



COVID Pneumonia with Immune Thrombocytopenic Purpura and Some Novel Strange Graduated Electrocardiographic T-Wave Abnormalities, Clinical Impact and Interpretation

Yasser Mohammed Hassanain Elsayed^{1*}

¹Critical Care Unit, Kafr El-Bateekh Central Hospital, Damietta Health Affairs, Egyptian Ministry of Health (MOH), Damietta, Egypt

Corresponding Author: Yasser Mohammed Hassanain Elsayed

Address: Critical Care Unit, Kafr El-Bateekh Central Hospital, Damietta Health Affairs, Egyptian Ministry of Health (MOH), Damietta, Egypt; Email: dryaser24@yahoo.com

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Abstract

Rationale: Immune thrombocytopenic purpura may be associated with severe acute respiratory syndrome (SARS) or Coronaviruses. Probably fatal outcome for the disease has a remarkable effect on morbidity and mortality. T-wave is the positive deflection post-each QRS-complex. Physiologically, it represents ventricular repolarization.

Patient concerns: A 66-year-old, teacher, married male, Egyptian patient was presented to the physician outpatient clinic with COVID-19 pneumonia with thrombocytopenia and abnormal T-wave.

Diagnosis: COVID pneumonia with immune thrombocytopenic purpura and novel T-wave graduation.

Interventions: Non-contrast chest CT, electrocardiography, oxygenation, and echocardiography.

Outcomes: Good response and better outcomes despite the presence of numerous remarkable risk factors were the results.

Lessons: The association of COVID pneumonia with immune thrombocytopenic purpura and novel T-wave graduation is highly interesting. An elder age, male sex, COVID-19 pneumonia, and immune thrombocytopenic purpura are constellation serious risk factors. Touching radiological variant pericardial injury with mild hypokalemia maybe interpret the novel T-wave graduation.

Keywords

COVID-19 Pneumonia, Thrombocytopenia, T-Wave Inversion, Novel T-Wave Graduation, Touching Radiological Variant Pericardial Injury

Abbreviations

CAD: Coronary Artery Disease; COVID-19: Coronavirus Disease 2019; ECG: Electrocardiogram; ICU: Intensive Care Unit; ITP: Immune Thrombocytopenic Purpura; O₂: Oxygen; POC: Physician Outpatient Clinic; SGOT: Serum Glutamic-Oxaloacetic Transaminase; SGPT: Serum Glutamic-Pyruvic Transaminase; VR: Ventricular Rate

Introduction

Immune thrombocytopenic purpura (ITP) is an isolated autoimmune thrombocytopenic disorder. Viruses such as HIV, MCV, EBV, parvovirus, rubella, and measles are already identified as triggering factors for the autoimmune process [1]. Indeed, there were reports for the associated relationship between ITP in coronavirus (COVID-19) infection. ITP is characterized by isolated thrombocytopenia (PLT <100,000/ μ l) secondary to autoimmune destruction of platelets or inhibition of synthesis. It varies from mild to severe disease with lethal sequelae. The severe form includes bleeding requiring treatment which usually occurs with a platelet count <20,000/ μ l. ITP may present acutely or chronically; the chronic form is defined as thrombocytopenia of more than 6 months' duration since initial clinical presentation [1]. The precise mechanism of ITP is still unclear.

Several hypotheses interpret that viral infection triggers the disease after which preformed antibodies cross-react with platelet antigens [2]. COVID-19 infection has been associated with the severe acute respiratory syndrome (SARS). Lymphocytopenia and thrombocytopenia are common hematological abnormalities in SARS patients. Autoimmune antibodies or immune complexes triggered by viral infection may represent a remarkable role in causing thrombocytopenia, SARS-CoV has a direct effect in infection of hematopoietic stem or progenitor cells, megakaryocytes, and platelets for their growth inhibition and apoptosis [1].

The electrocardiographic (ECG) T-wave is the positive deflection post-each QRS-complex. Physiologically, it represents ventricular repolarization [3]. The normal T-wave characteristics are; upright in all leads except aVR and V₁, amplitude < 5mm in limb leads, < 10mm in precordial leads (10mm males, 8mm females), and duration relates to QT-interval [3]. T-wave abnormalities either peaked, hyperacute, inverted, biphasic, 'Camel-Hump', or flattened T-waves [3]. So, T-waves are normally, upright in all leads, except aVR, aVL, III, and V₁ lead. The highest amplitude of the T-wave is occurring at V₂ and V₃ leads. The T-wave shape is mostly asymmetrical has a rounded peak. T-wave inversions from V₁ to V₄ leads

are frequently found and normal in children. In normal adults, T wave inversions are less commonly found but can be normal from V₁ to V₃ [4].

