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CASE REPORT

Association of platelet satellitism with immune thrombocytopenia: A case report and review of literature

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Abstract

Platelet satellitism refers to the rosetting of the platelets around white blood cells, mostly neutrophils that could lead to spuriously low platelet counts on automated analyzers. The phenomenon has usually been described in EDTA processed blood samples. We describe the clinical course of a patient with immune thrombocytopenia with platelet satellitism in both EDTA as well as non EDTA processed blood samples. We also review the literature describing two other reports of the platelet satellitism in patients with immune thrombocytopenia. We also reference the literature describing the heterogeneity of the presence of platelet satellitism in different clinical and laboratory settings.

KEYWORDS
immune-mediated thrombocytopenia, platelets, platelet satellitism, thrombocytopenia

1 | INTRODUCTION

Platelet satellitism is a rare in vitro phenomenon that refers to the rosetting or clumping of the platelets around white blood cells mostly neutrophils [1]. This could lead to spuriously low platelet count on the automated analyzers. If not considered and corrected this could lead to excessive and unnecessary laboratory work up as well as the institution of management plans that could have adverse implications for the patient care [2, 3].

Possible mechanisms that have been described in the literature for the platelet satellitism include the formation of IgG antibodies with reactivity against glycoprotein IIb/IIIa receptors on the platelet membranes and FcγIII receptors of neutrophils leading to the adhesion of the platelets to neutrophils in the presence of EDTA at room temperature [4]. However, other non-immunogenic mechanisms proposed include the adherence of the platelets and neutrophils mediated by thrombospondin or the alpha granule protein of platelets [5].

This is important as some of the implicating antibodies in patients with immune-mediated thrombocytopenia also have the specificity for the receptor glycoprotein IIb/IIIa. In the literature, to the best of our knowledge, we were able to find only two descriptions of platelet satellitism in patients with Immune Thrombocytopenia (ITP) [6, 7]. Here, we describe the presence of platelet satellitism in a patient diagnosed with ITP who was found to have spuriously low platelet counts. We also provide examples from the literature emphasizing the heterogeneity of this phenomenon in different laboratory and clinical settings.

2 | CASE PRESENTATION

A 55-year old, otherwise healthy gentleman was referred to our center due to the concern for a low platelet count noted on blood work performed as part of a routine health maintenance exam. The patient had been medically healthy otherwise and did not have any history of recent infections, weight loss, epistaxis, gum bleeds, joint aches or easy bruisability. The patient did not have any history of excessive alcohol intake and was also not on any prescribed medications and denied the use of any over-the-counter medications or supplements. The family

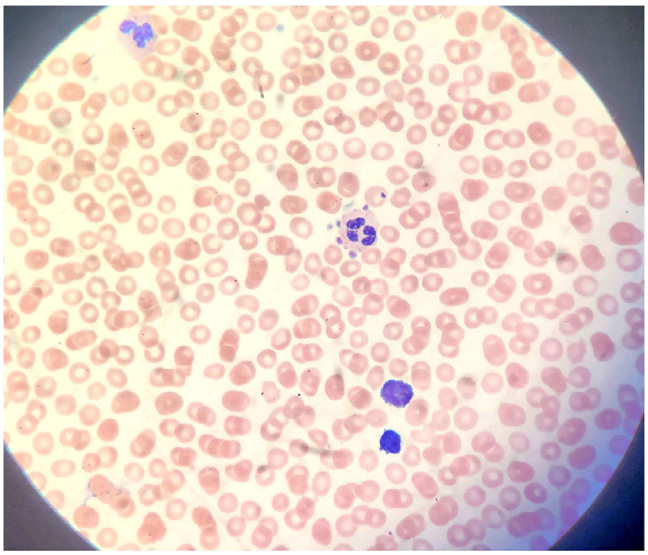

FIGURE 1 Microscopic image showing presence of platelet satellitism around neutrophil.

history was noncontributory. Blood work in the past during routine health maintenance exams had been normal. The patient described history of COVID vaccination about six months before the current presentation and had not received any other vaccinations recently. A detailed physical exam was largely unremarkable with no skin changes, lymphadenopathy, or splenomegaly.

