

Copper deficiency

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A 45 year-old woman presented for evaluation because of neutropenia and anemia. Her complete blood counts (CBC) revealed Hb: 9 g/dl, MCV: 99 fl, WBC: $1.4 \times 10^9/L$, PLT: $257 \times 10^9/L$, and absolute neutrophil count: $0.45 \times 10^9/L$. She was diagnosed with idiopathic autonomic neuropathy of the gastrointestinal tract since the age of 25 years. On clinical examination, the patient was afebrile, but pale. Examination of a peripheral blood smear disclosed decreased granulation along with abnormal nuclear globulization of the neutrophils (Figure 1A) and cytoplasmic vacuolization of monocytes (Figure 1B). A bone marrow smear showed asynchronous nuclear to cytoplasmic maturation, dyserythropoiesis, and abnormal distribution of granules in the cytoplasm of myeloid precursors along with cytoplasmic vacuolization (Figure 1C-E). Cytogenetics were normal. Further evaluation

disclosed very low levels of ceruloplasmin and copper. Examination for Kayser–Fleisher rings was negative. A diagnosis of copper deficiency due to malabsorption was made, and the patient received oral copper supplementation resulting in a rapid improvement of CBC counts and peripheral blood morphology (Figure 1F: 2 months; G: 1 year; H: 2 years, after treatment initiation). Dysplastic features do not always represent myelodysplastic syndromes; other rare mimics, including copper deficiency, should be included in the differential diagnosis.

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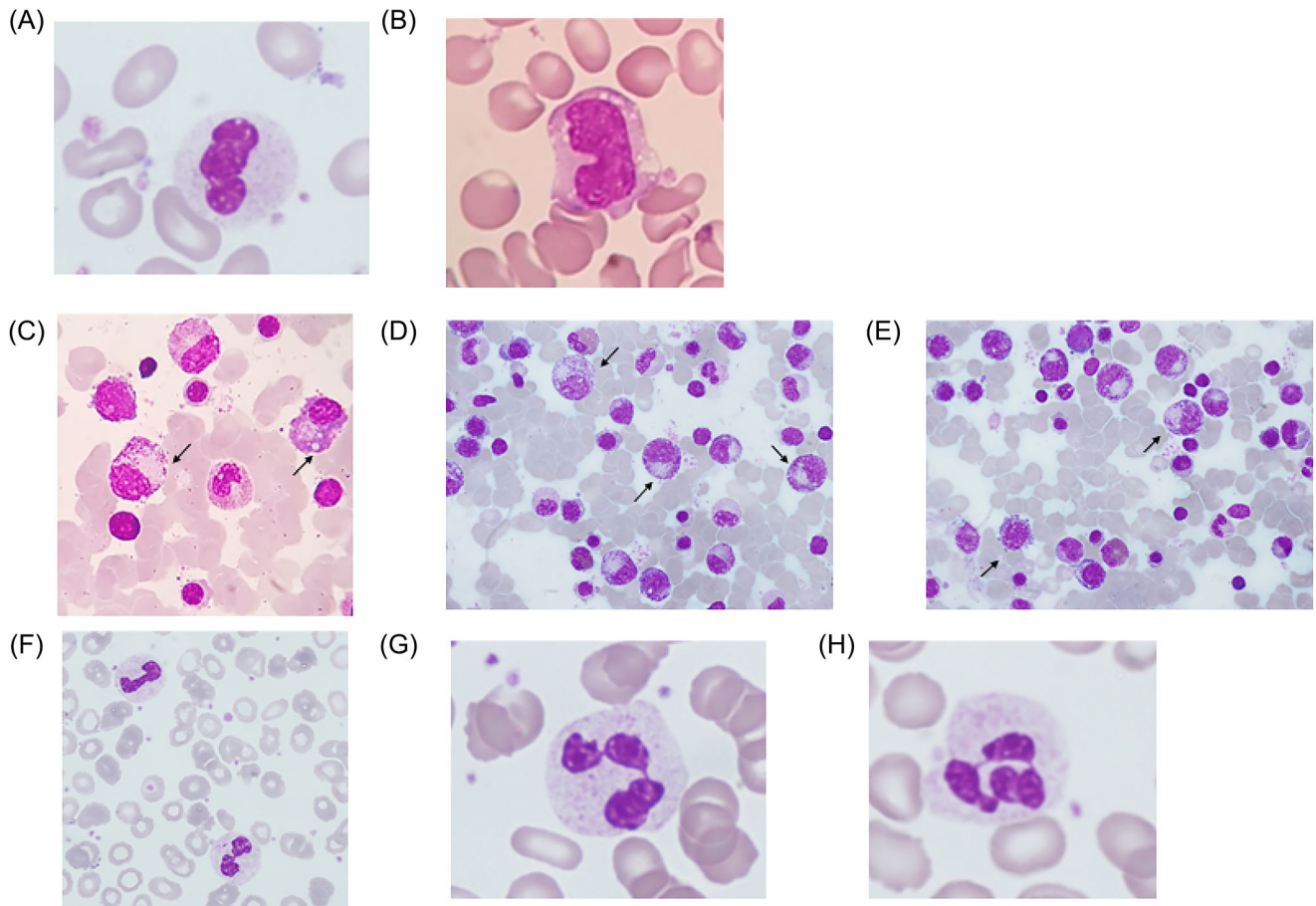


FIGURE 1 A: Abnormal nuclear globulization of neutrophils and B. cytoplasmic vacuolization of monocytes in the peripheral blood. C–E: A bone marrow smear showing asynchronous nuclear to cytoplasmic maturation, dyserythropoiesis, and abnormal distribution of granules in the cytoplasm of myeloid precursors along with cytoplasmic vacuolization (arrows). F–H: Improvement in the peripheral blood morphology two months (F), one (G) and two (H) years after initiation of treatment.