The T-wave depth carries a progressive shallow form from one to the next lead [5]. The T-wave height should not exceed 5 mm in limb leads and more than 10 mm in precordial leads [4]. However, ST-segment and T-wave abnormalities are the keys to the abnormalities of the ventricular repolarization or depolarization [5]. Inverted T-wave is considered abnormal if inversion is deeper than 1.0 mm. The presence of inverted T-waves in leads other than the V₁ to V₄ leads is associated with increased cardiac deaths. Inverted T waves accompanied by cardiac chest pain or cardiac murmur are highly suggestive of coronary artery disease (CAD) [4]. Biphasic T-waves move in opposite directions.

The two main causes of these waves are CAD and potassium deficit [5]. T-wave is considered flat when the wave varies from -1.0 mm to + 1.0 mm in height. Hypokalemia or digitalis therapy can cause flattened T-wave with a prominent U-wave. With marked hypokalemia, the T-wave becomes more flattened while U-wave becomes more prominent, with progressively deeper ST-segment depression. In digitalis toxicity, sagging QT-interval, flattened T-wave, and prominent U-wave with a shortened QT-interval are commonly seen adverse effects [5].

Case Presentation

A 66-year-old, businessman, married, Egyptian male patient was presented to the physician outpatient clinic (POC) with fever, dry cough, and generalized body aches. Fatigue, anorexia, and loss of smell were associated symptoms. The patient started to complain for 4 days. There is a recent contact with a confirmed case of COVID-19 pneumonia 12 days ago. The patient denied a history of other relevant diseases, drugs, or other special habits. Informed consent was taken. Upon general physical examination; generally, the patient was restless, distressed, with generalized petechial rash, a regular pulse rate of VR; 79 bpm, blood pressure (BP) of 100/60 mmHg, respiratory rate of 19 bpm, the temperature of 39.2 °C, and pulse oximeter of oxygen (O₂) saturation of 93%.

Case Report

Currently, the patient was managed at home to COVID-19 pneumonia with thrombocytopenia. Initially, the patient was treated with O₂ inhalation by O₂ cylinder (100%, by nasal cannula, 5L/min; as needed). The patient was maintained treated with Ringer solution (500ml; TDS), normal saline 0.9% (500ml; TDS) cefotaxime; (1000 mg IV every 8hours),

azithromycin tablets (500 mg, OD), oseltamivir capsules (75 mg, BID only for 5 days), and paracetamol (500 mg IV every 8 hours as needed). SC enoxaparin 80 mg, BID), aspirin tablet (75 mg, OD), clopidogrel tablets (75 mg, OD), and hydrocortisone sodium succinate (100 mg IV every 12 hours).

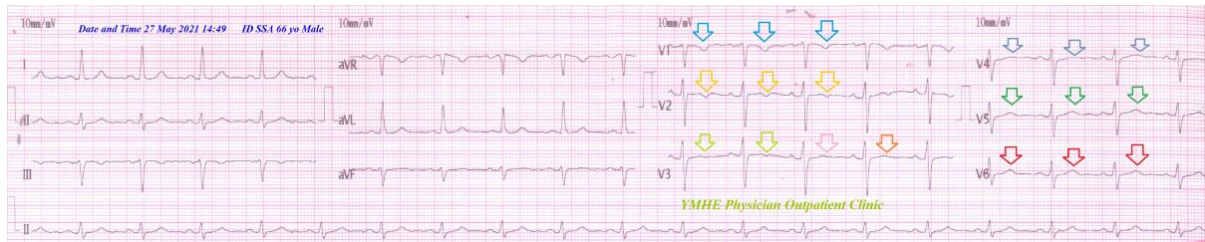


Fig-1:

ECG tracing was done on the day of the presentation to the POC showing NSR of VR; 79. There are graduated T-wave abnormalities; started with T-wave inversion in V1 lead (light blue arrows), mild T-wave inversion in V2 lead (yellow arrows), slight T-wave inversion in the first 2 beats of V3 (lime arrows), flat T-wave in the third beat in V3 lead (rose arrow), slight upright T-wave in the fourth beat in V3 lead (orange arrow), mild upright T-wave in V4 (dark blue arrow), moderate upright T-wave in V5 (green arrow), to finally usual upright T-wave in V6 lead (red arrow).

