Case Report / *Olgu Sunumu*

DOI: 10.5578/ced.20240106 • *J Pediatr Inf 2024;18(1):e33-e36*

Cutaneous Anthrax: Two Pediatric Case Reports

Kutanöz Şarbon: İki Pediyatrik Olgu Sunumu

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Cite this article as: Tosun D, Hatipoğlu N, Hatioğlu SS. Cutaneous anthrax: Two pediatric case reports. J Pediatr Inf 2024;18(1):e33-e36.

Abstract

Anthrax is a zoonosis that affects herbivorous animals. Its causative agent is *Bacillus anthracis* and it is gram-positive, aerobic or facultatively anaerobic, immobile and has a polypeptide capsule. Its incidence is gradually decreasing in the world and in our country. The disease is especially common in regions dealing with animal husbandry and in periods when contact with questionable animal meat increases. In this article, two pediatric cases who developed symptoms after contact with animal meat suspected of anthrax during Eid al-Adha in İstanbul were shared. In both cases, cutaneous anthrax was observed as a result of contact with animal meat. The blood culture of the patients was negative, and the polymerase chain reaction (PCR) was positive for *Bacillus anthracis*. Ciprofloxacin treatment was started for the cases, and the cases recovered without complications. The most common form of anthrax is cutaneous anthrax. It starts as a small, painless but often itchy papule. Ciprofloxacin can be used as monotherapy as a treatment option in penicillin-resistant strains.

Keywords: Cutaneous, anthrax, ciprofloxacin

Öz

Şarbon otçul hayvanları etkileyen bir zoonozdur. Etkeni *Bacillus anthracis* olup gram-pozitif, aerobik veya fakültatif anaerobik, hareketsiz ve polipeptit yapısında kapsüle sahiptir. Dünyada ve ülkemizde görülme sıklığı giderek azalmaktadır. Hastalık, özellikle hayvancılık ile uğraşan bölgelerde ve şüpheli hayvan eti temasının arttığı dönemlerde yaygın olarak görülmektedir. Bu yazıda İstanbul ilinde Kurban Bayramı'nda şarbon şüpheli hayvan eti ile temas sonrasında belirti veren iki pediyatrik olgu paylaşıldı. İki olguda da hayvanın eti ile temas sonucunda kutanöz şarbon görüldü. Hastaların kan kültürü negatif, *Bacillus antracis* pozitif polimeraz zincir reaksiyonu (PCR) pozitif olarak sonuçlandı. Olgulara siprofloksasin tedavisi başlandı, olgular komplikasyonsuz iyileşti. Şarbon hastalığının en yaygın şekli kutanöz şarbondur. Küçük, ağrısız ama çoğunlukla kaşıntılı bir papül olarak başlar. Penisiline dirençli suşlarda tedavi seçeneği olarak siprofloksasin monoterapi olarak kullanılabilir.

Anahtar Kelimeler: Şarbon, antrax, siprofloksasin

Introduction

Anthrax is a zoonotic infection that mainly affects herbivorous animals such as cattle, sheep and goats, and its causative agent is *Bacillus antracis* (1). There are four main anthrax syndromes including cutaneous anthrax, inhalation anthrax, gastrointestinal system anthrax and the more rare primary anthrax meningitis (2). The most common form of anthrax in humans is cutaneous anthrax with a rate of 95% (2,3). Skin contact occurs due to inoculation of *Bacillus antracis* spores into subcutaneous tissues through abraded skin. These bacteria then multiply locally and start to produce toxin. This leads to characteristic edema and skin ulceration (4).

Although the incidence of anthrax cases is gradually decreasing in our country, it is an endemic disease whose frequency increases especially in regions where animal husbandry is widespread and periodically during periods of increased contact with suspicious animal meat (5). Today, the incidence of the disease in humans is decreasing and it is important to consider anthrax in the differential diagnosis.

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Received: 07.11.2023 **Accepted:** 26.12.2023 **Available Online Date:** 19.03.2024

In this article, it was aimed to report two pediatric cases who developed symptoms after contact with anthrax suspected animal meat in İstanbul province. Consent was obtained from the families of the cases for this article.

