

CLINICAL PEARLS IN BLOOD DISEASES

MORPHOLOGY UPDATE

Covid-19 and acute kidney injury

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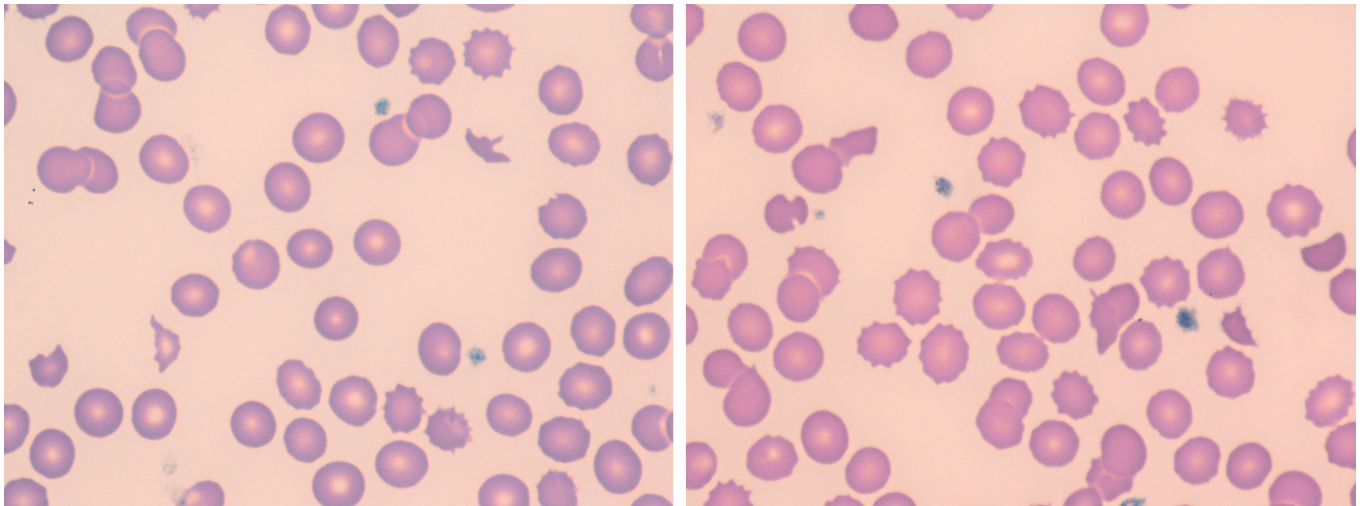
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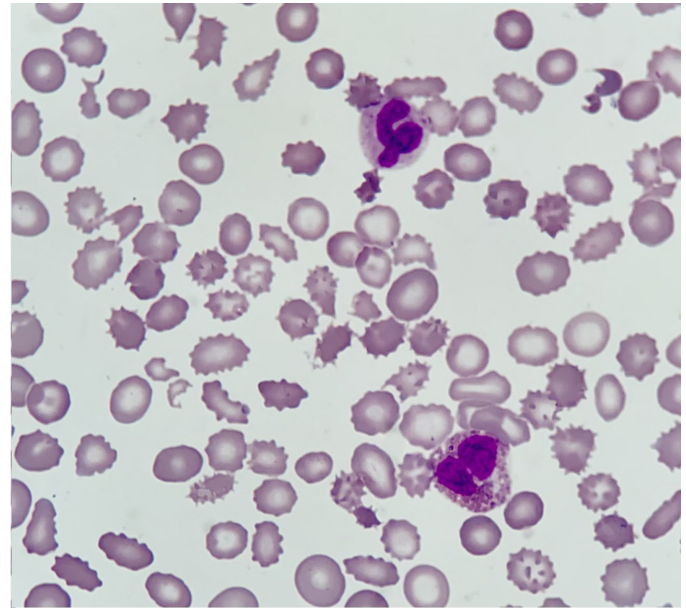
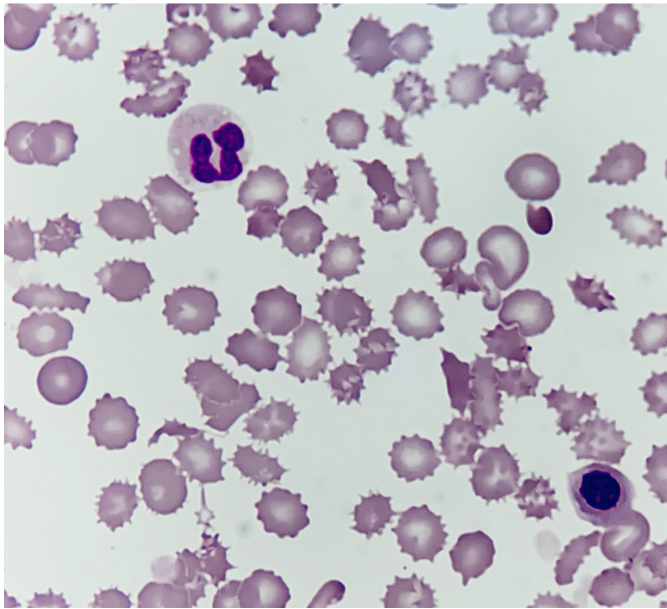
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Since the onset of the Covid-19 pandemic the spectrum of disease caused by SARS-CoV-2 has been found to be very wide with a myriad of hematologic manifestations. We illustrate here the peripheral blood features of two patients with acute kidney injury, which is part of this spectrum.

