

Particularities of diagnosis in an elderly patient with neglected peritonitis: a case report

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Abstract

Acute peritonitis accounts for 1% of inpatient surgical emergencies and is the second leading cause of sepsis in patients in intensive care departments. Diagnosis through laboratory analysis in bacterial peritonitis focuses mainly on the biomarkers, procalcitonin and C-reactive protein. A 73-year-old male patient presented with meteorism, diarrhea, vomiting, fever, and hypotension. Laboratory investigations showed very high procalcitonin and C-reactive protein values, and abdominal radiography revealed paraumbilical hydroaerial levels, which suggested septic shock of intra-abdominal origin. Emergency laparotomy was performed, which revealed agglutinated intestinal loops in the right iliac fossa with false membranes, purulent fluid, overdilated jejunum and ileum with an occlusive appearance, acute gangrenous appendicitis with perforation, and suppurative omentitis. The intraoperative diagnosis was acute neglected peritonitis in the occlusive phase owing to acute gangrenous appendicitis with perforation and suppurative omentitis. Laboratory analysis in conjunction with imaging provides important information in the early diagnosis of infectious pathology in elderly patients, even if these methods do not accurately

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identify the cause. The combination of procalcitonin and C-reactive protein biomarker levels successfully contributed to the diagnosis in this case. Notably, the patient's white blood cell counts were inconsistent with the severity of the infection.

Keywords

Diagnosis in the elderly, neglected peritonitis, septic shock, procalcitonin, C-reactive protein, case report

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Introduction

Acute peritonitis accounts for 1% of inpatient surgical emergencies and is the second leading cause of sepsis in patients in intensive care departments,¹ with a global mortality rate of approximately 20%.² Abdominal symptoms of peritonitis in elderly patients are frequently diminished, absent, or less specific compared with younger patients. This difference is owing to the aging process, which produces structural, functional, and metabolic alterations that lead to exacerbation of the impact of any insult to the body.³ Owing to atypical symptoms in elderly patients on the one hand, and factors such as the difficulty of leaving home and the fear of hospitalization on the other hand, there may be delays in elderly patients presenting to the hospital.⁴ Delayed peritonitis treatment by more than 48 hours after the onset of symptoms leads to neglected peritonitis, which is a particular entity with very serious characteristics. Neglected peritonitis initiates functional or organic plurivisceral changes that at some point may evolve on their own even after resolution of the peritoneal focus, leading to a mortality rate of approximately 10% to 15%.⁵ The complications of generalized peritonitis frequently leads to septic shock,⁶ with a mortality rate that can reach >50% to 80%, in developing countries.⁷

Early diagnosis and management of peritonitis remain a challenge for clinicians

despite the increasing availability and use of imaging and laboratory tests.¹ Diagnosis by laboratory analysis in bacterial peritonitis with or without sepsis focuses on a series of biomarkers, such as procalcitonin (PCT) and C-reactive protein (CRP), which are among the most intensively studied and cited biomarkers in the literature.^{8–11} The utility of PCT in the diagnosis of bacterial peritonitis has been shown to be superior compared with CRP; however, PCT cannot be recommended as the gold standard biomarker for peritonitis and should be interpreted in a clinical and para-clinical context.^{8,9} Despite this limitation, data from the literature suggest that PCT is useful in peritonitis diagnosis in elderly patients, with the test performance equal to that in younger patients.¹²

This study was performed to report a difficult diagnosis in an elderly patient with neglected peritonitis owing to acute gangrenous appendicitis with perforation, complicated with septic shock.

Case Report

We report the case of a 73-year-old patient who presented to our local hospital (Emergency County Clinical Hospital Sfântul Apostol Andrei, Galati) in July 2021 with symptoms that began 5 days earlier. The symptoms comprised meteorism, diarrhea, vomiting, fever ($T = 38.3^{\circ}\text{C}$), and

low blood pressure (BP = 90/50 mm Hg). The patient had a history of ischemic stroke and untreated type II diabetes. Objective examination revealed an enlarged abdomen that was slightly painful with palpation in the right iliac fossa. Abdominal radiography revealed paraumbilical hydroaerial levels (Figure 1). Laboratory testing revealed abnormal values for the following: white blood cell count (WBC) = $13.1 \times 10^9/L$ (normal range: $4-9 \times 10^9/L$); hemoglobin = 116 g/L (normal range: 140–170 g/L); glucose = 10 mmol/L (normal range: 3.9–5.8 mmol/L); creatinine = 0.37 mmol/L (normal range: 0.062–0.114 mmol/L); urea = 28.3 mmol/L (normal range: 2.5–7.33 mmol/L); creatine phosphokinase = 269 U/L (normal range: 24–195 U/L); potassium = 5.3 mmol/L (normal range: 3.5–5.1 mmol/L); sodium = 150 mmol/L (normal range: 136–145 mmol/L); chloride = 114.7 mmol/L (normal range: 98–107 mmol/L); bicarbonate = 10 mmol/L (normal range 22–29 mmol/L). Because the patient had a fever, we decided to measure



