

Ethylenediaminetetraacetic Acid-Dependent Pseudothrombocytopenia Discovered During Preoperative Evaluation: A Case Report

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DOI: <https://doi.org/10.36347/sjmcr.2024.v12i11.002>

| Received: 24.09.2024 | Accepted: 31.10.2024 | Published: 02.11.2024

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Abstract

Case Report

Pseudothrombocytopenia (PTCP) can be caused by various factors, and misdiagnosing it as true thrombocytopenia can cause significant risks to the patient. When using ethylenediaminetetraacetic acid (EDTA) as an anticoagulant in a complete blood cell (CBC) test, EDTA-dependent PTCP can occur in approximately 0.1% to 0.2% of cases. Anesthesiologists review various medical findings during the preoperative evaluation process, one of which is the blood test results. PTCP can lead to unnecessary interventions or treatments before surgery, potentially harming the patient. This study presents a case of PTCP discovered during preoperative evaluation of a patient diagnosed with pancreatic cancer. As anesthesiologists, ensuring the optimal condition of the patient before surgery is paramount, and this case highlights the importance of proper management and in-depth consideration when encountering patients suspected of having PTCP.

Keywords: Case report, Ethylenediaminetetraacetic acid, General anesthesia, Pre-anesthetic evaluation, Pseudothrombocytopenia.

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INTRODUCTION

Pseudothrombocytopenia (PTCP) can result from various causes, including Ethylenediaminetetraacetic acid (EDTA)-dependent PTCP, platelet aggregation, and issues in sample handling. Misdiagnosing this condition as true thrombocytopenia can lead to significant risks for the patient. In particular, EDTA-dependent PTCP accounts for approximately 0.1% to 0.2% of all PTCP cases and can be detected during blood tests that use EDTA as an anticoagulant. EDTA-dependent PTCP occurs due to a change in the glycoproteins on the surface of platelets after the use of EDTA, which leads to the binding of autoantibodies. This causes platelet aggregation, making it appear as though platelet counts are reduced in a complete blood cell (CBC) test [1]. Anesthesiologists conduct preoperative assessments to prepare patients for surgery, reviewing results from various tests such as blood tests, electrocardiograms, and imaging studies. Sometimes, the data recorded by the machine or the physician's findings are trusted without further verification, and the preoperative preparation is conducted accordingly. However in rare cases, severe thrombocytopenia is observed in blood tests that use EDTA anticoagulants. Misdiagnosing this as true

thrombocytopenia can result in unnecessary tests or treatments. From an anesthesiologist's perspective, this may lead to unnecessary drug administration or platelet transfusion. Therefore, this study reports a case of EDTA-dependent PTCP diagnosed in a pancreatic cancer patient scheduled for a pancreaticoduodenectomy. Through this study, we aim to contribute to preventing unnecessary interventions and mitigating potential risks to the patient during the preoperative preparation process.

CASE REPORT

This study was conducted with the approval and the requirement for informed consent was waived by the Institutional Review Board of the Presbyterian Medical Center (IRB no. E2023-04).

A 61-year-old male patient presented to the emergency room with jaundice that had started 3 to 4 days prior. The patient had no significant underlying diseases, and a routine blood test using EDTA performed in the emergency room showed no abnormal findings. Abdominal and pelvic contrast-enhanced computed tomography was subsequently performed, which raised suspicion of pancreatic cancer. Further evaluation with

Citation: Changhwan Oh, Hyun Joo Heo, Yu Yil Kim. Ethylenediaminetetraacetic Acid-Dependent Pseudothrombocytopenia Discovered During Preoperative Evaluation: A Case Report. Sch J Med Case Rep, 2024 Nov 12(11): 1843-1846.

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pancreatic magnetic resonance imaging revealed a hypovascular tumor approximately 3.9 cm in size, presumed to originate from the uncinate process. The patient underwent an endoscopic ultrasound and pancreatic biopsy with esophagogastroduodenoscopy (EGD) and endoscopic retrograde cholangiopancreatography (ERCP), and endoscopic retrograde biliary drainage placement was performed. Following this, a blood test using sodium citrate revealed decreased hemoglobin (9.8 g/dl) and hematocrit (29.9%), prompting a transfusion of one unit of 400 ml packed red blood cells and hemostasis via EGD. Coagulation tests showed normal results with an activated partial thromboplastin time (aPTT) of 24.9 seconds, prothrombin time (PT) of 8.6 seconds, PT (%) of 103%, and an INR of 0.96. There were no adverse reactions during the transfusion process, and hemostasis was successfully performed. The patient was referred to the hepatobiliary and pancreatic surgery department for surgery based on the biopsy results. Five days before the scheduled surgery, a routine blood test using EDTA showed a hemoglobin of 9.3 g/dl, hematocrit of 29.0%, and a platelet count of 5,000/ μL , with other results within normal ranges (Fig 1). The laboratory department recommended comparing the results with a sodium citrate test and conducting a peripheral blood smear. Using the same blood sample, the sodium citrate test results showed hemoglobin of 8.5 g/dl, hematocrit of 26.4%, and a platelet count of 207,000/ μL (Fig 1). Coagulation tests again showed normal results. A peripheral blood smear using EDTA showed normal red blood cells and white blood cells but multiple findings of

platelet clumping. Based on these findings, the laboratory department diagnosed PTCP and recommended referencing the platelet count from the sodium citrate blood test results.