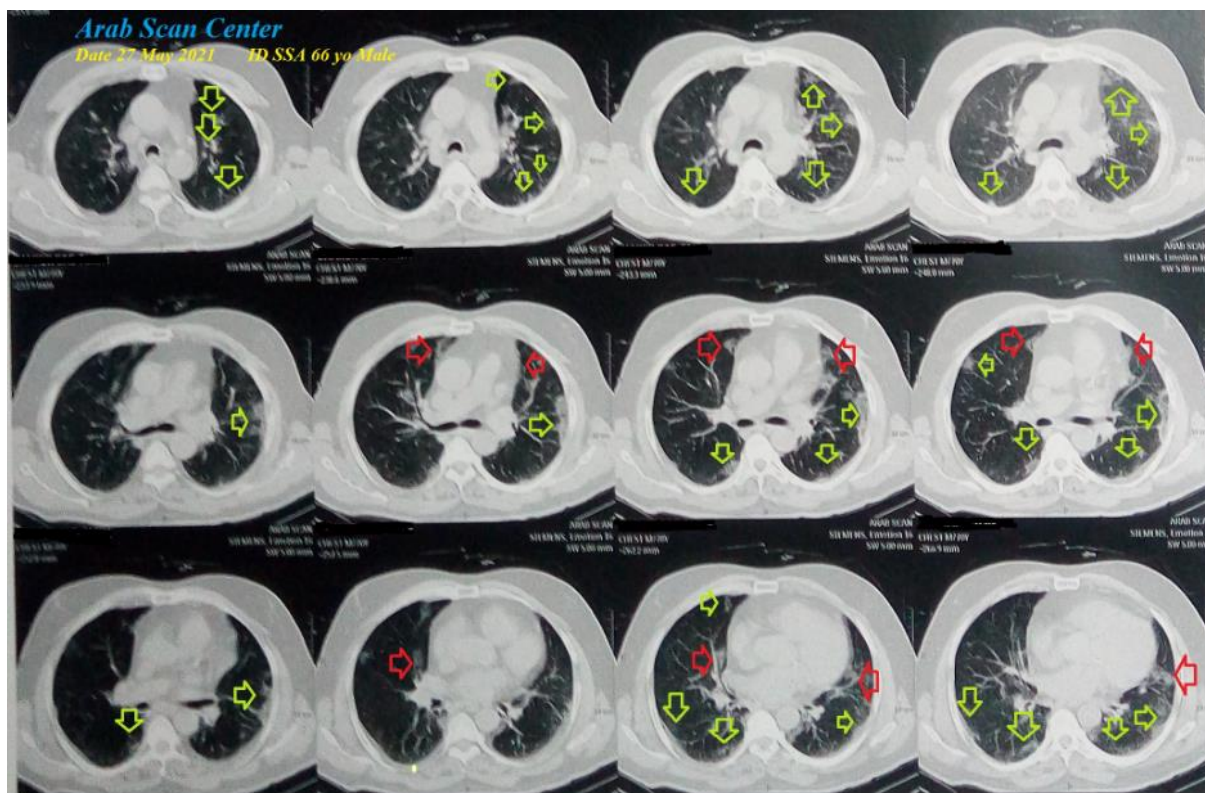


Fig-2:

Chest CT without contrast was done on the day of the presentation to the POC showing multiple bilateral variable-sized ground-glass opacities in posterior, basal, pleural, and sub-pleural segments (lime arrows). There are multiple variable-sized ground-glass opacities in the pericardial surface (red arrows).

Case Report

The patient was daily monitored for temperature, pulse, blood pressure, ECG, and O₂ saturation. The initial ECG tracing was done on the day of the presentation to the POC showing NSR of VR; 79. There are graduated T-wave abnormalities; started with T-wave inversion in V1 lead, mild T-wave inversion in V2 lead, slight T-wave inversion in the first 2 beats of V3, flat T-wave in the third beat in V3 lead, slight upright T-wave in the fourth beat in V3 lead, slight upright T-wave in the fourth beat in V3 lead, mild upright T-wave in V4 lead, moderate upright T-wave in V5 lead, to finally usual upright T-wave in V6 lead (Fig-1).