A complete blood count performed on the initial visit showed a low platelet count of 25 × 103/μL with a normal white cell count of 8×10^3/μL with normal differentials and a hemoglobin level of 15 g/dL with normal Mean Corpuscular Volume (MCV) and other parameters. Serum chemistries including liver enzyme levels were normal. A review of the peripheral blood smear showed the presence of platelet satellitism. A manual platelet count was calculated by the examination of the stained peripheral blood smear under microscope while counting for the platelets around the neutrophils. The manual platelet count calculated counting for platelet satellitism was found to be 45 × 103/μL (Figure 1).

The decision was made to process the new blood samples with sodium citrate and heparin on the subsequent visits due to the known association of platelet satellitism with EDTA anticoagulant, however, the platelet satellitism persisted with comparable platelet counts readings on the automated analyzers on both sodium citrate and heparin processed blood samples and similarly platelet satellitism persisted even with processing of blood sample at 37°C.

Due to the low platelet counts even when accounting for platelet satellitism, the patient underwent a detailed workup to rule out any secondary causes of thrombocytopenia including viral serologies for hepatitis B, hepatitis C, HIV, laboratory screening for rheumatologic disorders as well as a bone marrow biopsy that was largely unremarkable. Due to the known association of immune thrombocytopenia with *Helicobacter Pylori* infection, a stool antigen testing was offered but was deferred by the patient.

Due to the detailed and largely negative work up for secondary causes of thrombocytopenia, a diagnosis of immune thrombocytopenia was made, and the patient was followed closely over the next several months.

Due to the platelet count of 16×10^3/μL during the subsequent follow-up visit, the patient received a dose of steroids and IVIG that led to a transient improvement in the platelet count, however, due to the side effects and the lack of clinical symptoms and the manual count being always above 10×10^3/μL, the decision was made to follow the patient at regular intervals with serial count checks without continuing any additional medications (Figure 2). The patient continues to be asymptomatic with no concerning symptoms and low but stable platelet counts at 24 months since the initial visit.

3 | DISCUSSION

Platelet satellitism refers to the rosetting of platelets around white blood cells usually neutrophils. This phenomenon was first described in 1963 by Field and Macleod in a 14-year old male patient [1]. Since its first description, multiple case reports in literature have described the presence of this phenomenon in both healthy individuals and patients with various hematologic and other medical disorders [8–12]. Platelet satellitism usually results due to the rosetting of platelets around neutrophils in EDTA processed blood samples and could lead to spuriously low platelet counts on automated analyzers. The incidental finding of platelet satellitism in patients could lead to unnecessary laboratory work up and management decisions that could have important implications for the patient care.

Possible mechanisms proposed for platelet satellitism include the formation of IgG antibodies with reactivity against platelet membrane receptors IIb/IIIA and neutrophil FcγIII receptors leading to the adhesion of the platelets to neutrophils particularly in the presence of the EDTA. EDTA leads to calcium chelation causing conformational change in the antigenic receptors causing resetting of the platelet and neutrophils by these antibodies. Other possible mechanisms include the nonimmunologic adherence mediated by thrombospondin or the alpha-granule protein of platelets [4, 5]. Physiologic studies of the platelets in patients with immune thrombocytopenia show them to be functionally normal [13].

Although mostly platelet satellitism is observed due to the adhesion of the platelets to the neutrophils, multiple case reports describe the presence of platelet satellitism around other white blood cells including exclusively around lymphocytes as well as multilineage involvement with satellitism observed around neutrophils, monocytes as well as lymphocytes in patients with different underlying diagnoses [10, 11, 14, 15].

