemia, can induce dysrhythmia and gastrointestinal dysmotility, potentially leading to intussusception even in the absence of structural abnormalities.[1,5,6]

In this report, we present an intussusception in an adolescent patient with diabetic ketoacidosis (DKA), review the literature, and investigate the possible mechanism of this condition.

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Case Report

A 14-year-old girl previously diagnosed with type 1 diabetes mellitus was admitted to our emergency service department because of nausea, severe abdominal pain, and general deterioration. Her parents were recently divorced, which led to non-compliance with treatment and several hospital admissions with DKA. Physical examination on admission showed that she was lethargic, and tenderness was detected in all quadrants of the abdomen, whereas no signs of defensive tenderness or rebound tenderness were observed. The detailed examination results were as follows: Blood pressure: 95/55 mmHg; respiratory rate 22 bpm, heart rate: 110 bpm, body temperature, 36.8 °C.

Laboratory examination revealed a blood sugar level of 494 mg/dL and urine ketone level was significantly elevated, more than four times the normal range, at >15 mmol/L. Blood gas analysis revealed severe metabolic acidosis (pH: 7.08, pCO_2: 19 mmHg, HCO_3: 8.2 mmol/L, Base excess: -22.8 mmol/L). CBC indicated an increase in the white blood cell count (28.3x10³/µL) and the percentage of neutrophils (96%). Other parameters of CBC, plasma electrolytes, renal, and liver function were normal (Table 1). Her glycosylated hemoglobin A1c level was 12.7%, indicating poorly controlled diabetes.

In this case, the patient primarily presented with severe abdominal pain without other accompanying symptoms, except for one or two cases of vomiting before hospital admission. Throughout the hospital stay, the patient was managed non-orally. Although there was a slight decrease in abdominal pain, it persisted. Physical examination specifically revealed tenderness in the bilateral lower quadrants of the abdomen. Initially, an abdominal X-ray (Figure 1) did not reveal any significant findings beyond normal gastric gas patterns. However, due to persistent abdominal pain, ultrasonography of the abdomen was performed. Ultrasound revealed a 2-centimeter peripheral hypoechoic ring, commonly known as the target sign, suggesting the presence of intussusception. This finding led to further evaluation and management by the surgical team, who performed hydrostatic reduction. These details underscore the critical nature of continuous assessment in cases of severe DKA in which abdominal pain persists, highlighting the necessity of thorough imaging studies to exclude other serious abdominal pathologies, such as intussusception.

Discussion

DKA is the second most frequent presentation of T1DM and is characterized by symptoms, including nausea, vomiting, abdominal pain, and hyperventilation, which can escalate to lethargy and coma.[1,2,7,8]

Gastrointestinal manifestations are prevalent among individuals with diabetes, with a substantial cohort reporting various symptoms during diabetic clinic visits. These symptoms encompass gastro-esophageal reflux, dysphagia, early satiety, nausea, vomiting, anorexia, abdominal distension or bloating, dyspepsia, abdominal pain, diarrhea, and constipation.[3] Hyperglycemia is recognized as a prominent contributor to gastroparesis,[9,10] whereas hyperkalemia and metabolic acidosis have also been associated with gastrointestinal dysmotility.[11-13] Both acute hyperglycemia and inadequate glycemic control are correlated with small-

Table 1. Laboratory values at diagnosis and follow-up for the case

	At presentation	6th hour	12th hour	24th hour	48th hour
pH	7.08	7.2	7.31	7.36	7.42
pCO_2 (mmHg)	19.0	28.8	30.6	37.3	36.5
HCO_3 (mmol/L)	8.2	12.2	16.8	21.3	24.1
Base excess (mmol/L)	-22.8	-15.6	-9.8	-3.5	-0.4
Blood glucose level (mg/dL)	494	170	180	140	134
Creatinine (mg/dL)	1.09	0.78	0.61		0.6
Plasma sodium (mmol/L)	148	140	141	139	140
Plasma potassium (mmol/L)	4.8	4.0	3.9	3.8	4.1
Lactate (mmol/L)	2.7	2.9	1.2	1.5	0.9
CRP (mg/dL)	8.9				
Urine ketone (mmol/L)	>15	12	8	6	0
WBC (10³/µL)	28.3				8.1
NEU (%)	91.6				38.3
Hemoglobin (g/dL)	15.1				12.8
Platelet (10³/µL)	542				385

