

Case Report

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Case Report

# The Bleeding Burns Patient with Leukaemia

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Highlights

What are the main findings?

- A rare case of leukaemia in a burns patient is described
- Haematological derangement ie. thrombocytopenia is common in burns patients and aren't always related to sepsis.

What are the implications of the main findings?

- A bleeding tendency caused by leukaemia can mimic the blood investigations pattern in sepsis.
- The importance of a peripheral blood smear

Abstract

Background: Haematological derangements, including thrombocytopenia are common in burn patients and are usually attributed to SIRS or sepsis. However, rare haematological malignancies may present with similar laboratory findings, posing a diagnostic challenge. We report a case of a patient with a minor burn injury managed at home who presented six days post-injury with bicytopenia, leucocytosis and active bleeding. Initial differentials included sepsis, DIC, NSAID-induced gastrointestinal bleed, and toxic shock syndrome, with malignancy not initially suspected due to low incidence. Methods: This case is a retrospective view on the patients clinical notes, blood investigations , surgical investigation and documentation of their management. Results: Subsequent evaluation revealed Acute Promyelocytic Leukaemia (APL), a rare but potentially curable subtype of Acute Myeloid Leukaemia and this was the cause of the patient's bleeding tendency. This poses the question of whether a blood smear should be done routinely for haematological abnormalities in burns patients too. Conclusion: Muganza et al, demonstrated that platelet decline predicts poor outcomes in severe burns, while prior malignancy increases sepsis risk. This case highlights the importance of considering haematologic malignancy in atypical presentations and the potential value of routine peripheral blood smear screening in patients with persistent cytopenias. Derangements in blood counts should be investigated broadly, without the assumption of infection as the sole cause, as prompt diagnosis and treatment of conditions like APL can substantially improve clinical outcomes, even in critically ill patients.

**Keywords:** Acute Promyelocytic Leukaemia; SIRS; burns; thrombocytopenia

## 1. Introduction

Acute burn-induced systemic inflammatory response syndrome (SIRS) and early sepsis are frequently associated with haematological derangements including leucopenia or leukocytosis anaemia and thrombocytopenia. Notably Muganza et al [1], demonstrated that the degree of platelet decline can predict poor outcomes in severe burns. Thrombocytopenia in burn patients typically occurs during the early phase and often improves on day five of the injury.

When pancytopenia develops it is often associated with new-onset sepsis warranting a high index of suspicion. In the case presented the patient had a minor burn wound managed at home as

an outpatient but presented with bicytopenia and active bleeding six days post-injury. On arrival the differential diagnoses included upper gastrointestinal bleeding (UGIB) secondary to NSAIDs toxic shock syndrome sepsis and disseminated intravascular coagulation (DIC). Malignancy was not initially suspected due to its low incidence.

Acute promyelocytic leukaemia (APL) a subtype of acute myeloid leukaemia is a rare but potentially fatal malignancy primarily affecting adults. Patients typically present with signs and symptoms of bone marrow failure including anaemia, neutropenia and thrombocytopenia manifesting clinically as a bleeding tendency. On examination there may be evidence of organ infiltration such as hepatosplenomegaly. There are no clearly identifiable causes although prior chemotherapy ,radiation and congenital disorders have been described as risk factors [2].

In the context of burn patients leucocytosis in combination with anaemia and thrombocytopenia would typically be considered secondary to sepsis or SIRS until a haematological malignancy is confirmed.

2. Case Presentation

This is a case of a 12-year-old female without co-morbidities ,she sustained a 4% total body surface area hot water burn which was treated at a local clinic and she was discharged on Paracetamol and Ibuprofen. She presented to our Burns Unit after a week , with a history of haematemesis, melena and a bicytopenia ( Haemoglobin of 6.5 , Platelet count of 11 and an elevated WCC 20.6). On examination she was found to have pallor ,there was no jaundice or hepatosplenomegaly and the rest of the exam was normal including the burn wound which was clean. She was transfused and started on Pantoprazole. With Ibuprofen being the suspected trigger, she was booked for gastroscopy, the findings were pan-gastritis and she was assessed as UGIB in DIC. Further investigations revealed minimal free fluid in the pelvis. She continued to bleed, post procedure on the PPI's , thromboelastography was done for her and she received multiple blood transfusions. The cause of the DIC was then suspected to be from Toxic shock syndrome from the burn wound and she was started on empiric Augmentin and Clindamycin and blood cultures were pulled prior to initiation of antibiotics which further showed no bacterial growth. Subsequent blood cultures revealed Carbapenem-resistant Enterobacterales (CRE) Klebsiella pneumonia and Pseudomonas putida requiring Meropenem and Colistin and Piperacillin-tazobactam, Table 1. She was seen by a multidisciplinary team of surgeons and allied rehabilitation heath workers during her admission in ICU.

