CASE REPORT / PRIKAZ SLUČAJA

WALKING AND TALKING WITH A pH OF 6.93: ACUTE KIDNEY INJURY MISSED IN A RESOURCE-LIMITED EMERGENCY SETTING

HODA I RAZGOVARA S pH 6,93: PREVID AKUTNE OZLJEDE BUBREGA U HITNOJ MEDICINSKOJ SLUŽBI S OGRANIČENIM RESURSIMA

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Abstract

Background: Acute kidney injury may present with nonspecific symptoms, particularly in elderly patients. Limited diagnostic resources in remote areas can delay the correct diagnosis and recognition of life-threatening conditions, including metabolic disturbances.

Case report: An eighty-year-old woman presented to a remote emergency department with fatigue and mild dyspnea. There were no available point-of-care (PoC) devices and she was referred to a tertiary center where she was diagnosed with acute kidney injury and severe metabolic disturbances. After initial management, she was subsequently enlisted in a chronic hemodialysis program.

Discussion: Acute kidney injury is often under-recognized early due to asymptomatic or nonspecific presentation, especially in elderly patients. Serum creatinine is a delayed marker, PoC testing for acid-base parameters can signal acute kidney injury before creatinine rises. In remote settings, integrating PoC testing for creatinine, urine biomarkers, and blood gas/acid-base analyzers may reduce diagnostic delay. Metabolic disturbances like severe acidosis themselves raise acute kidney injury suspicion, making PoC acid-base testing a valuable adjunct in remote emergency care.

Conclusion: Severe metabolic derangements may present with mild, nonspecific symptoms, particularly in elderly patients. This case also highlights the importance of prompt access to PoC devices in remote settings to enable early recognition, appropriate referral, and timely treatment.

Keywords: Dyspnea; Acute kidney injury; Acidosis; Hyperkalemia; Hemodialysis; Point-of-care devices.

Sažetak

Uvod: Akutno oštećenje bubrega može se očitovati nespecifičnim simptomima, osobito u starijih bolesnika. Ograničene dijagnostičke mogućnosti u udaljenim područjima mogu odgoditi pravodobno postavljanje dijagnoze i prepoznavanje životno ugrožavajućih stanja, uključujući metaboličke poremećaje.

Prikaz slučaja: Osamdesetogodišnja bolesnica javila se u udaljenu hitnu službu zbog umora i blage dispneje. Uređaji za dijagnostiku uz bolesnika (engl. *point-of-care*, PoC) nisu bili dostupni te je bolesnica upućena u tercijarni centar, gdje su dijagnosticirani akutno oštećenje bubrega te teški metabolički poremećaji. Nakon početnog liječenja uključena je u program kronične hemodijalize.

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Rasprava: Akutno oštećenje bubrega često se ne prepoznaje u ranoj fazi zbog asimptomatske ili nespecifične kliničke slike, osobito u starijih bolesnika. Budući da porast koncentracije serumskog kreatinina kasni, PoC određivanje acidobaznih pokazatelja može upozoriti na akutno oštećenje bubrega prije porasta kreatinina. U udaljenim sredinama uvođenje PoC određivanja kreatinina i bioloških pokazatelja u mokraći te analizatora krvnih plinova i acidobaznog statusa može smanjiti dijagnostičko kašnjenje. Metabolički poremećaji poput teške acidoze sami po sebi pobuđuju sumnju na akutno oštećenje bubrega, zbog čega je PoC analiza acidobaznog statusa vrijedan dodatak hitnom zbrinjavanju u udaljenim područjima.

Zaključak: Teški metabolički poremećaji mogu se očitovati blagim i nespecifičnim simptomima, osobito u starijih bolesnika. Ovaj slučaj također naglašava važnost pravodobne dostupnosti PoC uređaja u udaljenim sredinama radi ranog prepoznavanja bolesti, odgovarajućeg upućivanja i pravodobnog liječenja.

Ključne riječi: acidoza; akutno oštećenje bubrega; dispneja; hemodijaliza; hiperkalemija; uređaji za dijagnostiku uz bolesnika

Introduction

Acute kidney injury is an abrupt decline in renal function that carries high morbidity and mortality, particularly when recognition and treatment are delayed. Clinically, acute kidney injury is defined by increases in serum creatinine and/or reduced urine output. However, creatinine is a delayed marker that may rise only after substantial kidney injury has occurred, and urine output can be difficult to monitor reliably outside institutional settings.

> Acute kidney injury is a rare but potentially life-threatening condition. Elderly patients with severe acute kidney injury may present with minimal or no symptoms.

The most common cause of acute kidney injury in elderly patients is prerenal due to dehydration, accounting for 43% of cases in patients over 65 years compared to 29% in younger patients (1). Renal hypoperfusion accounts for 68.8% of acute kidney injury cases outside the intensive care unit. The most frequent comorbidities are hypertension, chronic kidney disease, coronary artery disease, diabetes, and heart failure. Most common triggers are diarrhea, infections, acute heart failure, dehydration and hypotension (2). Early manifestations are often nonspecific-fatigue, dyspnea, and subtle changes in mental status-and may be overlooked in elderly patients or those with chronic comorbidities (3). Without prompt diagnosis and supportive care, acute kidney injury can progress rapidly to severe metabolic derangements, including life-threatening hyperkalemia and profound metabolic acidosis (4).