CRP: C-reactive protein, WBC: White blood cell

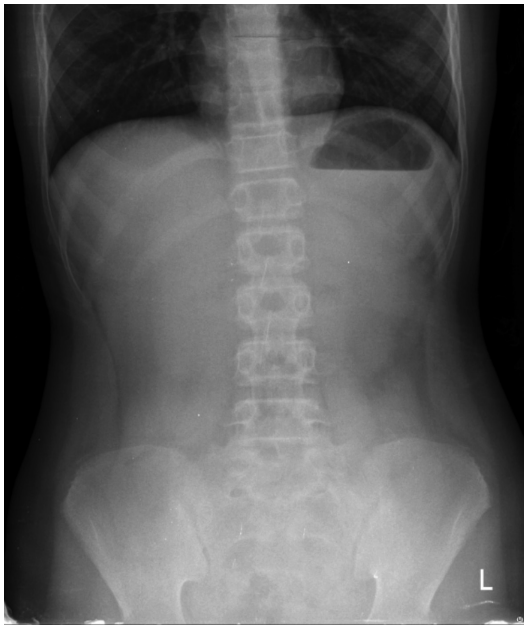

Figure 1. Abdominal radiography of the patient at presentation

bowel dysmotility.[11,14] Byrne et al.[15] employed intestinal manometry to demonstrate that acute hyperglycemia induces delayed jejunal transit time and diminished contraction.[12] Numerous studies have reported impaired gastrointestinal motility resulting from acute hyperglycemia.[5,16,17] Abdominal pain may be linked to increased bile duct and gallbladder pressure during acute hyperglycemia.[17] Conversely, chronic poor glycemic control can lead to diabetic parasympathetic autonomic neuropathy, culminating in gastrointestinal dysmotility.[18] Furthermore, dehydration associated with DKA can result in gastrointestinal hypoperfusion, potentially manifesting as constipation, abdominal pain, vomiting, and, in rare instances, intussusception.[3,13]

Intussusception is a surgical emergency; if left untreated, it can cause severe complications (perforation, peritonitis, sepsis etc.).[19] The classic triad of abdominal pain, vomiting, and currant jelly stools occurs in only one-third of the patients.[20] The pathogenesis of intussusception is generally considered to be related to a lead point, such as the Meckel diverticulum, polypoidal and submucosal lesions, and masses.[21] However, in some cases, Chron's disease, Celiac disease, acidosis, thyroid hormone imbalance, hyperglycemia, and electrolyte imbalance can lead to intussusception.[6,13,22]

In the available literature, cases of DKA coupled with intestinal invagination in adults have been documented, but a notable scarcity of reported pediatric cases is limited. A comprehensive review revealed a limited number of cases in children, thereby accentuating the rarity of such cases among this age demographics. When comparing the age and clinical characteristics of our patient with those in the literature, it becomes evident that pediatric cases are distinctly scarce, warranting heightened clinical awareness.[23,24] In our case of DKA, persistent abdominal pain despite standard corrective treatment prompted further investigation, leading to the diagnosis of intussusception via abdominal ultrasonography. This scenario highlights the complexity of diagnosing DKA complications because hyperglycemia is known to affect gastrointestinal motility, potentially contributing to conditions like intussusception. Studies have suggested that hyperglycemia can cause significant disruptions in motility, including delayed jejunal transit times and reduced contraction amplitudes, which might not only impair glucose absorption but also predispose patients to gastrointestinal pathologies. While speculation remains on the possibility of additional intussusceptions, the observed clinical improvement suggests a potential spontaneous resolution in some cases, emphasizing the need for cautious monitoring in pediatric patients with T1DM who present with similar complexities. Timely intervention remains paramount, serving as a reminder to clinicians that the prospect of spontaneous resolution may not be guaranteed in certain scenarios, necessitating proactive and vigilant approaches to avoid potential complications.

In spite of correcting dehydration, acidosis, and electrolyte imbalances; if abdominal pain persists, clinicians must remember acute abdominal causes. Intussusception, a rare cause of acute abdomen in adolescents and adults compared with the child population, must be recognized and treated immediately.

Ethics

Informed Consent: Informed consent was obtained.

Authorship Contributions

Surgical and Medical Practices: C.A., E.U., O.U., M.D., D.Y., Concept: E.U., M.D., D.Y., Design: E.U., O.U.,

Data Collection or Processing: C.A., E.U., Analysis or Interpretation: C.A., Literature Search: C.A., E.U., M.D., D.Y., Writing: C.A.

Conflict of Interest: No conflict of interest was declared by the authors.

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