To the best of our knowledge, we can identify only two case reports in the literature describing the association of platelet satellitism in patients with immune thrombocytopenia involving total of three patients [6, 7]. In these described reports, the platelet satellitism was observed only around neutrophils but interestingly persisted in both EDTA as well as citrate anticoagulated blood samples. In our

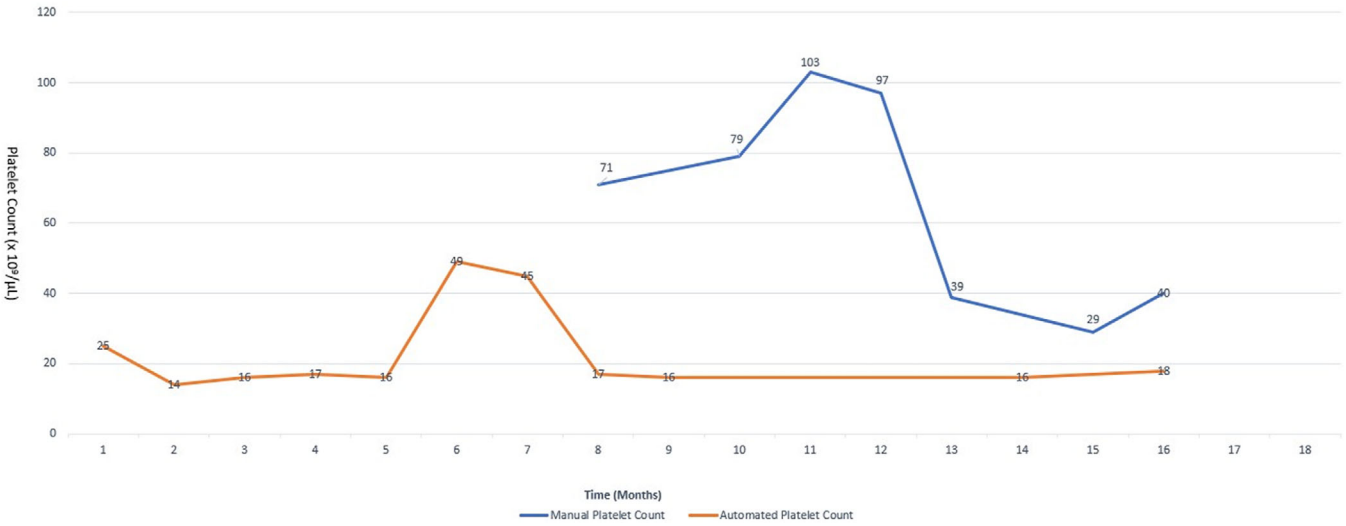

FIGURE 2 Graph showing difference in platelet count on automated versus manual analyses.

TABLE 1 Association of platelet satellitism with immune thrombocytopenia.

Patient's case	Reference	Underlying diagnosis	Patient's age/sex	Platelet satellitism	Autoantibodies to platelet glycoprotein receptor IIb/IIIa	Platelet satellitism observed with anticoagulants
1	[6]	Immune thrombocytopenia/Guillain-Barre syndrome	61/M	Present	Present	EDTA, citrate
2	[7]	Immune thrombocytopenia/psoriasis	55/F	Present	Present	EDTA, citrate
3	[7]	Immune thrombocytopenia/Evans syndrome	18/F	Present	Present	EDTA, citrate
4	Index case	Immune thrombocytopenia	55/M	Present	Not tested	EDTA, citrate, heparin

index patient with immune thrombocytopenia, we tested the patient's blood samples using EDTA, citrate, and subsequently heparin with persistence presence of platelet satellitism. Table I summarizes the individual patient characteristics describing the association of platelet satellitism with immune thrombocytopenia.

Some of the antibodies in patients with autoimmune thrombocytopenia are known to have specificity for the platelet receptor glycoprotein IIb/IIIa. Due to the common target of antibodies involved in the platelet satellitism and immune thrombocytopenia, patients with immune thrombocytopenia could have platelet satellitism that could persist irrespective of the use of the anticoagulant for the sample processing.

Our case highlights the occurrence of this rare phenomenon in a patient with immune thrombocytopenia and adds to the limited available literature about this rare finding. It also highlights the persistence of platelet satellitism in both EDTA as well as heparin and sodium citrate processed samples and corroborates the findings of the previous two studies [6, 7].

This case report and others also highlight the importance of the review of peripheral blood smears in patients with thrombocytopenia to rule out this rare phenomenon as the spurious cause of low platelet counts.

