Biological pictures

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Green neutrophilic inclusions: an underrated abnormality of clinical importance

Inclusions vertes dans les polynucléaires neutrophiles : une anomalie d'intérêt clinique insuffisamment connue

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A 47-years-old man developed septic shock after total nephrectomy for carcinoma. In intensive care unit (ICU), his conditions decreased rapidly with disseminated intravascular coagulation and acute hepatic failure (aspartate aminotransferase: 2,420 U/L, alanine aminotransferase: 803 U/L). The blood count showed normocytic anaemia (haemoglobin 72 g/L), thrombocytopenia (130×10^9/L) and normal white blood cells count (4.6×10^9/L) without neutropenia (2.1×10^9/L). A subset of neutrophils (about 15%) present unique or multiple bright blue-green refractile inclusions of variable size with an irregular (*figure 1A*, green arrow) or circular (*figure 1B*, green arrow) shape (they should not be confused with Döhle bodies which are light blue-grey non-refractile inclusions). Associated changes such as cytoplasmic vacuoles (*figure 1B,C*, black arrow), partially degranulated cytoplasm (*figure 1B,C*, red arrow) and apoptotic cells (*figure 1D*) were also present (May-Grünwald-Giemsa, objective x100). Despite appropriated intensive cares, the patient died few days after admission.

Similar cases of blue-green neutrophilic inclusions associated with acute hepatic failure and early death have been previously reported [1]. Recently, this morphologic sign has been reported in patients with COVID-19 and was similarly associated with short-term mortality [2]. However, the correlation between these green-granules and early death remains unclear. First, they have been reported in some patients with benign clinical course. Then, most cases are described in ICU where admission is associated with higher mortality, regardless of the presence or not of green inclusions.

Green neutrophilic inclusions, sometimes so-called "green crystals of death" or "critical green inclusions", are easily recognizable and most likely of high clinical relevance. But they are certainly underrated because not detected by haematology analysers and insufficiently known by technicians, pathologists and haematologists. To date, the number of reported cases remains low. Better awareness of this morphologic sign is imperative to define its real significance and to confirm it as a prognostic indicator of early death.

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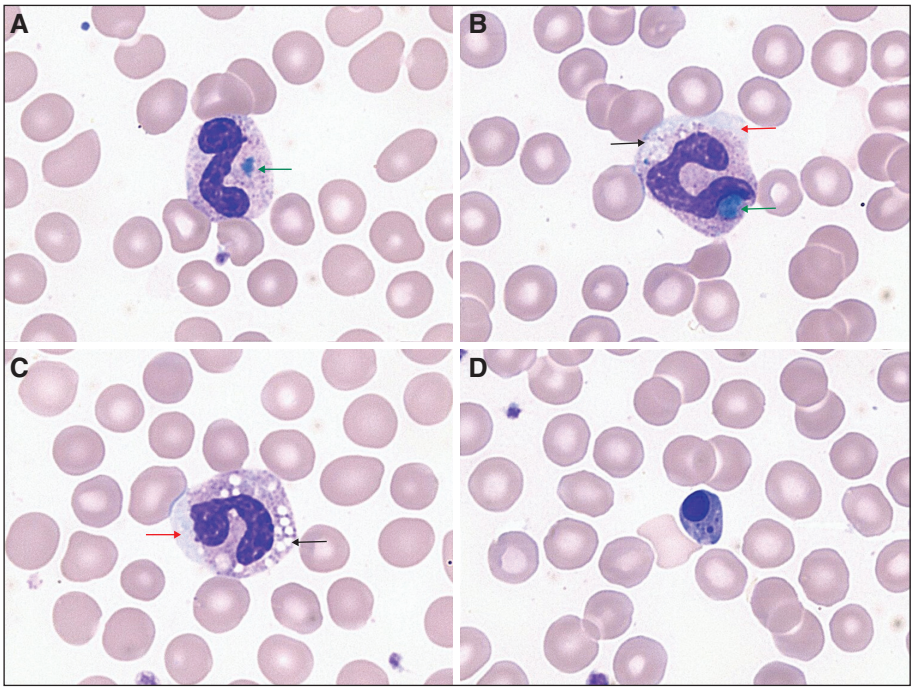

Figure 1. A. Neutrophil with irregular bright blue-green refractile inclusion (green arrow). **B**. Neutrophil with circular bright blue-green refractile inclusion (green arrow), vacuoles (black arrow) and partially degranulated cytoplasm (red arrow). **C**. Neutrophil with vacuoles (black arrow) and partially degranulated cytoplasm (red arrow). **D**. Apoptotic cell.

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