Chest CT without contrast was done on the day of the presentation to the POC showing multiple bilateral variable-sized ground-glass opacities in posterior, basal, pleural, and sub-pleural segments. There are multiple variable-sized ground-glass opacities in the pericardial surface (Fig-2). The abdominal ultrasound was within normal. Laboratory workup was done during the third day of the presentation. The initial complete blood count (CBC); Hb was 12 g/dl, RBCs; $4.49 \times 10^3/\text{mm}^3$, WBCs; $5.07 \times 10^3/\text{mm}^3$ (Neutrophils; 70 %, Lymphocytes: 21%, Monocytes; 7%, Eosinophils; 2% and Basophils 0%), and Platelets; $47 \times 10^3/\text{mm}^3$. S. ferritin was high (642 ng/ml). D-dimer was normal (0.2 ng/ml). CRP was high (48 g/dl). LDH was high (299/L). SGPT was slightly high (51 U/L), SGOT was normal (40 U/L). Serum albumen was normal (3.6 gm/dl). PTT was normal (28 sec), PT was normal (13 sec), and INR was normal (1.1%). Serum creatinine was normal (0.8 mg/dl) and blood urea was high (62.8 mg/dl). RBS was high (308 mg/dl). Plasma sodium was normal (138mmol/L). Serum potassium was mild low (3.3 mmol/L). Ionized calcium was normal (1.22 mmol/L). The troponin test was negative (0.04 U/L). Serological tests for both HBV and HCV were negative.

Echocardiography was done during the sixth day of the presentation with EF; 67 % showed no detected abnormalities. COVID pneumonia with immune thrombocytopenic purpura and novel T-wave graduation was the most probable diagnosis. The patient was dramatically and symptomatically improved within 12 days of management. The patient

was advised for further cardiac, infectious, and hematological follow-up.

Discussion

Overview:

A 66-year-old, teacher, married male, Egyptian patient was presented to the POC with COVID pneumonia with idiopathic thrombocytopenic purpura and electrocardiographic T-wave abnormalities.

- The primary objective for my case study was the presence of COVID pneumonia with idiopathic thrombocytopenic purpura and electrocardiographic T-wave abnormalities at home?
- Interestingly, the presence of the positive history of contact with a confirmed COVID-19 case, bilateral ground-glass consolidation, and laboratory COVID-19 suspicion on top of clinical COVID-19 presentation with fever, dry cough, generalized body aches, anorexia, and loss of smell will strengthen the higher suspicion of COVID-19 diagnosis.
- A novel T-wave graduation is a newly described term. There is no known mechanism.
- Touching radiological variant pericardial injury has seen parallel with the novel T-wave graduation.
- ITP is diagnosed by excluding other diseases [6]. COVID-19 pneumonia is a possible cause.
- The hallmark of ITP is isolated thrombocytopenia with no anemia and/or neutropenia [6].
- Diagnosis of this type of pseudo-thrombocytopenia based on there are normal platelet counts on repeated on a sample of heparin-anticoagulated or citrate-anticoagulated blood [6].
- Corticosteroids are still the drug of choice for the initial management of acute ITP, especially in the life-threatening thrombocytopenia or when the response in the platelet count is needed in emergent conditions [7]. Intravenous immunoglobulin is the second drug of choice for some patients, such as when a rapid increase in platelet count is important [8].
- Pseudothrombocytopenia was the most probable differential diagnosis for the current case study.

Case Report

Clumps of platelets are seen on using a peripheral smear that is prepared on ethylenediaminetetraacetic acid (EDTA) of anticoagulated blood [9].

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 bone marrow aspirate or biopsy and splenic biopsy [6].

Conclusion and Recommendations

- The association of COVID pneumonia with immune thrombocytopenic purpura and novel T-wave graduation is highly interesting.
- Touching radiological variant pericardial injury with mild hypokalemia maybe interpret the novel T-wave graduation.
- An elder age, male sex, COVID-19 pneumonia, and immune thrombocytopenic purpura are constellation serious risk factors.

Conflicts of Interest

There are no conflicts of interest.

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