In the preoperative examination conducted one day before surgery, the platelet count measured in the EDTA tube remained low at 2,000/ μL , but the count was normal at 277,000/ μL in the sodium citrate tube (Fig. 1). The peripheral blood smear continued to show platelet clumping, as seen five days before the surgery. Based on these preoperative results, the anesthesiologist prepared the patient for general anesthesia.

No additional interventions or medications were administered before anesthesia. Upon the patient's arrival at the operating room, the blood pressure was 157/97 mmHg, heart rate 61 bpm, oxygen saturation 99%, and body temperature 36.2 °C. Invasive arterial pressure monitoring was conducted via the left radial artery, and a central venous catheter was inserted into the right subclavian vein. Anesthesia induction was initiated with 120 mg of propofol and target-controlled infusion of remifentanyl, with neuromuscular blockade induced by 60 mg of rocuronium. No significant hemodynamic instability, abnormal or excessive bleeding occurred during the surgery, and no additional medications or transfusions were required.

Postoperatively, the patient was transferred to the intensive care unit. The results of blood tests performed serially after surgery were as follow (Fig 1).

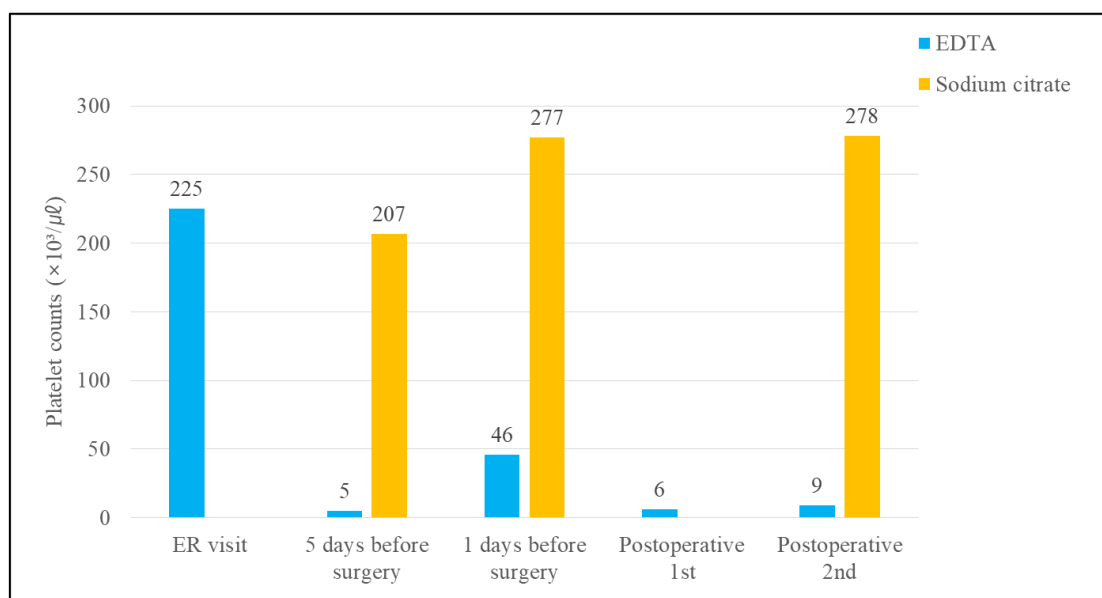


Figure 1: Platelet counts; Serial platelet count measured using EDTA and sodium citrate
EDTA: Ethylenediaminetetraacetic acid

DISCUSSION

Since PTCP was first reported in 1969 [2], research has continued on its causes and diagnosis. Despite numerous studies, PTCP often remains under-

recognized, leading to errors in interpreting platelet counts. This can result in inappropriate clinical decisions and, at times, unnecessary and risky diagnostic procedures or treatments [3]. PTCP becomes even more

complex when using various anticoagulants, and clinical implications have been discussed in cases involving multiple anticoagulants, considering factors such as temperature, amikacin supplementation, measurement methods, and the type of anticoagulant used [4]. In the case of the patient presented in this study, PTCP was identified through a preoperative peripheral blood smear. The peripheral blood smear is an essential tool for assessing the number and morphology of red blood cells, white blood cells, and platelets, and it is useful in confirming abnormalities seen in routine blood tests [5].

