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CASE REPORT

Anthrax of the gastrointestinal tract and oropharynx: CT findings

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Abstract Anthrax is an acute infection caused by the Gram-positive organism *Bacillus anthracis*. It causes cutaneous, respiratory, and gastrointestinal (GI) infections in humans. We present the computed tomography findings of anthrax of the GI tract and oropharyngeal involvement which include inflammatory lesion in the oropharynx and GI hemorrhage.

Keywords Anthrax · Oropharynx · Computed tomography

Introduction

Anthrax is an acute infection caused by the Gram-positive organism *Bacillus anthracis* [1]. Anthrax spores may cause lesions from the oral cavity to the cecum [2]. Computed tomography (CT) findings, both oropharyngeal (OP) and gastrointestinal (GI) involvement of anthrax, have not been previously reported. We present the CT findings of OP and GI anthrax in a 43-year-old woman.

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Case report

A 43-year-old woman complained of abdominal pain, nausea, vomiting, and generalized weakness of 2 days' duration. The patient presented with sore throat and extensive swelling of the neck and anterior chest wall. There was marked inflammation and ulcerations of the posterior oropharynx. Head and neck lesions have compromised the airway. Lesions of OP cavity were associated with neck swelling, fever, toxicity, and dysphagia. Her temperature was 39.5°C, and leukocyte count was 13,300 cells/mm^3, with 86% neutrophils. She had no history of hypertension, diabetes mellitus, or tuberculosis. She had a history of ingestion of meat 4 days before the symptoms began. Culture, smear, and blood culture were performed. Blood culture confirmed *B. anthracis*. A contrast-enhanced neck CT scan revealed multiple enlarged, necrotic, ellipsoid, inhomogeneous contrast enhancement lymph nodes in the neck. There was no calcification in the lymphadenopathies (LAPs). On CT images, perinodal inflammation and perinodal contrast enhancement were revealed. There was right submandibular, cervical LAP, enhancing with contrast material, and fluid extending from the oropharynx to the upper mediastinum in the prevertebral space of the neck (Fig. 1).

Eight days later, she developed GI hemorrhage, and she underwent colonoscopy. The cecum, transverse colon, and ascending colon were edematous, with hemorrhagic mucosa and multiple ulcers (Fig. 2). The endoscopic exam of the upper GI tract showed evidence of multiple erosions in the stomach. Postcontrast abdominal CT scan revealed hyperdense hemorrhage due to extravasation through the abdomen, and there were ascites in the entire abdomen. Coronal CT angiogram demonstrated active extravasations of con-

Fig. 1 Oropharyngeal anthrax. Pre- (**a**) and postcontrast (**b**) axial computed tomography (CT) image of the neck shows marked soft tissue edema and mucosal ulceration at the nasopharynx, oropharynx, and larynx that narrowed the airway from the right side. Contrast-enhanced CT shows multiple enlarged internal jugular chain nodes (level II and level III) and spinal accessory lymph nodes (level V) with inhomogeneous contrast enhancement, areas of nodal necrosis. Some associated perinodal inflammation is also seen (**c**). There is also a large amount of fluid in the prevertebral space extending from the oropharynx to the upper mediastinum (**d**)

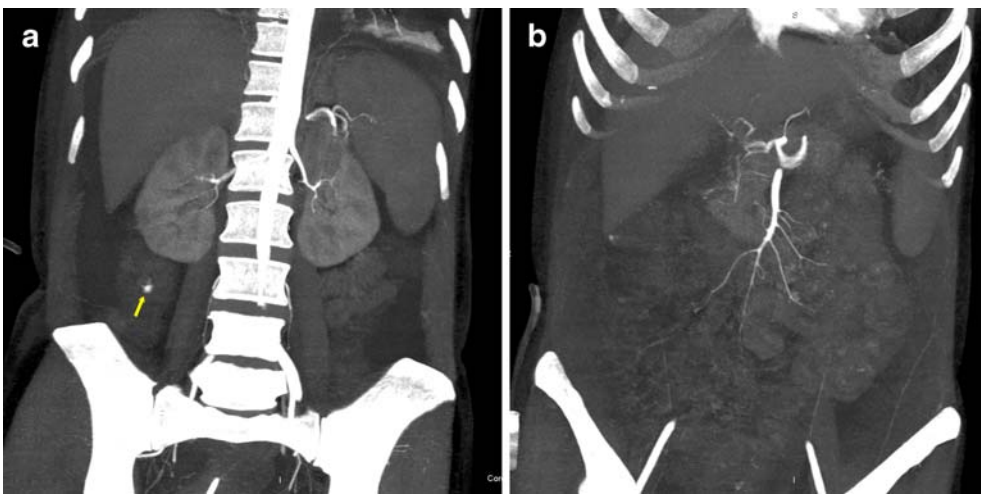

Fig. 2 Gastrointestinal tract anthrax. **a** Coronal computed tomography (CT) angiograms demonstrate active contrast material extravasation in the ascending colon (*arrow*). **b** Coronal CT angiogram demonstrates active contrast material extravasation into the area supplying superior mesenteric artery

trast material in the stomach and jejunum. CT angiogram showed ascites and diffuse mucosal enhancement throughout the stomach and in portions of the small bowel (Fig. 3). Attempts at resuscitation with intravenous fluids and treatment with penicillin failed, and the patient died 20 days after admission due to late admission.