Case Report

Case

A four-year-old girl presented to the emergency department with fever, vomiting and rash on her hands. It was learned that her parents had contact with suspected anthrax meat during the Eid al-Adha period 10 days before she was admitted to our clinic. The patient had a history of using amoxicillin-clavulanate suspension for two days before presenting to our outpatient clinic. On physical examination; general condition was good, consciousness was clear, she was oriented, coherent, her Glasgow coma scale (GCS) was 15, blood pressure (BP) was 90/50 mmHg, heart rate (HR) was 110 beats/min, body temperature was 36.5 °C, and respiratory rate (RR) was 20/min, SaO_2= 99. Head and neck examination was normal and both lung sounds were normal by listening. The patient had five painless papular lesions measuring 0.5x0.5 cm in the lumbar region and three papular lesions measuring 2 x 1 cm^2 in both hands (Figure 1). On abdominal examination, bowel sounds were increased and there was tenderness in the periumbilical region. No pathologic findings were found in other systemic examinations. Laboratory tests were as follows: white blood cell (WBC)= 17880, hemoglobin (Hg)= 11.3 g/dL, platelet (Plt)= 392000, glucose (Gl)= 90 mg/dL, creatinine (Cr)= 0.6, ALT= 15 U/L, AST= 20 U/L, Na= 135 mEq/L, K= 4.5 mEq/L, C-reactive protein (CRP)= 0.48 mg/dL, albumin= 3.2 d/dL. Rotavirus and adenovirus antigen in stool and stool culture were performed for gastrointestinal system infections. The patient had no signs of dehydration and did not have fever and vomiting on the first day of hospitalization. Ciprofloxacin 30 mg/kg/day intravenously and topical cream containing bacitracin and neomycin sulfate were started. A sample was taken from the suspected anthrax lesions for gram staining; no microorganism was observed on gram staining, and blood agar was inoculated; however, no growth was observed. A blood sample sent to the Turkish Public Health Laboratory (TPHL) for definitive diagnosis was positive for *Bacillus anthracis* PCR. The disease was appropriately reported to the Provincial Health Directorate. Our patient was discharged with oral antibiotherapy on the third day of hospitalization with regression of the lesions. One week later, the lesions were found to have healed at the pediatric infection outpatient clinic control.

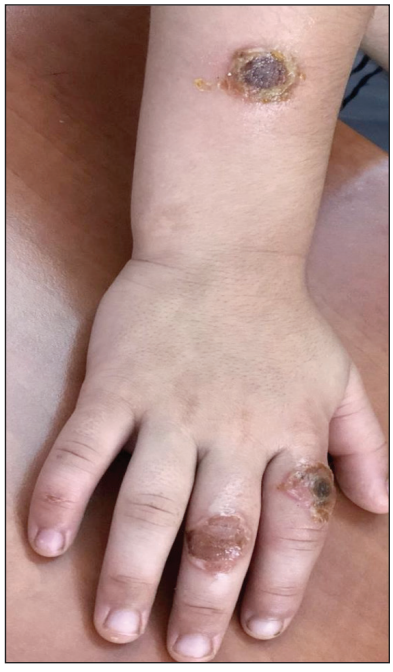

Figure 1. The patient's papular lesions.

Case

A seven-year-old male patient presented with a pruritic lesion on the right hand and right forearm for five days. It was learned that amoxicillin-clavulanate suspension treatment was started in another health institution. It was learned that the patient's mother had similar lesions, had contact with suspected anthrax meat during the Eid al-Adha and the lesions developed after contact. Physical examination was as follows: general condition was good, consciousness was clear, oriented, cooperated, BP= 120/70 mmHg, HR= 90 beats/min, body temperature= 36.6 °C, RR= 16/min, SaO_2= 97. Mildly indurated pustular lesions with yellow crust and erythematous surroundings measuring 2 x 2 cm^2 were observed in the proximal right humerus and left femoral region (Figure 2). No pathologic findings were found in other systemic examinations. Laboratory tests were as follows:

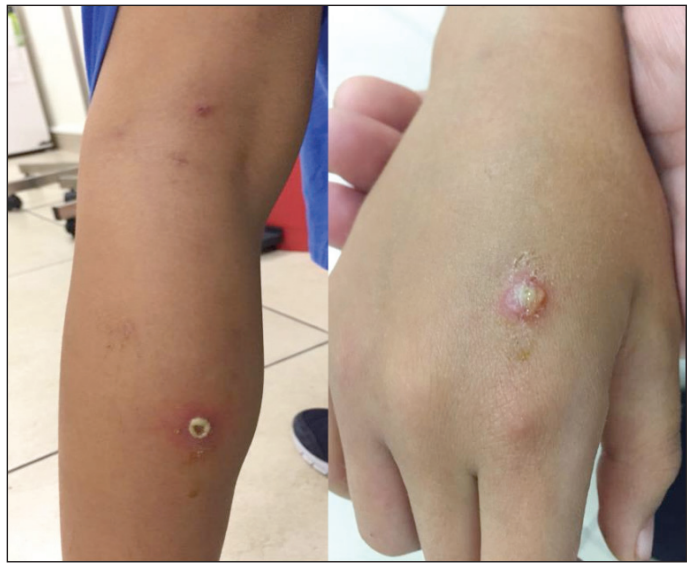

Figure 2. The patient's surroinding erythematous yellow crusted lesions are shown.

white blood cell (WBC)= 15740, Hemoglobin (Hg)= 12.9 g/dL, platelet (Plt)= 442000, glucose (Gl)= 80 mg/dL, creatinine (Cr)= 0.8, ALT= 40 U/L, AST= 50 U/L, Na= 132 mEq/L, K= 4.3 mEq/L, C-reactive protein (CRP)= 4.2 mg/dL, albumin= 3.1 d/dL. Samples were taken from the patient's lesions for Gram staining; no microorganism was observed on Gram staining, blood agar was cultured but no growth was observed, blood cultures were taken and these samples were sent to TPHL. Ciprofloxacin treatment was started for the patient who was thought to have cutaneous anthrax. The test results showed that the patient was anthrax PCR positive. The disease was reported to the Provincial Health Directorate appropriately.

