

Camel-Hump T-Wave, Tee-Pee Sign, and Wavy Triple Sign (Yasser's Sign) with Hypocalcemia and Hyperkalemia in Covid-19 Pneumonia with Lacunar Infarction

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Abstract

Rationale: A novel COVID-19 is a multi-systemic critical worldwide pandemic infection. Certainly, associated multiple electrolytes imbalance in COVID-19 pneumonia is a remarkable decisive event. Camel-hump T-wave, Tee-Pee sign, and Wavy triple sign (Yasser's sign) are novel highly significant descriptive electrocardiographic signs that are seen in calcium and potassium disturbance. There is an established and strong relationship between and electrocardiographic abnormalities and electrolytes imbalance. COVID-19 pneumonia and cerebrovascular stroke are commonly seen in a patient with Coronavirus infection.

Patient concerns: A 69-year-old married worker Egyptian male patient was presented to the emergency department with COVID-19 pneumonia and cerebrovascular stroke.

Diagnosis: COVID-19 pneumonia with lacunar infarction, hypocalcemia, and hyperkalemia.

Interventions: Chest CT scan, brain CT scan, electrocardiography, oxygenation, and echocardiography.

Outcomes: Initial bad and deterioration outcome but, the dramatic outcome had happened after later management.

Lessons: The understanding of electrocardiographic signs regarding metabolic disorders such as electrolytes imbalance and other associated systemic diseases is very important. Elderly male sex, heavy smoker, COVID-19 pneumonia, cerebrovascular stroke, chronic renal impairment, ischemic heart disease, hypokalemia, hypocalcemia, and hypernatremia represent bad prognostic points and is indicating a high-risk condition.

Keywords: COVID-19; camel-hump T-wave; tee-pee sign; wavy triple sign (yasser's sign); hypocalcemia; hyperkalemia; lacunar infarction; cerebrovascular stroke

Introduction

Generally, in medical diseases, the clinical response is commonly parallel to laboratory and electrocardiographic improvement. A direct relationship between clinical status, ECG, and laboratory workup is essential [1]. Early studies had recorded different electrolyte disturbances at admitted patients with severe COVID-19 infection. As electrolyte imbalance mainly affects the impact of patient care rather than the pathophysiology of COVID-19 [2]. Periodic measuring of electrolytes after the initial presentation during hospitalization is a target to timely establish and appropriate corrective management [2]. The relationship between electrolytes disturbance and coronavirus disease 2019 (COVID-19) in patients of the emergency department (ED) is still vague [3]. The role of the ECG in the assessment and management of acutely unwell patients has long since extended beyond

the evaluation of chest pain [4]. Johri et al (2009) reported a case of a combination of hyperkalemia and hypocalcemia resulting in pre-cordial QRS-complex with peaked T-wave, prominent U-wave, and prolongation of the descending limb of the T-wave. This resulted in the T-wave overlapping the U wave and they called it the "Tee-Pee Sign" because the shape of the QRS complexes resembled the traditional shape of native American Indians dwelling (Figure 1). The combination of prolongation of both the ST segment and descending limb of the T-wave resulted in pseudo-prolongation of the QT interval [5]. Camel-hump T-wave is not specific for electrolyte imbalance. The presence of multiple severe electrolyte abnormalities is the cause for this very dramatic camel-hump T-wave, formed by fusion of the T-wave and Giant U-wave [4]. Multiple electrolyte imbalances and have observed dramatic ECG changes of camel-hump T waves and the "Tee-Pee sign". A combination of electrolyte imbalance has not previously been

reported and this is the most dramatic example of camel hump T-wave [5]. Wavy triple an electrocardiographic sign (Yasser's sign) is a new specific diagnostic sign seen in 97.3% of the cases of hypocalcemia. Wavy triple an electrocardiographic sign can be used as a therapeutic guide in the cases of hypocalcemia [6]. Coronavirus disease 2019

(COVID-19) evolved quickly into a global pandemic with myriad systemic complications, including stroke. COVID-19 is an independent risk factor for stroke in hospitalized patients and mortality, and stroke presentations are frequently atypical [7].

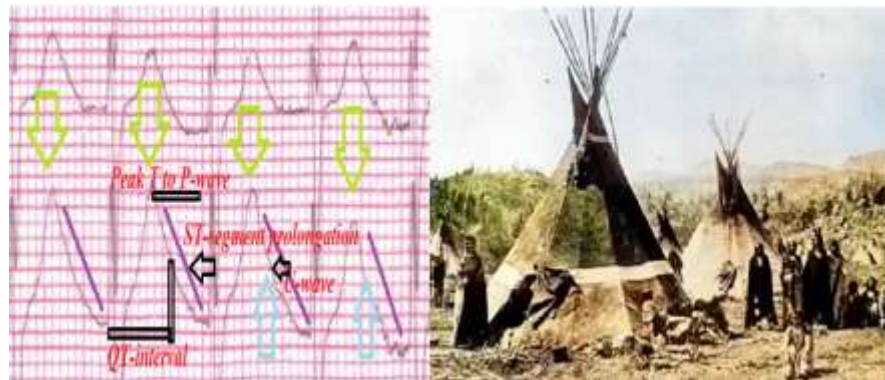


Figure-1 showing traditional shape of native American Indians dwelling.

