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A Peculiar Case of Stupor and Muscular Stiffness Associated with Hyperkalemia

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1. Abstract

A **man 66 years old**, presented to the emergency with stupor and lethargy. His relatives recorded that patient had several episodes of diarrhea prior days, widespread muscle pain, walking difficulties with loss of balance and became progressively weaker and confused. His medical history included bipolar disorder, diabetes mellitus, obesity, smoking status, referred slight chronic kidney disease, arterial hypertension, prior right nephrectomy since a cancer occurred, followed by bilateraladrenalectomy because metastasis.

Patients was on treatment with statin, high dose thiazide diuretic, an angiotensin-converting-enzyme inhibitor, clozapine, low dose aspirin, and insulin. No other clinical documentation has been provided.

At medical attention patient presented widespread muscle weakness with nervous sensibility, cranial nerves and musculoskeletal reflections preserved. He was arousable and when awakened he had no apparent loss of strength or focal deficits, but was unable to maintain upright posture if not supported. He was not easy to be awakened, but when he did he was disoriented and in a daze. His blood pressure was 95/60 mmHg, his pulse was irregular and apparently little, with heart rate variable between 60 and 110 bmp. The arterial oxygen saturation was 98% breathing ambient air and, he was eupnoeic with normal breathing rate. He looked pale, with skin and mucous membranes dehydrated and peripheral vasoconstriction, afebrile. No signs of peripheral oedema or pulmonary congestion were observed. The abdomen clinical examination showed no irregularities, nor pain was evoked on abdominal palpation. Isotonic fluids have been infused in the meantime since the patient was apparently dehydrated and hypotensive. A standard 12-lead electrocardiogram(ECG) and arterial blood gas sampling were instantly performed. Venous sampling to test renal, liver, blood count, coagulation, acute inflammation indices such as procalcitonin, and muscle enzymes alsohas been collected. Since cardiovascular high risk patient and diabetes mellitus high sensitivity troponin has been determined.

The first ECG (Figure 1) showed regular rhythm of undetermined origin, with apparently no P waves

detected, enlarged wide QRS complex, and T waves high and sharp, all together indicative findings ofhyperkalemia and or drug intoxication.

The acid-base balance (Figure 2) showed a metabolic acidosis with partial respiratory compensation, very high potassium blood level (16.02 mmol/L), high blood urea nitrogen level (146 mg/dL), mild hyperglycemia (glucose level 134 mg/dL), mild hyponatremia (129.7 mmol/L).

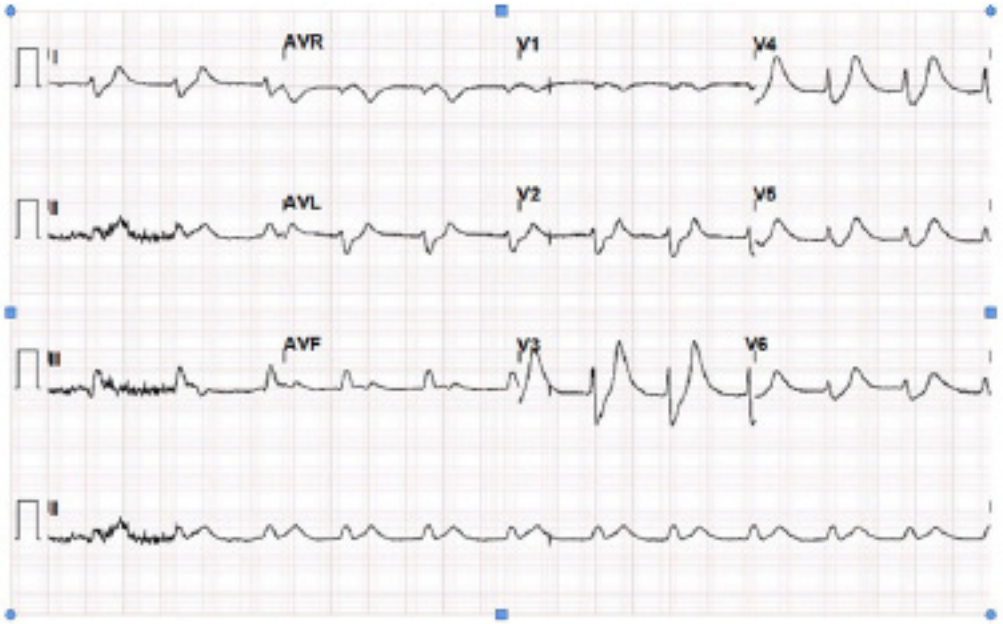
Questions: what is the real cause of the arrhythmia? Can it to be of multifactorial origin? What is next step to improve patient health? Does patient's clinical presentation is hypokalemia or hyperkalemia-dependent? How can we explain abnormal potassium plasmatic levels?