Discussion

Cases of cutaneous anthrax develop after subcutaneous transmission of *Bacillus antracis* spores, usually as a result of contact with infected animals or animal products. Abrasions or lacerations increase susceptibility to cutaneous infection. The incubation period is usually five to seven days (4).

More than 90 percent of cutaneous anthrax lesions occur on exposed areas such as the face, neck, arms and hands. The disease begins as a small, painless but often pruritic papule that rapidly enlarges to develop a central vesicle or bulla, followed by erosion and a painless necrotic ulcer with a black, sunken eschar. Diffuse edema, often regional lymphadenopathy and lymphangitis may be observed in the surrounding tissues due to toxin release (6).

Although not seen in the majority of cases, systemic symptoms such as fever, fatigue and headache may accompany the cutaneous lesion, although less common in children. In a systematic review of 340 adults hospitalized for cutaneous anthrax, fever or chills have been reported in 39 percent, fatigue and flu-like symptoms in 11 percent and headache in 10 percent (7). In both of our cases, systemic symptoms were observed at the time of admission to our hospital and were effective in the management of the patients and in the decision for internationalization and clinical follow-up.

Overall, secondary meningitis has been reported in approximately 10 percent of patients hospitalized for cutaneous anthrax. It is important to identify patients at risk for adverse outcomes. These include those with head and neck involvement, signs of sepsis or meningitis. Therefore, the presence of fever, chills, hypotension, nausea or vomiting, altered consciousness, headache, signs of meningeal irritation, papilledema, convulsion, leukocytosis, bacteremia, coagulopathy, lymphadenopathy and diffuse edema are shown as risk factors for meningitis (8).

Anthrax cases have a high mortality rate if not treated appropriately. However, mortality is much lower when reasonably good health care is available. In a joint study on the duration of anthrax treatment in our country, no death was observed among 66 patients with uncomplicated cutaneous anthrax (no shock, sepsis, meningitis or lung involvement) (9). Although the complaints at hospital admission were systemic symptoms in both of our patients, cutaneous anthrax without systemic involvement was considered in clinical follow-up and their treatments were organized.

Patients with suspected cutaneous anthrax should be sampled from within the vesicle in the presence of a vesicle, with two swabs moistened with saline in the presence of an ulcer, or removed in the presence of an eschar and a swab sample should be sent for Gram stain and culture, the latter for PCR testing. Patients who are not receiving antibiotic treatment or who have received less than 24 hours of treatment should send a Gram stain, culture and PCR test specimen. In patients with evidence of systemic disease (e.g. fever, tachycardia, hypotension), blood culture and PCR testing are recommended. Specimens sent for culture should ideally be collected prior to antimicrobial therapy. Non-culture tests are usually performed in a reference laboratory (9).

Clinicians suspecting anthrax should liaise closely with their clinical laboratory to ensure appropriate microbiologic examination of any *Bacillus* isolates and to ensure that the specimen is sent to a reference laboratory for definitive identification. For patients with suspected or documented systemic anthrax, the initial evaluation also focuses on potential complications of the infection. A complete blood count, serum electrolytes, renal and liver function tests, and coagulation parameters should be sent. In addition to detailed physical examination, additional imaging and laboratory evaluations should be ordered (7-9). While leukocytosis was present in both of our patients, CRP elevation, coagulopathy and liver enzyme elevation were not observed.

Systemic anthrax is defined as cutaneous anthrax accompanied by systemic involvement (gastrointestinal, inhalation, meningitis anthrax and bacteremia). Patients with suspected systemic anthrax should be evaluated like other pediatric patients with fever, including blood cultures and other appropriate cultures before treatment (8,9).

Recommended antimicrobial regimens for anthrax include bactericidal agents and a protein synthesis inhibitor that suppresses toxin production. *Bacillus anthracis* is highly susceptible to several antimicrobial agents, including penicillin, chloramphenicol, tetracycline, erythromycin, streptomycin, carbapenems, linezolid, clindamycin and fluoroquinolones, and resistant to cephalosporins and trimethoprim-sulfamethoxazole. Since *Bacillus anthracis* has beta-lactamase genes, beta-lactam use can induce resistance during treatment. Although several penicillin-resistant isolates tested were susceptible to amoxicillin-clavulanate, this agent is expected to inhibit only one of the two beta-lactamase gene products of *Bacillus anthracis*. Therefore, amoxicillin-

clavulanate and ampicillin-sulbactam are not good options for penicillin-resistant strains (10).

