



New-Onset Atrial Fibrillation Triggered by Diarrhea-Induced Dehydration: A Case Report

Urgent Message: Dehydration and its associated electrolyte disturbances can precipitate new-onset atrial fibrillation. Recognition of an irregular cardiac rhythm should prompt electrocardiographic evaluation and/or referral to a higher level of care.

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Abstract

Introduction: Atrial fibrillation is the most common sustained arrhythmia in adults and is frequently associated with precipitating factors, including systemic illness, metabolic derangements, and physiologic stressors. Although dehydration and hypovolemia are reversible, recognized contributors, they may be overlooked in older adults presenting with prolonged gastrointestinal illness.

Clinical Presentation: A 75-year-old female presented to urgent care with a 2-month history of persistent diarrhea, worsening thirst, dry mouth, orthostatic lightheadedness, and recent heat exposure while working outdoors.

Physical Examination: Physical examination demonstrated dry mucous membranes and an irregularly irregular cardiac rhythm.

Diagnosis: Electrocardiography confirmed new-onset



atrial fibrillation with a controlled ventricular response.

Resolution: The patient was referred to the emergency department for further evaluation. Laboratory studies demonstrated low-normal potassium (3.6 mmol/L) and mild hypomagnesemia (1.8 mg/dL) in the setting of ongoing gastrointestinal fluid loss and volume depletion. Treatment included electrolyte replacement,

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telemetry monitoring, anticoagulation with apixaban, and further cardiac evaluation.

Conclusion: This case highlights prolonged gastrointestinal fluid loss resulting in dehydration and borderline electrolyte abnormalities as potentially reversible contributors to new-onset atrial fibrillation in older adults.

Introduction

Atrial fibrillation (AF) is the most common sustained arrhythmia in adults and is associated with an increased risk of stroke, heart failure, and mortality.¹ Additionally, AF is frequently associated with underlying cardiovascular disease as well as acute precipitating factors including systemic illness, metabolic disturbances, and physiologic stressors.¹ While structural heart disease and acute systemic stressors—including infection, hypoxia, and metabolic disturbances—are well-recognized contributors to AF, volume depletion and electrolyte abnormalities may also contribute to arrhythmia development, particularly in older adults.¹ Patients with new-onset AF may initially present with nonspecific symptoms or incidental examination findings.¹

In the urgent care setting, the relationship between volume depletion, electrolyte abnormalities, and cardiac conduction disturbances may be easily overlooked, potentially delaying diagnosis of underlying arrhythmia. Careful cardiac auscultation remains essential, as identification of an irregularly irregular rhythm should prompt further evaluation with electrocardiography, consistent with current guideline recommendations.¹

This case highlights the development of new-onset atrial fibrillation in an older adult with prolonged diarrhea, dehydration, and borderline electrolyte abnormalities. Although dehydration and electrolyte disturbances are well-recognized reversible precipitants of atrial fibrillation, this case illustrates the importance of recognizing these factors during an urgent care evaluation, particularly when relatively mild electrolyte abnormalities accompany prolonged gastrointestinal fluid loss.¹

Clinical Presentation

A 75-year-old female presented to urgent care with a 2-month history of persistent watery diarrhea that began following a 10-day course of amoxicillin prescribed for a sinus infection. She reported previous self-limited episodes of post-antibiotic diarrhea; however, this episode

was notably more severe and prolonged, with peak frequency reaching 10–20 episodes of diarrhea per day.

She described the stools as watery, yellowish-brown, non-bloody, and odorless without associated mucus. Accompanying symptoms included diffuse lower abdominal cramping, which had since improved, with a sensation of generalized abdominal pressure. Over the past few weeks, the patient initiated self-directed management with loperamide, probiotics (*Saccharomyces boulardii*), oral rehydration therapy (powdered electrolyte drink), and adherence to a BRAT diet (banana, rice, applesauce, toast), resulting in partial symptom improvement. At the time of visit, her stool frequency had decreased to approximately 3 episodes per day.