2. Treatment, Monitoring and Clinical Course

Because hypotension and hyperkalemia the patient has been quickly undergone at intravenous boluses of calcium gluconate, rapid bolus intravenous insulin infusion and intravenous rehydration using 10% glucose solution [1]. Immediate intravenous hydrocortisone has been administrated to to support the blood pressure.

Since life-threatening arrhythmias risk, cardiac rhythm monitoring

has been required and a second ECG has been performed (Figure 3). After about thirty minutes sinus rhythm was restored and blood pressure was improved. Blood tests performed have confirmed high potassium level (9.2 mmol/L) and shown high level of creatinine (10.05 mg/dL) and blood urea nitrogen (87 mg/dL). Troponin T level was at normal range, differently creatinine kinases blood levels (CPK) were 861 UI/L. Noalteration of blood cell count has been found.



25 mm/s 10 mm/mV PRONTO SOCCORSO 5009401

Figure 1

Test	Valore	Unità	Avvisi
pH	7.194		↓
pCO2	17.1	mmHg	↓
pO2	145.9	mmHg	↑
Hct	79	%	X
Na+	129.7	mmol/L	↓
K+	16.02	mmol/L	↑
Cl-	112.0	mmol/L	↑
Ca++	5.22	mg/dL	↑
Glu	134	mg/dL	↑
Lac	1.1	mmol/L	
BUN	146	mg/dL	X
TCO2	7.2	mmol/L	
nCa	4.67	mg/dL	
Gap	11.1	mmol/L	
SO2%	98.8		↑
Hbc	26.3	g/dL	
BE-ecf	-21.7	mmol/L	
BE-b	-16.9	mmol/L	↓
SBC	13.4	mmol/L	
HCO3-	6.6	mmol/L	↓
pO2/FIO2	698.3	mmHg	
A	127.7	mmHg	
a/A	1.1		
Osm	309.8	mOsm/k	