Figure 1. Abdominal radiography showing paraumbilical hydroaerial levels.

serum biomarkers, which revealed a PCT value of $>32 \mu\text{g/L}$ (normal range: $<0.05 \mu\text{g/L}$) and a CRP value of 1228.5 nmol/L (normal range: $<95.2 \text{ nmol/L}$). These values increased the suspicion of septic shock of intra-abdominal origin. No blood was collected for blood culture owing to the surgical urgency and the lack of chills in the patient at the time of admission. Empirical intravenous antibiotic therapy with third-generation cephalosporins was administered, and emergency surgery was performed. Surgery was performed under general anesthesia with orotracheal intubation. Exploratory laparotomy revealed agglutinated intestinal loops in the right iliac fossa, with false membranes and purulent-appearing fluid, which was collected for bacterial culture and sensitivity. On examination of the abdominal viscera, acute gangrenous appendicitis with perforation (Figure 2a) and suppurative omentitis were found, and the jejunum and ileum were overdistended and had an occlusive appearance (Figure 2b). Appendectomy, segmental omentectomy, and lavage and drainage of the peritoneal cavity were performed. The intraoperative diagnosis was neglected peritonitis in the occlusive phase owing to acute gangrenous appendicitis with perforation and suppurative omentitis. The diagnosis was confirmed on the basis of the results of the histopathological examination of the resected tissues (appendix, greater omentum). Histopathology revealed the following: 1) acute gangrenous appendicitis with focal epithelial hyperplasia and atypia (possibly reactive) and acute fibrinopurulent peritonitis (Figure 3a–c); and 2) greater omentum: vascularized connective and adipose tissue with an acute granulocytic inflammatory infiltrate comprising fibrin, and small nests of reactive cells with large nuclei and obvious nucleoli; this tissue had an inflammatory reactive appearance (Figure 3d). Bacterial culture and sensitivity of the peritoneal fluid indicated

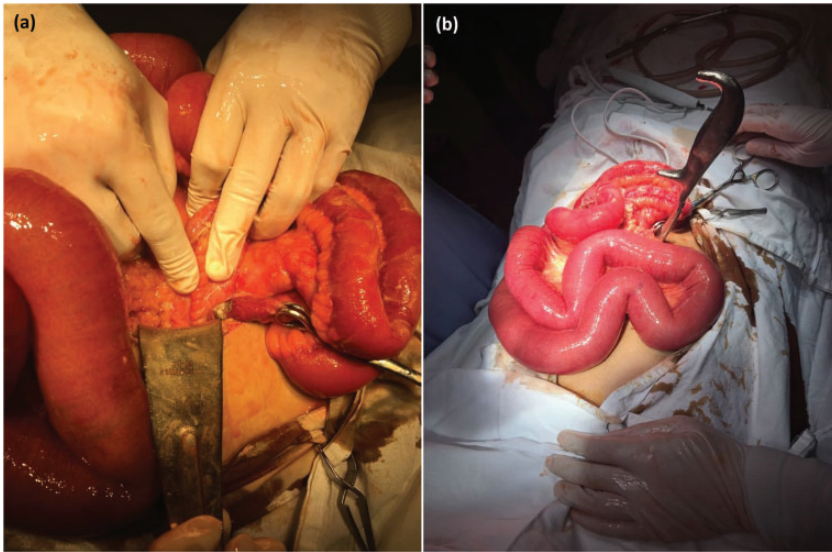


Figure 2. Intraoperative findings (a) acute gangrenous appendicitis with perforation at the base and (b) neglected peritonitis in the occlusive stage.