Despite this improvement, she reported persistent signs of dehydration, including dry mouth, increased thirst, and orthostatic lightheadedness. She also noted an unintentional weight loss of approximately 5 lbs over the past month. She denied fever, nausea, vomiting, chest pain, or shortness of breath. She had not undergone a recent colonoscopy and declined further gastrointestinal workup due to emotional distress about the experience. She reported no known history of cardiac disease or other chronic medical conditions.

Physical Exam

The patient was alert, comfortable, and non-toxic. Vital signs were notable for a heart rate of 93 beats per minute, a respiratory rate of 20 breaths per minute, a blood pressure of 139/87 mmHg, and an oxygen saturation of 96% on room air. She was afebrile. Her mucous membranes were noted to be dry. Abdominal examination revealed a soft and nondistended abdomen without focal tenderness, and she had hyperactive bowel sounds.

Cardiac auscultation revealed an irregularly irregular rhythm with variable heart sound intensity and no discernible cadence. No murmurs, rubs, or gallops were appreciated. Given the abnormal rhythm on examination, an electrocardiogram (ECG) was performed, demonstrating findings consistent with AF, including irregular R–R intervals and the absence of distinct P waves. The rate remained controlled at 82 beats per minute. All other systems were unremarkable on physical exam.

Given the persistence of symptoms and recent antibiotic exposure, outpatient stool testing—including *Clostridioides difficile* (*C. difficile*), stool culture, and ova and parasite evaluation—was initially planned as the patient was unable to provide a specimen in the clinic. However, the patient's disposition changed following electrocardiographic confirmation of new-onset AF. Im-

mediate emergency department (ED) referral became the priority for further evaluation and management. As a result, the planned outpatient stool studies were not completed through the urgent care.

Differential Diagnosis and Medical Decision Making

The patient's initial presentation of persistent watery diarrhea raised several diagnostic considerations. Given the temporal association with a recent course of amoxicillin, *C. difficile* infection was high on the differential.² Although the patient described the stools as watery, non-bloody, and odorless, *C. difficile* infection remained an important consideration given the persistent symptoms following recent antibiotic exposure, and testing was warranted.² Other potential etiologies included viral gastroenteritis and antibiotic-associated, noninfectious diarrhea. The absence of fever and systemic signs of infection made other invasive bacterial enteric infections less likely, though they could not be definitively excluded.

Given the duration and severity of diarrhea, volume depletion and electrolyte imbalance were significant concerns.^{1,3} The patient exhibited clinical signs of fluid loss and was at risk for hypovolemia, particularly in the setting of advanced age. Her volume depletion and electrolyte abnormalities could also contribute to an increased susceptibility to arrhythmias.^{1,3} Cardiac auscultation revealed an irregularly irregular rhythm, prompting ECG evaluation. Because the patient remained hemodynamically stable following identification of new-onset atrial fibrillation, evaluation focused on identifying reversible precipitating factors, including suspected volume depletion and electrolyte abnormalities, while arranging transfer to the ED for further evaluation and management.¹

Final Diagnosis

The patient was diagnosed with new-onset AF in the setting of volume depletion and mild electrolyte abnormalities associated with prolonged diarrhea. The diagnosis was supported by electrocardiographic confirmation of AF in a patient without a prior history of arrhythmia. Clinical evidence of dehydration, prolonged gastrointestinal fluid loss, and low-normal potassium and hypomagnesemia suggested these reversible metabolic disturbances were likely precipitating factors contributing to the patient's cardiac presentation.

Emergency Department Course, Disposition

In the ED, laboratory evaluation revealed a potassium

level of 3.6 mmol/L and a magnesium level of 1.8 mg/dL. All the other laboratory results were unremarkable.

In the ED:

- Electrolyte repletion was initiated.
- The CHA₂DS₂-VASc score—a validated clinical tool used to estimate thromboembolic risk in patients with AF and guide anticoagulation decisions—was calculated by ED clinicians.¹
- Anticoagulation with apixaban was initiated.
- A transthoracic echocardiogram was ordered to assess for underlying structural heart disease.