Case presentation

A 69-year-old worker, married male, Egyptian, heavy smoker patient was presented to the emergency department (ED) with tachypnea, left-side heaviness, generalized body aches, and palpitations. Fatigue, dry cough, anorexia, and loss of smell were the associated symptoms. There is a recent contact with a confirmed case of COVID-19 pneumonia. He was presented to the ED within 5 days of the above symptoms. He gives a history of chronic renal impairment. He is smoking about 20 cigarettes for 17 years. The patient denied a history of cardiovascular diseases, the same attack, drugs, or any other special habits. Informed consent was taken. Upon general physical examination; generally, the patient was tachypneic, distressed, with a regular pulse rate of VR; 120 bpm, blood pressure (BP) of 150/90 mmHg, respiratory rate of 27 bpm, the temperature of 37.8 °C, and pulse oximeter of oxygen (O₂) saturation of 87%. There is left-side hemiparesis with GCS; 12. Tests for latent tetany were elicited. Initially, the patient was treated with O₂ inhalation by O₂ cylinder (100%, by nasal cannula, 5L/min). The patient was maintained treated with cefotaxime; (1000 mg IV every 8hours), azithromycin (500 mg PO single daily dose), oseltamivir (75 mg PO twice daily only for 5 days), and paracetamol (500 mg IV every 8 hours as needed). SC enoxaparin 80 mg twice daily, aspirin tablet (75 mg, once daily), clopidogrel tablet (75 mg, once daily), and hydrocortisone sodium succinate (100 mg IV every 12 hours) were added. The patient was daily monitored for temperature, pulse, blood pressure, and O₂ saturation. The patient was managed in the ICU with COVID-19 pneumonia, ischemic heart disease, lacunar infarction, hyperkalemia, hypocalcemia, and hypernatremia. The initial ECG was done on the ICU admission showing sinus tachycardia VR; 118, ST-segment depression in both high lateral leads (I and, aVL), Camel-hump T-wave (II, III, aVF, and V3-5), Tee-Pee sign with ST-segment prolongation (V3), and Wavy triple sign Yasser's sign of hypocalcemia (V4-6 leads) (**Figure 2**). The first brain CT without contrast was done during the day

of hospital admission showing lacunar infarction (**Figure 3A**). The first chest CT without contrast was done during the day of hospital admission showing destructive left ground-glass opacities (**Figure 3B**). Currently, the patient was admitted to the critical care unit with COVID-19 pneumonia, cerebrovascular stroke, chronic renal impairment, and ischemic heart disease. The initial complete blood count (CBC); Hb was 10.9 g/dl, RBCs; $4.1 \times 10^3/\text{mm}^3$, WBCs; $19 \times 10^3/\text{mm}^3$ (Neutrophils; 87.5 %, Lymphocytes: 8.3%, Monocytes; 4.2%, Eosinophils; 0% and Basophils 0%), Platelets; $174 \times 10^3/\text{mm}^3$. S. Ferritin was high; 494 ng/ml. D-dimer was high (0.916 ng/ml). CRP was high (97 g/dl). LDH was high (538 U/L). SGPT was normal (41 U/L), SGOT was normal (36 U/L). Serum creatinine was high (4.7 mg/dl) and blood urea was high (154 mg/dl). RBS was normal (188 mg/dl). Plasma sodium showed hypernatremia (152 mmol/L). Serum potassium showed hyperkalemia (5.8 mmol/L). Ionized calcium was low 0.62 mmol/L). The troponin test was negative (0.03 U/L). CK-MB was normal (11 U/L). The echocardiography was done on the presentation showing mild grade I, diastolic dysfunction with an EF of 63%. Two calcium gluconate ampoules (10 ml 10% over IV over 20 minutes) were given as an emergency dose. Maintenance therapy with IVI calcium gluconate ampoules (10% with the rate; 0.5 mg/kg/hour over IV over 6 hours) was infused. Actrapid insulin was added in 500 ml of 10% dextrose 5% IV infusion. Periodic inhalation nebulizer sets with salbutamol drops were given. COVID-19 pneumonia, ischemic heart disease, lacunar infarction, hyperkalemia, hypocalcemia, and hypernatremia **was the most probable diagnosis**. The patient was discharged within 7 days of hospital admission nearly, after clinical, electrocardiogram, and workup improvement. The patient was continued on aspirin tablet (75 mg, OD) for three months, longstanding nitroglycerine oral capsules (2.5 mg BID), and calcium with vitamin D oral preparations (OD) for 2 weeks with follow-up. Further cardiac, renal, neurological, and chest follow-up was advised.



