A CASE REPORT OF PLATELETS PHAGOCYTOSIS BY PERIPHERAL BLOOD MONOCYTES IN A PATIENT WITH SEPSIS

Nguyen Long Quoc*, Phan Tran Xuan Quyen
Can Tho University of Medicine and Pharmacy Hospital
**Corresponding author: nlquoc@ctump.edu.vn*

ABSTRACT

Background*: Monocyte plays a crucial role in phagocytosis. This case report describes a 50-year-old female patient with septicemia who manifested leucocytosis with neutrophilia and severe anemia during her infection course. The peripheral blood examination strikingly showed platelet phagocytosed by the monocytes.* ***Methods:*** *patient's peripheral blood sample was obtained, spread, and stained with Giemsa solution, then examined under light microscopy.* ***Results:*** *several images of platelet phagocytosis by the monocytes were observed.* ***Conclusions:*** *platelet phagocytosis by monocytes can rarely be observed in peripheral blood in infective and inflammatory states such as sepsis, malignant diseases, and especially hemophagocytic syndrome. To our best knowledge, our finding may be the first time reported in Can Tho.*

Keywords: *platelet phagocytosis, hemophagocytic syndrome, hemophagocytic lymphohistiocytosis*

I. INTRODUCTION

The monocyte is the giant white blood cell in peripheral blood. It has an irregular nucleus and opaque greyish-blue cytoplasm with fine azurophilic granules; vacuoles may sometimes be seen [2]. Monocytes are derived from common granulocytic-monocytic precursors, then differentiate into macrophages which reside in tissues such as the liver, lung, brain, etc. Monocytes and macrophages play a crucial role in phagocytosis, antigen presentation, and immunomodulation [9], [3]. As indicated by its name, the platelet or thrombocyte, participates mainly in the hemostasis process [9]. Platelets also originated from granulocytic-monocytic precursors. Its morphology is a small discoid-shaped cell containing multiple fine azurophilic granules [2].

Since monocytes are phagocytic, they are occasionally found to have ingested blood cells [2]. Here we report a patient with septicemia and severe systemic inflammatory response syndrome who presented strikingly platelet phagocytosis in peripheral blood.

II. CASE REPORT

A 50-year-old female patient who had recently been discharged from the cardiovascular hospital for about ten days with the diagnosis of pneumonia and diabetes

type II was admitted to our institution because of new-onset fatigue. She reported a loss of appetite, dysuria, oliguria, the feeling of tiredness, and irritation. On physical examination, she was alert but lethargic and appeared pale. The vital signs showed a blood pressure of 120/70 mmHg, a heart rate of 120 beats per minute, a respiratory rate of 22 breaths per minute, and a peripheral oxygen saturation of 94% on 2 liters of oxygen. Her body temperature at admission was 37^0C, reaching a peak of 39.5^0C during the hospitalization. Neurologic, pulmonary, and cardiac examination was regular except for the tachycardia. There was no hepatosplenomegaly or lymphadenopathy palpable.

Complete blood count showed a leukocytosis with a white blood count of 13.6 x 10^9/L, absolute neutrophil count of 11 x10^9/L; hemoglobin level of 5.9 g/dL, which was compatible with severe anemia; platelet count in the normal range of 158 x10^9/L. On blood smear, the doctor observed several images of platelet phagocytosis. Coagulation tests showed a prothrombin time at 94% (normal range 70 - 120%), activated partial thromboplastin time at 49 seconds (control 39.5 seconds), fibrinogen at 5.45 g/L (normal range 2 - 4 g/L).