Discussion

Dehydration and electrolyte imbalance may contribute to the development of AF, particularly in older adults who are more susceptible to volume depletion, as seen in this case, which was due to gastrointestinal losses and environmental heat exposure. The 2023 American College of Cardiology, American Heart Association/American College of Chest Physicians, and Heart Rhythm Society guideline for the diagnosis and management of AF recognizes that it is frequently associated with acute precipitating factors, including metabolic disturbances and physiologic stressors.¹

The ECG in this case demonstrated AF with a controlled ventricular response, characterized by an irregularly irregular rhythm, absence of discrete P waves, and variable R-R intervals. Recognition of these characteristic ECG findings is essential in the urgent care setting, as prompt diagnosis facilitates evaluation for reversible precipitating factors and timely referral for definitive management.¹

Potassium plays a central role in maintaining cardiac electrophysiologic stability by regulating resting membrane potential and repolarization. Hypokalemia can delay repolarization, increase myocardial excitability, and promote ectopic atrial activity, creating a pro-arrhythmic state.³ While more pronounced potassium abnormalities are well-established contributors to arrhythmogenesis, milder reductions may contribute to electrical instability in susceptible individuals, particularly in the presence of concurrent physiologic stressors such as dehydration.^{3,4}

Mild hypokalemia is generally defined as a serum potassium concentration between 3.0–3.5 mmol/L. Although this patient's potassium level remained within the low-normal range at 3.6 mmol/L, prior studies suggest that potassium concentrations near the lower limit of normal may still increase susceptibility to arrhythmogenesis in predisposed individuals, particularly in

older adults with concurrent physiologic stressors. In this case, ongoing gastrointestinal fluid losses and dehydration may have contributed to increased susceptibility to atrial fibrillation.^{3,4}

Potassium depletion secondary to diarrhea or profuse sweating is common in older adults. With aging, total body water decreases, and renal mechanisms for fluid and electrolyte conservation become less efficient.⁴ Gastrointestinal potassium losses may further contribute to potassium depletion.⁴ Importantly, serum potassium may not fully reflect total body stores, as intracellular depletion can persist despite normalization of serum values, potentially contributing to ongoing electrical instability. These considerations underscore the importance of appropriate monitoring and repletion in patients with suspected electrolyte imbalance.⁴

Magnesium deficiency may contribute to arrhythmic risk by impairing the sodium-potassium ATPase pump, promoting intracellular potassium loss and disrupting normal cardiac ion homeostasis.⁵ In this case, mild hypomagnesemia (1.8 mg/dL), in combination with volume depletion and low-normal potassium levels (3.6 mmol/L), may have contributed to electrical instability.

Volume depletion may contribute to the development of AF by exacerbating metabolic and electrolyte disturbances that promote electrical instability, particularly in susceptible older adults.^{1,3} Dehydration may also worsen underlying electrolyte abnormalities, further increasing susceptibility to arrhythmia.^{1,3}

Persistent diarrhea following recent antibiotic exposure should prompt consideration of *C. difficile* infection. Current Infectious Diseases Society of America guidelines recommend considering *C. difficile* testing in patients with diarrhea following antimicrobial use or persistent diarrhea without another clear etiology.² The patient's atrial fibrillation in this case was likely precipitated by dehydration and electrolyte abnormalities; however, evaluation for the underlying etiology of her diarrhea was also important to ensure appropriate treatment.

This case highlights the importance of recognizing dehydration and electrolyte abnormalities as potential contributors to new-onset AF, particularly in older adults presenting with gastrointestinal illness. In the urgent care setting, careful physical examination and identification of abnormal cardiac rhythms should prompt further evaluation with electrocardiography. Early recognition and treatment of contributing factors may help reduce complications and improve patient outcomes.

Ethics Statement

The patient was unable to be contacted; therefore, certain demographics and details of the case have been changed to protect patient anonymity and confidentiality.

Takeaway Points

- In patients with suspected volume depletion, evaluation of volume status and electrolyte abnormalities should be prioritized.
- Dehydration and electrolyte imbalance may contribute to new-onset AF, particularly in older adults.
- Identification of an irregularly irregular cardiac rhythm on examination should prompt further evaluation with electrocardiography.
- Urgent care clinicians play an important role in early recognition, evaluation, and appropriate triage of patients with newly identified arrhythmias. ■

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