Figure 2: ECG tracing was done on the ICU admission showing sinus tachycardia VR; 118, ST-segment depression in both high lateral leads (I and, aVL; red arrows), Camel-hump T-wave (II, III, aVF, and V3-5; light blue and lime arrows), Tee-Pee sign with ST-segment prolongation (V3; purple lines), and Wavy triple sign Yasser’s sign of hypocalcemia (V4-6 leads; orange, green, and dark blue arrows).

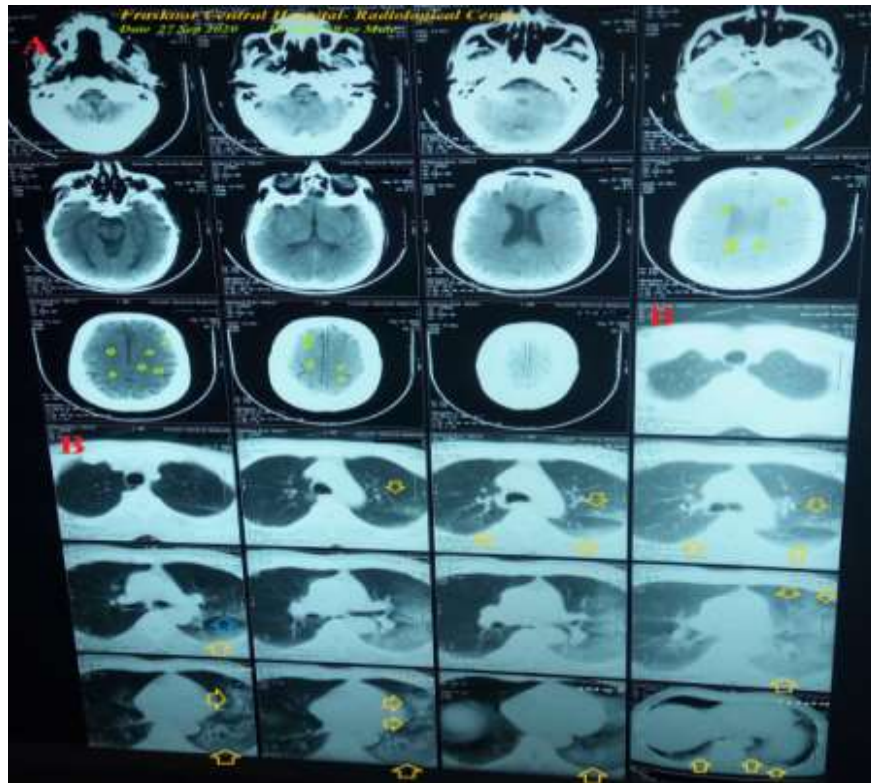


Figure 3(A): Brain CT without contrast was done during the day of hospital admission showing lacunar infarction (lime arrows). (B). Chest CT without contrast was done during the day of hospital admission showing destructive left ground-glass opacities (yellow arrows) with reversed halo sign (blue arrows).

Discussion

Overview:

A 69-year-old married worker Egyptian male patient was presented to the emergency department with COVID-19 pneumonia, ischemic heart disease, lacunar infarction, hyperkalemia, hypocalcemia, and hyponatremia.

The primary objective for my case study was the presence of a patient who presented with COVID-19 pneumonia, ischemic heart disease, lacunar infarction, hyperkalemia, hypocalcemia, and hyponatremia in the ICU.

The secondary objective for my case study was the **question** of; how did you manage the case at home?

There was a history of contact with a confirmed COVID-19 case. The presence of confirmed COVID-19 case, left-side ground-glass consolidation, and laboratory COVID-19 suspicion on top of clinical COVID-19 presentation will strengthen the COVID-19 diagnosis.

Interestingly, chronic renal impairment with tachypnea due to COVID-19 plays an essential role in the present hyperkalemia and hypocalcemia.

Elderly male sex, heavy smoker, COVID-19 pneumonia, cerebrovascular stroke, chronic renal impairment, ischemic heart disease, hypokalemia, hypocalcemia, and hyponatremia are risk factors.

QTc prolongation was the most probable electrocardiographic differential diagnosis for the current case study. but the QT interval in hypocalcemia rarely exceeds 140% of the normal⁵.

I can't compare the current case with similar conditions. There are no similar or known cases with the same management for near comparison.

The only limitation of the current study was the unavailability of serial workup.

Conclusion and Recommendations

- The understanding of electrocardiographic signs regarding metabolic disorders such as electrolytes imbalance and other associated systemic diseases is very important..

- Elderly male sex, heavy smoker, COVID-19 pneumonia, cerebrovascular stroke, chronic renal impairment, ischemic heart disease, hypokalemia, hypocalcemia, and hyponatremia represent bad prognostic points and is indicating a high-risk condition.

Conflicts of interest

There are no conflicts of interest.

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Abbreviations

COVID-19: Coronavirus disease 2019

ECG: Electrocardiogram

ED: Emergency department

ICU: Intensive care unit

O2: Oxygen

SGOT: Serum glutamic-oxaloacetic transaminase

SGPT: Serum glutamic-pyruvic transaminase

VR: Ventricular rate

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