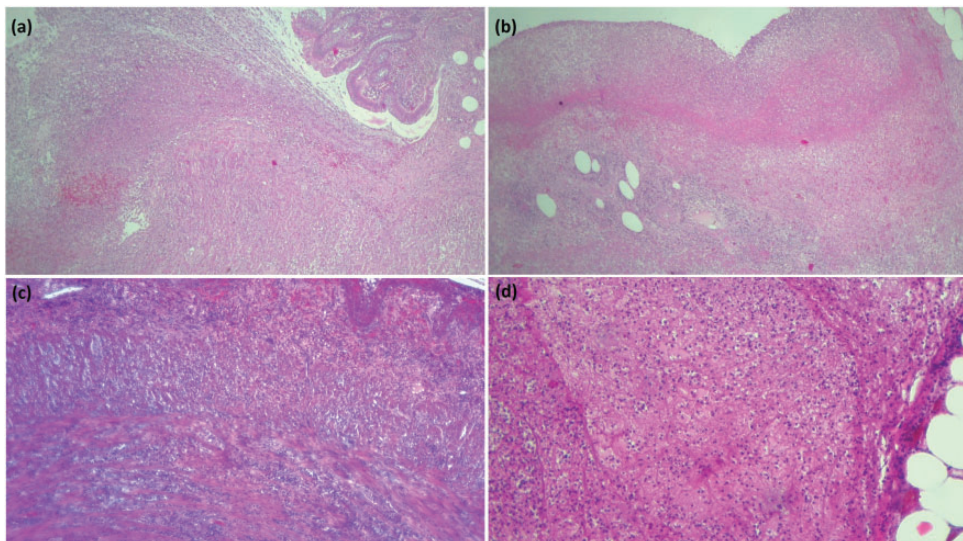


Figure 3. Histopathological examination of the surgically excised tissue (a) appendix: ulcerations on the mucosa, with the extension of an acute inflammatory infiltrate in the wall; HE \times 40; (b) massive fibrinopurulent deposits on the appendicular serosa indicating acute fibrinopurulent peritonitis; HE \times 40; (c) variable acute inflammation completely affecting the wall of the appendix; HE \times 40 and (d) vascularized adipose and connective tissue with acute granulocytic inflammatory infiltrate and fibrin deposits in the greater omentum; HE \times 100. HE, hematoxylin and eosin.

Escherichia coli with resistance to ampicillin and trimethoprim/sulfamethoxazole and sensitivity to amoxicillin/clavulanic acid, cefaclor, cefoperazone, cephazolin, ceftazidime, ciprofloxacin, gentamicin, levofloxacin, and tetracycline. Postoperatively, the patient was hospitalized in the intensive care unit considering the severity of his initial condition, where (in addition to the existing pathology) he developed acute pancreatitis, paroxysmal atrial fibrillation (heart rate: 168–190 bpm), and low blood pressure (80/40 mm Hg). However, under complex drug treatment to maintain vital functions, namely antibiotics, anticoagulants, analgesics, corticosteroids, vasopressors, fluid volume replacement, and electrolyte and acid-base rebalancing, the patient's general condition began to improve slowly, and he was discharged 19 days after admission. After discharge, at the 3-month check-up, the patient was in good general health with some resumption of his activities of daily living.

Discussion

Infections in elderly patients are quite different compared with infections in younger patients owing to immunosenescence, epidemiological and bacteriological aspects, and associated comorbidities.¹³ The signs and symptoms are often atypical, leading to supplementary investigations that often delay the diagnosis and appropriate treatment and which could place the patient at a higher risk of death.^{13,14} Wroblewski and Mikulowski studied the symptoms of peritonitis in geriatric patients and described diagnostic accuracy in only 47% of the cases, abdominal pain in 55% of the cases, and abdominal tension in 34% of the cases.¹⁵ Ross et al described patients who presented with abdominal pain who frequently received extensive imaging, namely computed tomography, ultrasonography, and radiography, as well as laboratory

testing.¹ However, imaging should be selected cautiously to avoid management delay, unnecessary patient movement, radiation exposure, and possible misdiagnosis.¹ Thus, patients with peritonitis accompanied by hemodynamic instability do not require imaging, as these findings would not change the need for laparotomy.¹ In our case, we consider that it was sufficient to perform abdominal radiography, which revealed an occlusive syndrome that required emergency laparotomy. In this case, it was not considered justified to perform computed tomography because vital time would have been lost, and the patient was hemodynamically unstable. Our experience in this case is in accordance with the recommendations of Ross et al.¹