During the preoperative anesthesia preparation process, anesthesiologists evaluate patients based on a variety of test results. If PTCP is suspected or detected in routine blood tests or peripheral blood smears, it is crucial to determine whether the patient has risk factors for PTCP, falls within the appropriate age group, or has previously been diagnosed with this condition at another medical institution. Anesthesiologists have long studied how to develop anesthesia plans by considering various factors, such as the method of anesthesia, the type of surgery, and the patient's current condition. Research has also been conducted for a long time on the management of anesthesia for patients in whom PTCP is expected or for those undergoing emergency surgery, where this condition may not have been anticipated [6-9]. Failing to accurately distinguish the cause of thrombocytopenia beforehand can lead to unnecessary platelet transfusions, corticosteroid use, surgical interventions such as splenectomy, and other risks to the patient. In this case, since a clear diagnosis of pancreatic cancer had already been established and various imaging and physical exams, as well as blood tests, had been performed, no additional or unnecessary interventions for thrombocytopenia were undertaken. However, cases have been reported in which PTCP was not easily distinguished based on the patient's medical history, surgical history, or treatment history due to insufficient and inaccurate test results or mechanical errors in laboratory equipment. This has led to unnecessary additional interventions or treatments [10-14].

CONCLUSION

PTCP rarely requires significant clinical intervention or additional treatment. However, if unnecessary tests or interventions are performed, they can cause economic, physical, and psychological harm to the patient. Therefore, anesthesiologists should avoid evaluating a patient's condition solely based on numerical values from blood tests when preparing for surgery. Instead of relying entirely on the blood test results, the goal should be to compare these results with other test findings and thoroughly assess the patient's overall condition during preoperative preparation. This approach can prevent not only PTCP but also other misdiagnoses and unnecessary tests or treatments in advance.

Additionally, if anesthesiologists have concerns or believe further testing is necessary based on the patient's test results, it is crucial to communicate thoroughly with the surgeon and review the patient's condition from multiple perspectives. By resolving these concerns and proceeding with preoperative preparation, anesthesiologists can provide the patient with appropriate and optimal anesthesia care.

REFERENCES

- Sahin, M., Savci, U., & Sahin, H. H. K. (2018). Case Report Preoperative evaluation of EDTA-dependent pseudothrombocytopenia before lumbar disc herniation surgery: A case report. *Int J Med Biochem*, 1(2), 77-79.
- Gowland, E., Kay, H. E. M., Spillman, J. C., & Williamson, J. R. (1969). Agglutination of platelets by a serum factor in the presence of EDTA. *Journal of clinical pathology*, 22(4), 460-464.
- Bizzaro, N. (2009). Pseudothrombocytopenia. *Pathology*, 41, 40-41.
- Lardinois, B., Favresse, J., Chatelain, B., Lippi, G., & Mullier, F. (2021). Pseudothrombocytopenia—a review on causes, occurrence and clinical implications. *Journal of clinical medicine*, 10(4), 594.
- Moreno, A., & Menke, D. (2002). Assessment of platelet numbers and morphology in the peripheral blood smear. *Clinics in laboratory medicine*, 22(1), 193-213.
- Hashimoto, M., Kouchi, A., Inaba, S., Motomura, Y., & Takahashi, M. (2003). Anesthetic management of a patient with suspected pseudothrombocytopenia. *Masui. The Japanese Journal of Anesthesiology*, 52(10), 1118-1120.
- Kim, T. K., Lee, S. J., Kil, H. Y., & Yoon, Y. J. (1998). An Anesthetic Experience in a Patient with EDTA-induced Pseudothrombocytopenia: A case report. *Korean Journal of Anesthesiology*, 34(1), 213-216.
- Souza, L., Amorim, L., & Pereira, A. (2018). In-Hospital Onset of Pseudothrombocytopenia Days before Surgery. *Case Reports in Anesthesiology*, 2018(1), 4726036.
- Bernstein, J., Hua, B., Kahana, M., Shaparin, N., Yu, S., & Davila-Velazquez, J. (2016). Neuraxial anesthesia in parturients with low platelet counts. *Anesthesia & Analgesia*, 123(1), 165-167.
- Krukowska, K., Kieszko, R., Kurek, K., Chmielewska, I., Krawczyk, P., & Milanowski, J. (2020). An episode of pseudothrombocytopenia during pembrolizumab therapy in NSCLC patient. *Case Reports in Oncological Medicine*, 2020(1), 4196178.
- Stiegler, H., Fischer, Y., Steiner, S., Strauer, B. E., & Reinauer, H. (2000). Sudden onset of EDTA-dependent pseudothrombocytopenia after therapy with the glycoprotein IIb/IIIa antagonist c7E3 Fab. *Annals of hematology*, 79, 161-164.
- Li, H., Wang, B., Ning, L., Luo, Y., & Xiang, S. (2020). Transient appearance of EDTA dependent pse

- udothrombocytopenia in a patient with 2019 novel coronavirus pneumonia. *Platelets*, 31(6), 825-826.
13. Ceran, E., Schlömmner, C., Kröckel, I., Scheriau, G., Angleitner, P., & Steinlechner, B. (2021). Pseudothrombocytopenia inducing nonindicated platelet transfusion after cardiac surgery. *Case Reports in Medicine*, 2021(1), 3695407.
 14. Onan, B., Timur, B., Kadiroğulları, E., & Erkanlı, K. (2017). Ethylenediaminetetraacetic acid-dependent pseudothrombocytopenia in complex cardiac surgery. *Cardiovascular Surgery and Interventions*, 4(1), 15-17.