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Botryoid Neutrophils in Urosepsis: A Rare Morphological Observation on Peripheral Blood Smear

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Abstract: ***This case report describes a 73-year-old female presenting with urosepsis and acute kidney dysfunction. Laboratory findings revealed elevated inflammatory markers and leukocytosis. Peripheral blood smear examination showed a rare morphological finding: botryoid neutrophils, characterized by marked nuclear hypersegmentation with a distinctive radial configuration. These neutrophils, observed in 70% of the total neutrophil population, displayed nuclei interconnected by thin interchromatin bridges. This unusual neutrophil morphology has been associated with various pathological conditions, including sepsis and uremia. The case highlights the importance of considering uremia in patients exhibiting neutrophilic hypersegmentation without macrocytosis, emphasizing the diagnostic value of peripheral blood smear examination in sepsis cases.***

Keywords: Botryoid neutrophils, Urosepsis, Hypersegmented neutrophils, Peripheral blood smear, Sepsis.

1. Introduction

Sepsis induces both functional and morphological changes in WBCs. The changes are reflected in the CBC analyzer report; morphological changes can be viewed under a microscope during peripheral smear examination. One uncommon morphological finding is the presence of neutrophils with botryoid nuclei on a peripheral blood smear [1].Botryoid neutrophils are characterized by an abnormal nuclear chromatin distribution, exhibiting marked hypersegmentation with a distinctive radial configuration, often resembling a rosette, and interconnected by thin interchromatin bridges [2].

This nuclear morphology has been associated with various pathological conditions, including severe thermal burns, hyperthermia, substance abuse (notably cocaine and methamphetamine), uremia, encephalitis, and systemic infections such as sepsis[3].

We report a case of an adult patient presenting with urosepsis, in whom botryoid hyper segmented neutrophils without macrocytosis were identified on peripheral smear examination.

2. Case Summary

A 73-year-old female admitted to the ICU of our hospital with an elevated serum creatinine of 8.41 mg/dL, Blood Urea of 114.9 mg/dL, and BUN (blood urea nitrogen) of 53.7 mg/dL, indicating acute kidney dysfunction. Inflammatory markers were markedly elevated, with C-reactive protein (CRP) at 238 mg/L and procalcitonin at 17.5 ng/mL, suggesting a severe septic process.

A complete blood count revealed the following findings:

- Haemoglobin**:** 10.2 g/dL
- MCV: 81.2 fl (within normal limits)
- MCH: 21.6 pg (within normal limits)
- MCHC: 26.5 g/dL (within normal limits)
- RDW CV: 16.3 % (within normal limits)
- Total leukocyte count (TLC): 19,200 /mm³ (leukocytosis)
- Platelet count**:** 390,000 /mm³ (within normal limits)

Peripheral smear examination showed normocytic normochromic red blood cells with prominent rouleaux formation. Notably, 70 % of neutrophils displayed marked nuclear hypersegmentation, arranged in a distinct radial (rosette-like) configuration, with nuclei interconnected by thin interchromatin bridges, which are characteristic of botryoid neutrophils

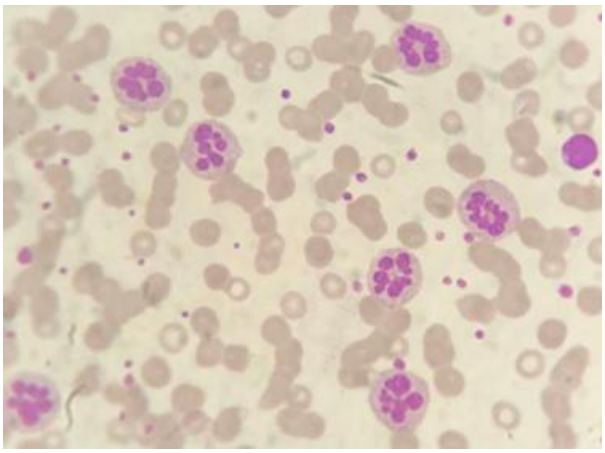

Figure 1

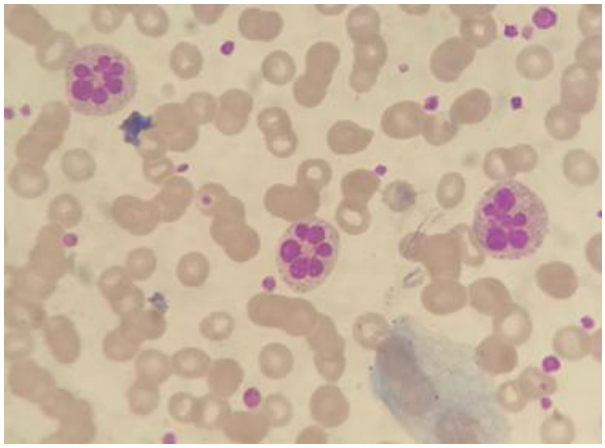

Figure 2

Figure 1 & 2 Peripheral smear showing botyroid neutrophil with radially hyper segmented nucleus.

3. Discussion

Hypersegmentation of neutrophils is characterized by the presence of ≥5% neutrophils with five or more lobes or at least one neutrophil with six lobes[4]. The most prevalent causes include deficiencies in serum vitamin B12 and folic acid, as well as myelodysplastic syndromes. However, several less common etiologies have also been identified, such as uremia, hyperthermia, and certain pharmacological agents, including chemotherapeutic drugs, corticosteroids, and granulocyte colony-stimulating factor (G-CSF). [5] In our case of urosepsis, we observed a botryoid neutrophil with a radially hypersegmented nucleus, closely resembling the case described by Serrando et al. [1].in a patient with sepsis secondary to Influenza A virus. Furthermore, Hattersley and Engels[6] reported that a significant number of patients exhibiting neutrophilic hypersegmentation without macrocytosis had underlying uremia. This finding underscores the necessity of considering uremia in the differential diagnosis when hypersegmented neutrophils are present in the absence of macrocytic changes.

4. Conclusion

This case report highlights the significance of peripheral blood smear examination in identifying rare morphological findings such as botryoid neutrophils. The presence of these distinctively hypersegmented neutrophils in a patient with urosepsis and acute kidney dysfunction underscores the potential diagnostic value of this observation and emphasizes the importance of considering these etiologies in patients presenting with similar hematological findings. This case contributes to the limited literature on botryoid neutrophils and reinforces the need for careful morphological assessment in sepsis cases.

5. Future Scope

1) Further research is required to clarify the mechanisms and functional implications of botryoid neutrophil formation in sepsis, uremia, and inflammatory states.
2) Large-scale prospective studies should assess the prevalence of botryoid neutrophils and their correlation with disease severity, prognosis, and treatment response.
3) Establishing standardized criteria for botryoid neutrophil identification and quantification could enhance their clinical utility and diagnostic consistency.

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