She subsequently went into shock with multiple organs in failure requiring vasopressors . A decision was made to do a blood smear and iron studies ,to investigate the bicytopenia ,and the result came back as Acute Leukaemia (APL) as the cause of bleeding. FISH test showed findings consistent with Acute Promyelocytic Leukaemia. Paediatric Haem-Oncology was consulted. The patient's family was counseled and the child was immediately started on chemotherapy within an hour with ATRA and later on during the day the double-agent vasopressors she was receiving were weaned. Her multi organ failure condition unfortunately continued to worsen and she subsequently demised.

Table 1. Ms X's blood results.

|                  | Day 1 | Day 2 | Day 4 | Day 5  | Day 6 | Day 7 |
|------------------|-------|-------|-------|--------|-------|-------|
| White cell count | 20.86 | 22.28 | 87.88 | 113.85 | 52.51 | 23.71 |
| Haemoglobin      | 3.3   | 6.4   | 5.4   | 7.0    | 8.1   | 5.3   |
| Platelet count   | 11    | 18    | 16    | 28     | 13    | 4     |

|                                |                                                                                          |           |                  |        |                           |
|--------------------------------|------------------------------------------------------------------------------------------|-----------|------------------|--------|---------------------------|
| C-Reactive Protein             | 245                                                                                      |           | 14               |        | 300                       |
| Procalcitonin                  | 128                                                                                      | Rejected  | Rejected         | 254    | 221.2                     |
| Smear                          | Features in keeping with AML with concern for APL                                        |           |                  |        |                           |
| Blood culture                  | No growth                                                                                | No growth | CRE K. Pneumonia | 1. 2.  | K. Pneumonia MDR P.Putida |
| Parathyroid Hormone            | 49.1 (Normal 2-8.5)                                                                      |           |                  |        |                           |
| Urea                           | 11.6                                                                                     | 15.6      | 29.9             | 36.4   | 39.9                      |
| Creatinine                     | 237                                                                                      | 331       | 625              | 649    | 568                       |
| International Normalised Ratio | 1.66                                                                                     | 1.57      | 1.64             | 1.46   | 1.59                      |
| D-Dimer                        |                                                                                          |           | >17.60           | >17.60 | >17.6                     |
| FISH t(15;17) PML::RARA        | 60% Cells were positive for the translocation t(15;17) (q24;q21) , PML/RARA fusion gene. |           |                  |        |                           |

Further blood investigation results; Flow test - forward scatter: side scatter and CD45 gating. Immunophenotypic analysis performed on sample revealed a population of 95-96% large complex cells which fall within the granulocyte gate. Showed features in keeping with acute myeloid leukaemia with features compatible with an acute promyelocytic leukaemia, FISH for t(15;17) has been submitted for confirmation in this regard. FISH : t(15;17) to detect PML: RARA fusion gene - This case is positive (60% of screened cells) for the translocation of t(15;17)(q24;21), PML/RARA fusion gene. This finding is consistent with the diagnosis of Acute Promyelocytic leukaemia.

4. Discussion

A study conducted in 2025 in Texas demonstrated that burn patients with a prior cancer diagnosis had increased odds of developing sepsis, and those with haematological neoplasms exhibited higher odds of poor outcomes [3].

The consulted paediatric haemato-oncologist noted that, although the patient had already developed five organ dysfunctions on referral , which conferred a poor prognosis from that perspective, the APL itself carries an approximately 75% survival rate. They emphasised that earlier referral upon detection of the bicytopenia could have potentially improved the patient’s outcome.

In this case, the patient presented with bicytopenia, elevated white cell count, and raised procalcitonin. In burn patients, there is always a high index of suspicion for sepsis as the underlying cause. In the unit’s experience, the majority of patients admitted with bicytopenia have it secondary to bacteraemia, SIRS, or fungal sepsis, and peripheral blood smears are not routinely performed for all such patients. This raises the question of whether earlier identification of APL could have been possible within the burns unit where index of suspicion for malignancy is low in the acute setting.

This case represents a rare and challenging diagnosis in burn patients, with many confounding signs and symptoms that, in the context of burns, would typically not be attributed to malignancy. Moving forward, it may be prudent to screen patients with bicytopenia or pancytopenia using a peripheral blood smear as an additional test during routine blood work, rather than attributing abnormalities solely to sepsis. Derangements in blood counts should prompt thorough investigation, without narrowing the differential diagnosis solely to the most common complications of the burn injury. There is limited research on the topic of malignancy presenting in a burns patient and further research focusing on burns patients with underlying malignancy, particularly new onset leukaemia, are required to improve patient outcomes.

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Abbreviations

The following abbreviations are used in this manuscript:

|       |                                         |
|-------|-----------------------------------------|
| CRE   | Carbapenem-resistant Enterobacterales D |
| DIC   | Disseminated Intravascular Coagulation  |
| FISH  | Fluorescence In Situ Hybridization      |
| NSAID | Non-steroidal Anti-Inflammatory Drugs   |
| SIRS  | Systemic Inflammatory Response Syndrome |
| UGIB  | Upper Gastrointestinal Bleeding         |

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