Laboratory analysis plays an important role in the diagnosis of infectious pathology. In addition to blood culture, which is the gold standard in the diagnosis of sepsis but which requires time to obtain the results,¹⁶ PCT and CRP are useful in the early diagnosis of bacterial infection, peritonitis, sepsis, and septic shock.^{8,17} PCT and CRP are among the most frequently measured biomarkers worldwide.^{10,11,18,19} Because our patient had a fever, we measured these biomarkers, which revealed very high values, as follows: PCT = >32 µg/L (values >10 µg/L suggest septic shock) and CRP = 1228.5 nmol/L (values >95.2 nmol/L suggest an inflammatory syndrome). These values, with the abdominal radiographic findings, indicated a high suspicion of septic shock with an intra-abdominal origin, which was confirmed intraoperatively. In this case, the patient's WBC was elevated at $13.1 \times 10^9/L$; however, the degree of elevation was not as dramatic compared with the PCT and CRP values, where were much higher than their respective normal ranges. With the accurate intraoperative diagnosis, we would have expected a much higher WBC in accordance with the presence of acute gangrenous

appendicitis with perforation and neglected peritonitis with septic shock; perhaps a WBC of $20 \times 10^9/L$. In accordance with a study by Guraya et al of WBC values in acute gangrenous and perforated appendicitis in patients aged 12 to 70 years (mean age: 23.7 years), the reported median WBC was approximately $17.9 \pm 2.1 \times 10^9/L$.²⁰ However, other studies involving elderly patients have reported low accuracy in the diagnosis of sepsis using WBC and even CRP, compared with PCT, which has a much higher accuracy and can differentiate localized infection from sepsis and septic shock.^{17,21} Gbinigie et al suggested that many useful diagnostic tests in younger patients do not help diagnose bacterial infections in the elderly.²² In our patient, the WBC did not lead us to a diagnosis of neglected peritonitis with septic shock. Instead, this value suggested a simple localized infection; thus, the WBC did not have diagnostic accuracy in our patient. PCT had the highest accuracy in making the diagnosis in our patient because we could classify the infection as having progressed to septic shock. CRP also provided increased accuracy in making the diagnosis, suggesting the presence of an inflammatory syndrome. Numerous studies recommend and support the measurement of biomarkers for better accuracy in the early diagnosis of sepsis.^{23–25} Gao et al found the measurement of PCT, CRP, and interleukin-6 useful in the early diagnosis of sepsis and other bacterial infections.²⁶ In our case, PCT and CRP values were sufficient for the early diagnosis of septic shock. The CRP and PCT values, with the imaging findings, suggested an intra-abdominal pathology that required emergency laparotomy. Thus, we were able to obtain an accurate diagnosis of neglected peritonitis owing to acute gangrenous appendicitis with perforation. Laparotomy also permitted the collection of peritoneal fluid for bacterial culture and sensitivity, which revealed

Escherichia coli with multiple sensitivities to different classes of antibiotics. We consider this result very useful in this case, especially considering that blood culture was not possible. In fact, many specialized studies confirm the usefulness of peritoneal fluid culture, and the microbiological results in these studies incriminate *Escherichia coli* as the first agent in secondary peritonitis owing to perforated appendicitis.^{27–29} The empirically administered antibiotic that we chose was among those with sensitivity in the culture results; therefore, antibiotic therapy was continued after the culture results, with the initially administered cephalosporins. Maintenance of the antibiotic therapy, with the complex medication administered postoperatively, was beneficial for the patient. Owing to the measurement of the biomarkers, and the imaging and urgent operation, the patient survived even though his chances of survival were very low initially. The reporting of this study conforms to the CARE guidelines.³⁰

Conclusion

Neglected peritonitis in elderly patients has a high potential to progress to septic shock. The atypical clinical symptoms in our patient did not provide enough information to make a diagnosis. However, a diagnosis was possible with corroboration between the laboratory test results and imaging findings, which provided important information in the early diagnosis of intra-abdominal infection, even if these examinations did not accurately identify the cause. The measurement of PCT and CRP successfully contributed to the early diagnosis of septic shock in this patient, while the WBC was not consistent with the severity of the infection.

Availability of data and materials

The datasets used and/or analyzed during the present study are available from the corresponding author on reasonable request.

Authors' contributions

All authors contributed equally to this work, critically revised the manuscript, and gave final approval of the submitted version.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

Ethics statement

Our ethics committee does not require approval for case reports. Written informed consent was obtained from the patient for treatment and for publication of this case report.

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