The images above ($\times 100$ objective) are from a 15-year-old Iraqi patient with β thalassemia major who was on regular transfusion and iron chelation therapy. He presented peri-cardiac arrest with ventricular tachycardia and acute kidney injury. He was found to have suffered hemorrhage from a duodenal ulcer, requiring emergency surgery and massive transfusion. PCR for SARS-CoV-2 was positive. Postoperatively he required hemofiltration and ventilatory support. His blood count and biochemical tests showed: white cell count (WBC)

$8.4 \times 10^9/L$, hemoglobin concentration (Hb) 99 g/L, platelet count $130 \times 10^9/L$, creatinine 125 $\mu\text{mol/L}$ (NR 50–120), urea 13.2 mmol/L (NR 2.5–7.0), lactate dehydrogenase (LDH) 933 iu/L, D-dimer 8460 ng/mL fibrinogen equivalent units (FEU) (NR for age 160–390), and serum ferritin 2403 $\mu\text{g/L}$. Liver function tests were also abnormal. His blood film showed schistocytes and echinocytes (both images), indicative of microangiopathy and renal insufficiency, and in addition there were occasional pincer or 'mushroom' cells (right). Further complications during the clinical course included femoral vein thrombosis and seizures due to intracranial microhemorrhages. The patient was treated with dexamethasone and remdesivir and after 19 days in the intensive care unit and a further 13 days of hospitalization was discharged with recovery of renal function to baseline.



The images above ($\times 100$ objective) are from a 79-year-old Indian man who presented with fever and respiratory failure. PCR for SARS-CoV-2 was positive. His blood count and biochemistry tests showed: WBC $29.5 \times 10^9/L$ with neutrophilia and monocytosis, Hb 72 g/L, platelet count $28 \times 10^9/L$, creatinine 123.8 $\mu\text{mol/L}$, urea 32.3 mmol/L, LDH 1434 iu/L, D-dimer 2110 ng/mL FEU (NR 0–500), and ferritin 548.2 $\mu\text{g/L}$. His blood film confirmed the severe thrombocytopenia and showed schistocytes, marked echinocytosis (including echinocytic elliptocytes) and 3 nucleated red blood cells/100 WBC. The patient's condition deteriorated rapidly and he died within 3 days of presentation.

The peripheral blood features of these two patients reflect the presence of two recognized Covid-19 complications: echinocytes are indicative of acute kidney injury and schistocytes are indicative of microangiopathic damage to red cells. In addition, the first patient showed pincer cells, which have been reported in Covid-19 and suggest possible oxidant-induced damage.¹ Microvascular thrombosis, particularly in the lungs but also in other organs, is a well recognized feature of Covid-19 and is responsible for the schistocytes observed. The origin of acute kidney injury in Covid-19 is multifactorial, including acute tubular damage and infiltration by lymphocytes and macrophages, with the virus having been identified within glomerular endothelium and in tubular cells. In addition, thrombotic microangiopathy involving the kidney can lead to coagulative necrosis.² However microvascular thrombosis within the kidney does not appear to be common and may not be extensive; microvascular thrombi were observed in only three of 21 cases in one series,³ in three of 26 cases in another,⁴ in one of three personally observed cases in a third series,⁵ and in none of 12 cases in a fourth series.⁶ Acute kidney injury in Covid-19 is an adverse prognostic indicator.

CONFLICT OF INTEREST

Nothing to report

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