In remote or resource-limited settings, the absence of basic laboratory diagnostics further delays recognition and appropriate referral. Point-of-care (PoC) testing could enable decentralized diagnostic analysis by offering portability, automation, and the ability to deliver results more quickly and at lower cost. Common PoC devices include those for blood glucose, pregnancy testing, blood gas and electrolyte analysis, urine testing, bacterial screening, and forensic medicine applications (5).

> Integrating PoC blood gas analysis into clinical pathways in remote settings may provide a critical diagnostic bridge, enabling earlier recognition of severe metabolic disturbances and prompting timely transfer and treatment.

Case presentation

An eighty-year-old woman presented to a remote emergency department with fatigue and mild dyspnea. She was undergoing treatment for scabies associated with troublesome sleeping and reduced oral intake the preceding week. The patient medical history included arterial hypertension, type 2 diabetes mellitus and hyperlipidemia. Examination was unremarkable with normal vital parameters and electrocardiogram. There was no available PoC devices and no available laboratory or imaging testing in surrounding area. Given her age and acute treatment of scabies, she was discharged as likely exhaustion and sleep deprivation, with instructions to return/call if her condition aggravates or doesn't improve. Upon re-presentation with persistent symptoms two days later, she was referred to tertiary center. At admission at the hospital, she was hemodynamically stable. Arterial blood gas revealed severe metabolic acidosis and laboratory findings presented acute kidney injury and increased potassium levels (Table 1.)

Initial management included calcium gluconate, insulin with glucose, furosemide, and sodium bicarbonate followed by urgent hemodialysis at the intensive unit. She was subsequently initiated in a chronic hemodialysis program. A chronological summary of key events of this case is presented in Table 2.

Table 1. Arterial blood gas and laboratory results indicating metabolic acidosis and acute kidney injury.

pH	6.93
cBase	-26.8
pCO2 (kPa)	2.06
HCO3 (mmol/L)	5.2
eGFR (ml/min/1.73m²)	2.4
Creatinine (µmol/L)	1145
Urea (mmol/L)	53
K⁺ (mmol/L)	7.1

Table 2. Timeline of the patient's clinical course

Time	Clinical event
Day −7	Scabies diagnosis and initiation of treatment
Days −7 to 0	Poor sleep and reduced oral intake
Day 0	Initial patient contact and examination
Day 2	Re-presentation and referral to the tertiary center; hospital admission, initial management, and emergency hemodialysis
Day 3+	Enrollment in a chronic hemodialysis program

Discussion

Acute kidney injury is frequently under-recognized in its early stages, as many patients with mild to moderate disease remain asymptomatic and are identified only after laboratory testing (4). When symptoms do occur, they are often nonspecific: nausea or vomiting (33.3%), dyspnea (14.5%), oliguria (16.2%), and confusion (6.8%), while up to 31.6% of patients may remain asymptomatic, which can delay recognition particularly in elderly individuals with multiple comorbidities (3).

In the present case, despite a pH of 6.93 and bicarbonate level of 5.2 mmol/L, the patient remained hemodynamically stable and presented only with fatigue and mild dyspnea. This marked discordance between biochemical severity and clinical presentation highlights how advanced metabolic derangements may remain clinically subtle and contribute to delayed recognition of critical illness.

Serum creatinine, although central to diagnosis, is a delayed marker of decreased glomerular filtration rate and may require 24–72 hours to reach a new steady state following acute kidney injury, thereby postponing detection of clinically significant renal dysfunction (6). While PoC creatinine testing is not yet sufficiently validated to replace standard laboratory measurements (7), PoC blood gas analysis may offer a practical and reliable alternative for early detection of metabolic disturbances. PoC blood gas analysis can rapidly assess acid-base status and selected hematologic, metabolic, and electrolyte parameters (pH, pO_2, pCO_2, hematocrit, hemoglobin, sodium, potassium, chloride, ionized calcium, ionized magnesium, glucose, lactate, anion gap and some other parameters depending on the device model) (8). Among these, pH, pCO_2, and bicarbonate levels are particularly useful for identifying severe metabolic acidosis, which may serve as an early indicator of acute kidney injury (9).

> Severe metabolic acidosis may be an early indicator of acute kidney injury before serum creatinine rises.

This has potential to be of importance in remote emergency settings, such as in this case, where the nearest tertiary center was over one hour away and advanced transport options were limited. Severe acidosis could have raised suspicion of acute kidney injury and justified urgent escalation of care. In such environments, the absence of diagnostic tools, including laboratory testing and PoC devices, possibly increases the risk of delayed diagnosis and referral.

Conclusion

Acute kidney injury in elderly patients may present with minimal symptoms despite severe metabolic derangement and normal vital signs. In this remote emergency case, the absence of laboratory diagnostics and PoC testing delayed recognition of acute kidney injury and life-threatening acidosis. PoC blood gas analysis may help identify critical metabolic abnormalities earlier, guide initial supportive treatment, and support timely referral in remote emergency settings.

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