

Contribution of Cyto-Hematology and GOLDE score in the Diagnosis of Intra-Alveolar Hemorrhage in Light of a Case Report

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Abstract

Case Report

Cyto-hematology plays a crucial role in diagnosing intra-alveolar hemorrhage (IAH), a rare and severe condition associated with significant mortality. While clinical diagnosis is based on the classic triad of hemoptysis, anemia, and diffuse alveolar opacities on imaging, this triad is present in only one-third of cases and may be incomplete. Thus, the diagnosis of IAH often requires bronchoscopic examination and cyto-hematological analysis of bronchoalveolar lavage (BAL) fluid using Perls' staining and GOLDE score calculation, both of which are essential for confirming the diagnosis. We present a case of IAH in which the diagnosis was confirmed through BAL smear analysis stained with Perls' method and GOLDE score assessment. This approach enabled prompt therapeutic management, leading to significant clinical and biological improvement in the patient.

Keywords: Cyto-Hematology, Bronchoalveolar Lavage, Perls' Stain, GOLDE Score, Diagnosis, Intra-Alveolar Hemorrhage.

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INTRODUCTION

Intra-alveolar hemorrhage (IAH), characterized by the presence of blood in the pulmonary acinus due to damage of the alveolar-capillary barrier (excluding bronchial-origin flooding), is a rare and severe condition that can be life-threatening. Between 20% and 50% of patients require mechanical ventilation and/or dialysis. Mortality rates range from 20% to 100%, with early mortality directly attributable to IAH estimated at 10–30% [1].

Diagnosis is primarily clinical, based on the classic triad; however, this triad is rarely fully present. This underscores the importance of the cytological and hematological analysis of bronchoalveolar lavage (BAL) fluid, using Perls' staining to establish the GOLDE score and confirm the diagnosis in cases of occult IAH.

CASE REPORT

We present the case of a 30-year-old patient with no significant medical history, admitted to the pulmonology department of HMIMV for evaluation and management of moderate hemoptysis, without any associated symptoms. On pleuropulmonary examination, the patient was eupneic, with no abnormal breath sounds

on auscultation. The rest of the clinical examination was unremarkable. A transthoracic ultrasound was performed, yielding normal results, while a chest X-ray revealed a left hilar-apical infiltrate. This finding led the clinician to perform a bronchoscopy due to suspicion of intra-alveolar hemorrhage (IAH). During the procedure, a diffusely inflamed pulmonary mucosa was observed, along with hemorrhagic-appearing bronchoalveolar lavage (BAL) fluid. The BAL sample was sent to the hematology laboratory for cytological analysis and GOLDE score assessment, as well as to the microbiology laboratory for cytobacteriological examination.

Laboratory Findings and Evolution:

The complete blood count (CBC) revealed:

- White blood cell count: 6.6 G/L
- Hemoglobin level: 14 g/dL
- Platelet count: 280 G/L

Perls' Staining:

A thick drop of BAL fluid, rich in red blood cells and macrophages, was spread without crushing, air-dried, and stained using Perls' method. The microscopic examination at 10x100 magnification showed a GOLDE score of 106/400, confirming a positive result (a score >100 is considered positive) (Figure 1).

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Microbiological Analysis:

- Direct examination and culture for Koch's bacillus on Lowenstein-Jensen medium were negative.
- PCR GeneXpert® analysis detected no *Mycobacterium tuberculosis* DNA.

Biochemical Analysis:

- Sodium (Na): 139 mmol/L

- Potassium (K): 4.1 mmol/L
- Urea: 0.29 g/L
- Creatinine: 9 mg/L

Clinical Evolution:

The patient showed favorable progress, with resolution of hemoptysis under hemostatic treatment and preserved overall health status.