Discussion

Anthrax is an infection caused by the *B. anthracis*. *B. anthracis* endospores are nonmotile, Gram-positive, and aerobic [3]. Anthrax has appeared after the ingestion of grossly contaminated or undercooked meat or bones of infected animals, contact with hair and wool of infected animals, or inhalation of the spores [4]. The common clinical manifestations of anthrax in humans are cutaneous (95% of cases), orogastric, and inhalational [5]. Gastrointestinal anthrax infection is relatively rare, with mortality rates of 25–60% [6]. Primary infections of the respiratory tract are rare in agricultural settings [2].

In GI anthrax, the clinic spectrum ranges from asymptomatic to fatal, by shock or sepsis [2]. In most cases, symptoms include high fever, diarrhea, severe abdominal pain, and serosanguinous, or frankly hemorrhagic ascites [6, 7], which may be similar to an acute abdomen [5, 7]. In this case, acute abdomen had been initially diagnosed in emergency services.

The first description of the GI anthrax includes congestion and/or hemorrhage of the GI tract. Abdominal CT angiography findings of GI anthrax showed, generally, extravasations of contrast into bowel lumen on arterial phase images. Autopsy was not performed in the present case. The distribution of the lesions was reported to be down the GI tract, in the mid-jejunum, terminal ileum, or cecum and tend to develop around a single site or a few sites of ulceration and edema. These lesions may lead to hemorrhage, obstruction, perforation, or any combination of these. Ascites may complicate. There are similar findings of GI anthrax in the present case [2, 8, 9]. Other pathologies that cause GI bleeding (vascular abnormalities, polyp, tumor, inflammatory bowel disease, angiodysplasia, diverticula, and neoplasm) should be considered in the differential diagnosis of GI anthrax.

OP anthrax presents with severe sore throat or an ulcer in the OP cavity associated with neck swelling, fever, toxicity, dysphagia, and cervical LAP [5, 10]. In our case, the same signs were there. Neck swelling was usually marked and was caused by enlargement of cervical lymph nodes and soft tissue edema [11]. In rare instances, head and neck lesions have led to airway compromise [7]. Lesions may involve tonsils, posterior pharyngeal wall, or the hard palate [11].

CT findings of OP anthrax showed multiple enlarged, necrotic, ellipsoid, inhomogeneous contrast enhancement lymph nodes in the neck. There was no calcification in the LAPs. On CT images, perinodal inflammation and perinodal contrast enhancement were revealed. The differential diagnosis of GI anthrax includes malignant nodes, tuberculosis, cat scratch disease, fungal infection, Castleman disease, tularemia, and Kikuchi disease [12]. To differentiate other cervical chain nodal inflammation and infections, Gram's staining and culture should be performed.

The GI anthrax treatment consists of intravenous antibiotics, surgery, and aggressive replacement of protein and electrolyte [2]. Anthrax in people has a high mortality rate; clinical and public health measures should emphasize the rapid diagnosis and initiation of effective therapies. This is exemplified by our patient who did not respond to treatment and died within 20 days.

In our knowledge, simultaneously, both OP and GI anthrax CT findings have not been previously reported. CT findings may help the extent and severity of the anthrax involvement. The clinician should inform anthrax if there is a history of contact with infected animals or their products, because finding of anthrax is nonspecific at CT.

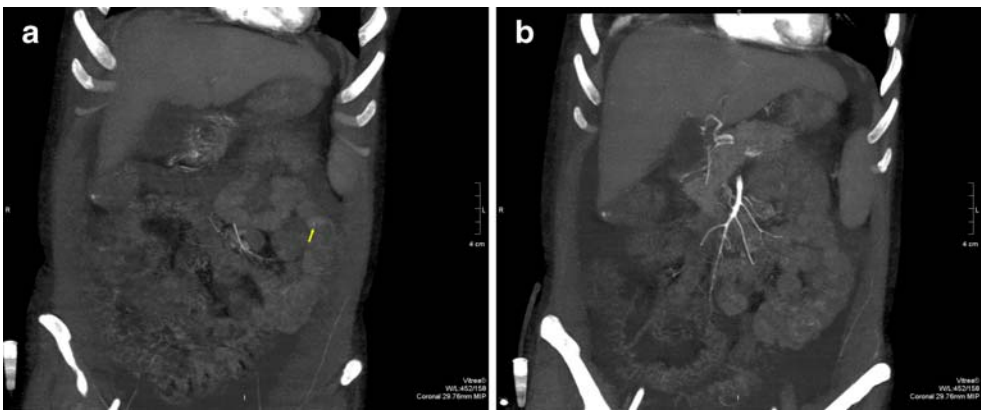

Fig. 3 Gastrointestinal tract anthrax. **a** Coronal CT angiogram demonstrates active extravasation of contrast material in the stomach and jejunum. CT angiogram shows ascites and diffuse mucosal enhancement throughout the stomach and in portions of the small bowel. **b** Coronal CT angiogram demonstrates edema of the small bowel

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