Ciprofloxacin 30 mg/kg/day IV or, for penicillin-susceptible strains only, penicillin G 400.000 units/kg/day and clindamycin 40 mg/kg/day IV are recommended. For cutaneous anthrax without systemic involvement, monotherapy should be used. Ciprofloxacin 30 mg/kg/day or amoxicillin 75 mg/kg/day monotherapy is recommended for strains sensitive to amoxicillin. Other alternative options are doxycycline 4.4 mg/kg/day or clindamycin 30 mg/kg/day or levofloxacin <50 kg= 16 mg/kg/day (not exceeding 250 mg/dose) ≥50 kg= 500 mg/day or penicillin V 50-75 mg/kg/day for penicillin-sensitive strains. Adequate doses of penicillin and amoxicillin are very important due to development of resistance during treatment (10). Since both of our patients had been using amoxicillin-clavunulate before presentation to our clinic, their treatment was considered to be penicillin resistant and their treatment was organized as ciprofloxacin.

Conclusion

As a result, the most common form of anthrax is cutaneous anthrax. It begins as a small, painless but often pruritic papule that rapidly enlarges to form a central vesicle or bulla, followed by erosion and culminating in a necrotic ulcer with a black eschar. In pediatric cases, ciprofloxacin as monotherapy may be used as a treatment option in penicillin-resistant strains.

Informed Consent: Patient consent was obtained.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - DT, NH, SH; Design - DT, NH, SH; Supervision - DT, NH, SH; Resource - DT, NH; Data Collection and/or Processing - DT, NH; Analysis and/or Interpretation - DT, NH; Literature Search - DT, NH; Writing - DT, NH; Critical Review - DT, NH.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

1. *Zacchia NA, Schmitt K. Medical Spending for the 2001 anthrax letter attacks. Disaster Med Public Health Prep 2019;13(3):539-46. https://doi.org/10.1017/dmp.2018.113*
2. *Sumter JL, Goodrich-Doctor A, Roberts J, Mason TJ. Twenty-first century emergency response efforts of the Commissioned Corps of the US Public Health Service. J Emerg Manag 2018;16(5):311-9. https://doi.org/10.5055/jem.2018.0380*
3. *Caffes N, Hendricks K, Bradley JS, Twenhafel NA, Simard JM. Anthrax meningoencephalitis and intracranial hemorrhage. Clin Infect Dis 2022;75(Suppl 3):S451-S458. https://doi.org/10.1093/cid/ciac521*
4. *Suffredini DA, Sampath-Kumar H, Li Y, Ohanjanian L, Remy KE, Cui X, et al. Does bacillus anthracis lethal toxin directly depress myocardial function? A review of clinical cases and preclinical studies. Toxins (Basel) 2015;7(12):5417-34. https://doi.org/10.3390/toxins7124891*
5. *Metan G, Uysal B, Coşkun R, Perçin D, Doğanay M. Şarbon meningoensefaliti: Bir olgu sunumu ve Türkiye literatürünün derlenmesi. Mikrobiyol Bul 2009;43(4):671-6.*
6. *Wenner KA, Kenner JR. Anthrax. Dermatol Clin 2004;22(3):247-v. https://doi.org/10.1016/j.det.2004.03.001*
7. *Hendricks K, Person MK, Bradley JS, Mongkolrattanothai T, Hupert N, Eichacker P, et al. Clinical features of patients hospitalized for all routes of anthrax, 1880-2018: A systematic review. Clin Infect Dis 2022;75(Suppl 3):S341. https://doi.org/10.1093/cid/ciac534*
8. *Thompson JM, Cook R, Person MK, Negrón ME, Traxler RM, Bower WA, et al. Risk factors for death or meningitis in adults hospitalized for cutaneous anthrax, 1950-2018: A systematic review. Clin Infect Dis 2022;75(Suppl 3):S459-S467. https://doi.org/10.1093/cid/ciac533*
9. *CDC. Recommended Specimens for Anthrax Testing by Clinical Presentation. Available from: https://www.cdc.gov/anthrax/lab-testing/recommended-specimens/clinical-presentation.html (Accessed date: 10.12.2023).*
10. *Bower WA, Schiffer J, Atmar RL, Keitel WA, Friedlander AM, Liu L, et al. Use of anthrax vaccine in the United States: Recommendations of the Advisory Committee on Immunization Practices, 2019. MMWR Recomm Rep 2019;68(4):1-14. https://doi.org/10.15585/mmwr.rr6804a1*