Biochemistry results revealed a marked increase of CRP at 345.4 mg/L (normal range < 0.5 mg/L), procalcitonin at 66.42 ng/mL (normal range < 0.05 ng/mL), creatinine at 185 µmol/L (normal range 44 - 110 µmol/L), glucose at 24.4 mmol/L (normal range 3.8 - 6.1 mmol/L), HbA1c at 10.5% (normal range 4.8 - 6.0%), ferritin at 3,100 ng/mL (normal range 12 - 300 ng/mL) whilst serum iron level at 2.8 µmol/L (normal range 4.48 - 27.92 µmol/L), triglyceride at 2.5 mmol/L (normal range < 1.7 mmol/L). Liver function tests were in normal range. Electrolyte tests depicted a severe hyponatremia at 116 mmol/L (normal range 134 - 145 mmol/L). Urinalysis showed a leukocyte count at 500 cells/µL (normal range: absent), red blood cell count at 300 cells/µL (normal range: absent), nitrite was negative. Blood and urine cultures yielded negative results.

On diagnostic imaging, the chest x-ray did not show any abnormalities; abdominal ultrasound showed mild hepatomegaly and splenomegaly.

A diagnosis of severe sepsis with acute organ dysfunction due to gram-negative septicemia, final identification pending and diabetes mellitus type II was made. The patient was treated with combined antibiotic therapy and supportive care, including blood transfusion and insulin therapy. She responded drastically and was discharged from the hospital after ten days.

III. METHODS AND RESULTS

3.1. Methods

2 mL of EDTA peripheral blood sample was obtained. Two blood smears were prepared and stained with Giemsa 10% solution for 30 minutes. The blood smears were left dry naturally and interpreted under light microscopy model Nikon E-200 from Japan by authors and then reviewed by a senior hematologist of the laboratory department.

On blood smear examination, three blood cell lineages composed of white blood cells, red blood cells, and platelets were evaluated thoroughly about quantity and morphological changes, if any.

3.2. Results

Microscopic evaluation of the peripheral smears revealed features of ongoing infection including left-shifted neutrophilia, band, and hypersegmented neutrophils, red cells rouleaux formation, occasional large platelets, and nucleated red cells. The most striking findings were the platelets phagocytosed by monocytes (**Figures 1 and 2**), which were found in several places of both smears. We also noticed normal monocytes without phagocytosis.

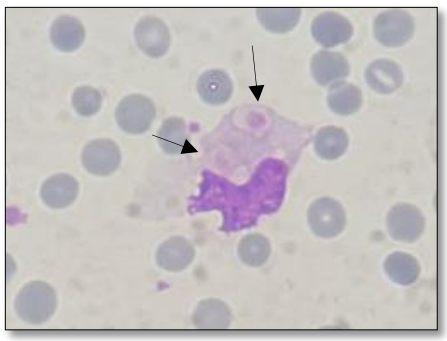

Figure 1. Monocyte phagocytosed 2 platelets (arrow), Giemsa stain, x1000.

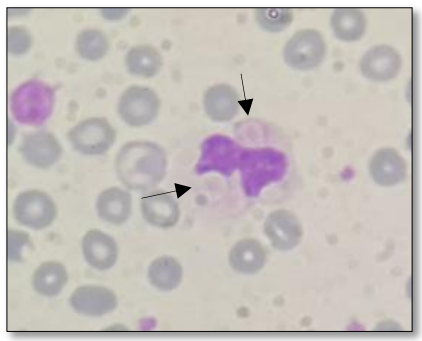

Figure 2. Monocyte phagocytosed 2 platelets (arrow), Giemsa stain, x1000.