Figure 2

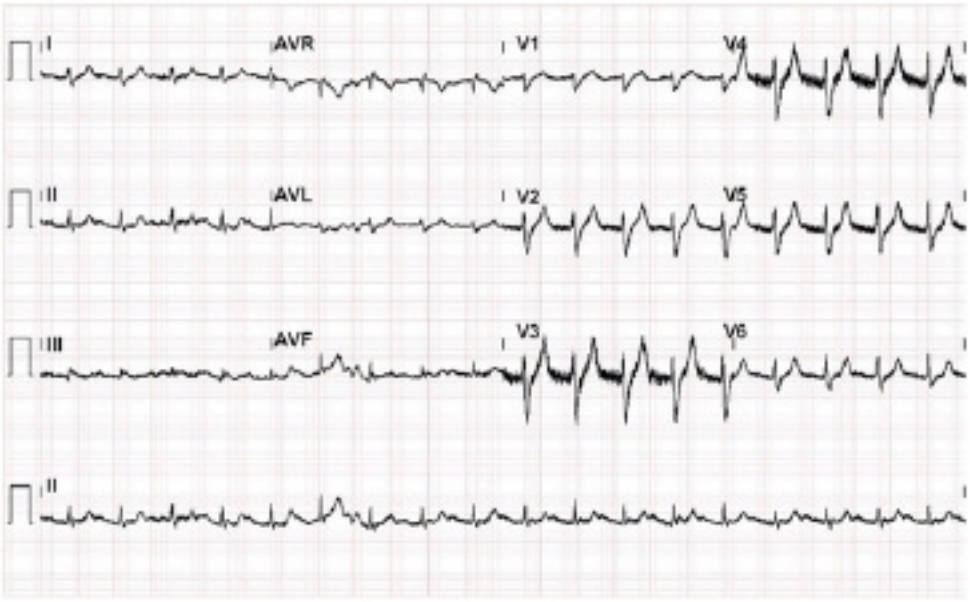


Figure 3

Additional blood control tests showed largely unchanged creatinine and potassium levels (9.59 mg/ dL and 8.8 mmol/L, respectively).

After initial treatment, the clinical condition of patient have slightly improved and he felt better. Lethargy and stupor improved and he became awake and mental oriented in time, place and person. When asked about what happened before falling ill, he remembered to have taken oral potassium chloride for long time, since his general practice medicine doctor advised him about a certain low potassium blood level some days before potassium chloride intake.

3. Interpretation

The patient had many factors favouring potassium disturbances in the blood. First, he took diuretic agents, such as thiazide and ACE inhibitors, the one causes hypokalaemia, the other hyperkalemia [2]. Together these drugs could help each other to maintain potassium level at normal range, and guidelines recommend taking them together to balance their contrasting effects on bloodelectrolyte levels [2,3].

Second, the patient was suffering chronic kidney disease, condition predisposing hyperkalemia [2]. Third, bilateral adrenalectomy could have caused acquired Addison's disease and, thus, contemporary hypokalemia, since no known replacement therapy with corticosteroids has been established [4].

Did patient have Addison's disease symptoms and, particularly, an adrenal crisis? Hypotension and dehydration are the most clinical features of Addison's disease but no melanodermia has been observed [4]. The acid-base balance anyway was suggestive of metabolic acidosis with hyponatremia, frequent disturbance due to loss of the hormone aldosterone causing impairment of sodium reabsorption in the distal tubule and acid/hydrogen ion (H+) secretion [4].

An adrenal crisis can be triggered by stress, injury, surgery, or infection [5,6]. Procalcitonin blood level (9.07 mg/dl) and clinical features, such as diarrhea, even were indicative of sepsis [7,8]. However relatives recorded that patient was easily irritable and troubled before he fell ill. More over patient had bipolar disorder, thus it is not sure that his mental status were associated merely to infection and/or endocrinological disorder also [6,8]. Furthermore clozapine intake could have partially contributed to hypotension [9].

The excessive intake of oral potassium, together with inflammatory response to probable infection, may have partially and progressively contributed to muscle disorder leading to CPK increase, appearance of nonspecific neuromuscular symptoms, including muscle pain, widespread weakness and difficulty to maintain the upright posture and equilibrium. Further iatrogenic hyperkalemia could have masked, or at least mitigated, low level of potassium due to endocrinological disorders, causing instead serious ECG changes.

Finally the patient has been undergone to hemodialysis and has been hospitalized in internal medicine unit to further evaluate of sepsis, and being not able to exclude adrenal crisis infection- triggered following hypoadrenocorticism because previous bilateral adrenectomy.

4. Take Home Points

- In middle-aged patients requiring several medicaments due to comorbidities, susceptibility to adverse drug reactions and drug-drug interactions is higher, especially electrolytic disorders are frequent and may increase the likelihood of serious arrhythmias
- The accurate knowledge of medical history and home therapy can help to answer otherwise unexplained

arrhythmic etiology

- Clinical aspects have to be considered and interpreted at the light of routine blood control test and ECG to avoid underdiagnosis of less common diseases, such as adrenal crisis, a rare but treatable complication
    - Any reasoned hypothesis is probable until the evidence of its contrary
    - Patient compliance to the multi-drug home therapy, especially in people with mental disorders and cognitive problems, must be taken in account

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