4 | CONCLUSION

Platelet satellitism is a rare phenomenon that could be present in varied clinical and laboratory settings. Platelet satellitism could lead to the spuriously low platelet counts and subsequent excessive diagnostic work up and interventions that could have implications for patient care. Platelet satellitism, although mostly described to be observed in EDTA processed blood samples, could be seen in blood samples processed in non EDTA anticoagulants in patients with immune thrombocytopenia based on limited available evidence. In any patients with new thrombocytopenia, it is important to review the peripheral blood smears to rule out the presence of platelet satellitism.

AUTHOR CONTRIBUTIONS

Steven Green was the primary physician involved in the initial care as well as the subsequent follow-up visits of the patient. Wali Junaid wrote the initial manuscript of the study and also did a literature review. Wali worked in collaboration with Green to create the final manuscript of the study. Shannon Robinson was involved in the initial care as well as the follow-up visits of the patient and helped coordinate during the various steps of the manuscript writing.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

FUNDING INFORMATION

No funding was used in the writing of this manuscript.

DATA AVAILABILITY STATEMENT

Due to the patient privacy and protected health information, the data for this study are only available upon request contingent upon institutional approval.

ETHICS STATEMENT

As per the institutional policy, due to the use of deidentified data used, this study was exempted from IRB approval.

CLINICAL TRIAL REGISTRATION

The authors have confirmed clinical trial registration is not needed for this submission.

PATIENT CONSENT STATEMENT

An informed consent was obtained from the patient in the writing of this manuscript.

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REFERENCES

1. Field EJ, MacLeod I. Platelet adherence to polymorphs. Br Med J. 1963;2(5353):388–89.
2. Bobba RK, Doll DC. Platelet satellitism as a cause of spurious thrombocytopenia. Blood. 2012;119:4100.
3. Kopcinovic LM, Pavic M. Platelet satellitism in a trauma patient. Biochem Med (Zagreb). 2012;22:130–34.
4. Bizzaro N, Goldschmeding R, von dem Borne AE. Platelet satellitism is Fc gamma RIII (CD16) receptor-mediated. Am J Clin Pathol. 1995;103:740–44.
5. Christopoulos C, Mattock C. Platelet satellitism and alpha granule proteins. J Clin Pathol. 1991;44:788–89.
6. Markewitz RDH, Falk KK. Platelet satellitism in immune thrombocytopenic purpura. Blood. 2022;140(19):2091.
7. Salama A. Autoimmune thrombocytopenia complicated by EDTA- and/or citrate-dependent pseudothrombocytopenia. Transfus Med Hemother. 2015;42:345–48.
8. Ghariani I, Braham N, Hamzaoui S, Bekir L. Platelet satellitism in autoimmune hemolytic anemia. Curr Res Transl Med. 2017;65:61–64.
9. Gupta V, Ahmad S, Chandra H, Shrivastava V. Platelet satellitism in chronic renal failure: an experimental study. J Nephropharmacol. 2015;1:13–15.
10. Latger-Cannard V, Debourgogne A, Montagne K, Plenat F, Lecompte T. Platelet satellitism and lympho-agglutination as presenting finding in marginal zone B-cell lymphoma. Eur J Hematol. 2009;83(1):81–82.
11. Cesca C, Ben-Ezra J, Riley RS. Platelet satellitism as presenting finding in mantle cell lymphoma: a case report. Am J Clin Pathol. 2001;115:567–70.
12. Kjeldsberg CR, Swanson J. Platelet satellitism. Blood. 1974;43:831–36.
13. Larson JH, Pierre RV. Platelet satellitism as a cause of abnormal hemalog D differential results. Am J Clin Pathol. 1977;68:758–59.
14. Lopez M, Sorigue M, Martinez A, Orna Montero E, Tejedor Ganduxé X, Leis Sestayo A, et al. Platelet satellitism around lymphocytes: case report and literature review. Int J Lab Hematol. 2019;41:81–83.
15. La Gioia A, Fiorini F, Fiorini M. Platelet satellitism: Just a laboratory curiosity? A case report of platelet satellitism with multilineage involvement. Ann Lab Med. 2022;42(5):606–8.

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