IV. DISCUSSION

Based on the findings of severe infection, hepatosplenomegaly, anemia, hyperferritinemia, hypertriglyceridemia, and platelets phagocytosis, a diagnosis of infection-associated hemophagocytic lymphohistiocytosis (HLH) was initially suggested. As she almost fulfilled five over eight criteria of HLH, which are the following: 1. Fever, 2. Splenomegaly, 3. Cytopenias (affecting ≥ 2 of 3 lineages in the peripheral blood: hemoglobin < 9 g/dL, platelets < 100 $x10^9$/L, neutrophils < 1.0 $x10^9$/L), 4. Hypertriglyceridemia and/or hypofibrinogenemia (fasting triglycerides ≥ 3.0 mmol/L, fibrinogen ≤ 1.5 g/L), 5. Hemophagocytosis in bone marrow or spleen or lymph nodes, no evidence of malignancy, 6. Low or no NK (natural killer) cell activity (according to local laboratory reference), 7. Ferritin ≥ 500 ng/mL, 8. sCD25 (ie, soluble IL-2 receptor) ≥ 2400 U/mL [8]. We could not perform NK cell activity or measure the sCD25 level due to the lack of facilities. The patient has introduced to antibiotic therapy immediately. Regarding the rapid response and recovery of the patient just after ten days, we, therefore might discriminate severe sepsis from HLH since infection-associated HLH treatment would have required more intensive measures with high-dose corticosteroids ± immunoglobulin or even chemotherapy combination [8].

Hemophagocytosis is seen more frequently in liver, spleen, or bone marrow biopsy [5]. The frequency of hemophagocytosis in the peripheral blood is unknown [5] but might be extremely rare [2]. Platelets phagocytosis by peripheral blood monocytes has been occasionally described in the case of HLH [5], [7], EDTA-dependent phagocytosis [4], malignancies [2], and septicemia [1]. In comparison with a publication by Kay A. Criswell in 2001, who reported a case of EDTA-dependant phagocytosis in which platelet phagocytosis was seen in both neutrophils and monocytes due to the presence of EDTA-

induced platelet autoantibodies resulting in a pseudo-thrombocytopenia [4]. Our case may therefore more likely correspond to septicemia than EDTA-dependent phagocytosis.

V. CONCLUSIONS

Platelets phagocytosis by monocytes can rarely be observed in peripheral blood in infective and inflammatory states such as sepsis, malignant diseases, and especially hemophagocytic syndrome. Cautious blood smear examination in these cases may contribute to making a soon and appropriate diagnosis.

REFERENCES

1. Expanded Immunization Project and Ministry of Health (2012), *Achievements of 25 years of Expanded Immunization in Vietnam*.
2. Antonio Coppola, Sreedhar Rao (1982), Phagocytosis of Monocytes and Platelets in a Neutropenic Infant with Septicemia, *Annals of clinical and laboratory science*, 12 (6), pp. 471-476.
3. Barbara J. Bain (2015), *Blood cells - A practical guide*, 5th edition, Wiley Blackwell, pp. 130-134.
4. C. Dale, Laurence Boxer, W. Conrad Liles (2008), The phagocytes: neutrophils and monocytes, *Blood*, 112 (4), pp. 935-945.
5. A. Criswell, Michael A. Breider, Michael R. Bleavins (2001), EDTA-Dependent Platelet Phagocytosis - A Cytochemical, Ultrastructural, and Functional Characterization, *Am J Clin Pathol 2001*, 115, pp. 376-384.
6. Kiyofumi Hagiwara, Masakazu Sawanobori et al (2006), Reactive hemophagocytic syndrome in a case of systemic lupus erythematosus that was diagnosed by detection of hemophagocytosing macrophages in peripheral blood smears, *Mod Rheumatol (2006)*, 16, pp. 169-171.
7. Kui Hyun Yoon (2013), A Case of Platelet Satellitism with Platelet Phagocytosis by Neutrophils and Plateletneutrophil Agglutination, *Lab Med Online*, 3 (4), pp. 259-263.
8. Manujasri Wimalachandra, Lallindra Gooneratne (2019), Platelet phagocytosis by a peripheral blood monocyte in a patient with haemophagocytic lymphohistiocytosis, *ASH Image bank*, American Society of Hematology, USA.
9. Paul La Rosee, AnnaCarin Horne et al (2019), Recommendations for the management of hemophagocytic lymphohistiocytosis in adults, *Blood*, 133 (23), pp. 2465-2477.
10. Richard Coico, Geoffrey Sunshine (2015), *Immunology - A short course*, Wiley Blackwell, pp. 13-16.

(Received: 15/01/2022 – Accepted:15/07/2022)