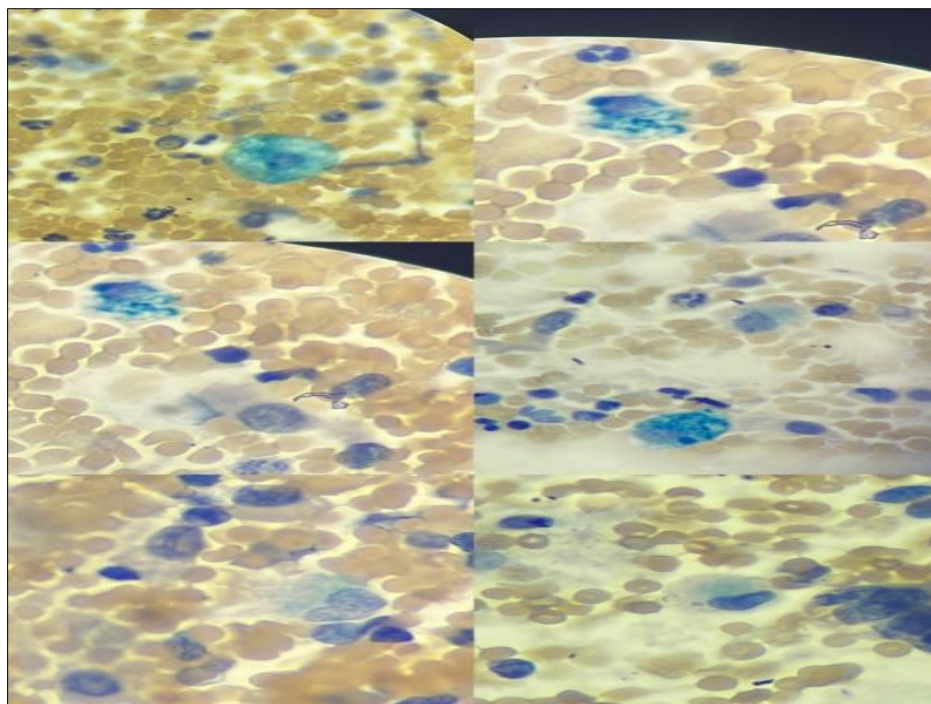


Figure 1: Different stages observed in macrophages (Obj. 10x100), Hematology Laboratory, HMIMV Rabat, Morocco

DISCUSSION

Intra-alveolar hemorrhage (IAH) is characterized by a classic clinical triad consisting of hemoptysis, anemia, and diffuse alveolar opacities on imaging [2].

Hemoptysis is rarely massive due to its distal nature, anemia can sometimes develop abruptly, and chest radiography initially shows micronodular images, followed by alveolar opacities.

However, this triad is present in only one-third of cases and may be incomplete, as observed in our patient. Due to the variability of clinical presentation, diagnosing IAH requires bronchoscopic examination and cytological-hematological analysis of BAL fluid, which can exhibit three macroscopic appearances [2]:

1. Uniformly hemorrhagic fluid in the active phase: overt IAH.
2. Pinkish fluid in a less active phase.

3. Clear or grayish fluid at a distance from the acute episode: occult IAH, where cytological-hematological analysis becomes crucial.

This analysis first requires Perls' staining, which highlights alveolar siderophages—macrophages loaded with hemosiderin—through a blue coloration, whose intensity reflects the degree of hemosiderin accumulation [3].

Subsequently, the GOLDE score is calculated based on the intensity of blue pigmentation in macrophages, with a grading scale from 0 to 4 per macrophage, assessed across 100 macrophages, resulting in a total score ranging from 0 to 400 (Figure 2).

Thus, siderophages are each graded from 0 to 4 based on the intensity of pigmentation, resulting in a GOLDE score ranging from 0 to 400. The higher the score, the greater the oxidative damage and hypoxemic impact [4].

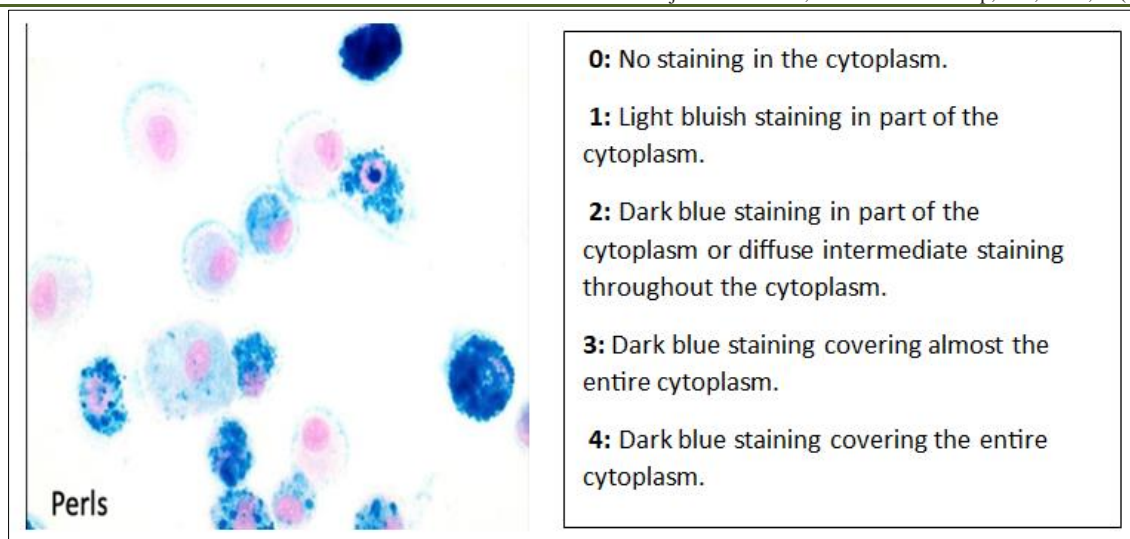


Figure 2: Appearance of alveolar macrophages at different stages according to the GOLDE score, stained using Perls' method.

- Score between 0 and 20: Normal
- 20-70: Intermediate resorption
- > 70: High resorption
- > 100: Occult IAH

The score should preferably be calculated independently by two individuals.

CONCLUSION

The cytological and hematological study of BAL fluid is essential for confirming the diagnosis of IAH, particularly in occult cases, through Perls' staining and the calculation of the GOLDE score. This highlights the importance of clinico-biological collaboration to ensure timely diagnosis of patients with occult IAH, allowing for optimal management and thereby reducing mortality associated with this rare disease.

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