

Cutaneous Anthrax in Kamakwie, Karene District, Northern Sierra Leone

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ABSTRACT

Background: Anthrax is a zoonotic bacterial infection caused by a gram-positive bacillus called *Bacillus anthracis*. It is a disease of public health importance with high mortality rate. The mortality rate could approach absolute without treatment, and about 64% in centres with best of care. Also, because of its role as a biological weapon and in bioterrorism; post 9-11 in the United States, anthrax spores had been deliberately released in mail parcel leading to a significant morbidity and mortality. The most severe manifestation of anthrax is pulmonary anthrax, which had the aforementioned statistics. Other manifestations include cutaneous anthrax, gastrointestinal, and injection anthrax.

Objective: To report four cases of cutaneous anthrax seen in Kamakwie, Karene District, Northern Sierra Leone, by illustrating their clinical presentations and management, in order to draw attention to the problem.

Method: Four cases of cutaneous anthrax were seen at Wesleyan Hospital, Kamakwie between the 7th June, 2018 and 11th July, 2018. The diagnosis was suspected from clinical interview and examination, and confirmed by Enzyme-linked Immunosorbent assay (ELISA) at Infectious disease [Ebola] Reference centre in Kenema, Sierra Leone.

Results: The age range of the cases was between 9 months and 20 years. Three of the cases were females and one male. All the cases had contact with cattle directly by virtue of animal care and milking, and indirectly by staying on the farmstead with the animals. One of the cases followed routine vaccination. All the cases presented with pustular or vesicular rash which later became ulcerated with central area of eschar. The duration of time between the onset of the rash and formation of the ulcers ranges from one day to three days. Other features were low grade fever, peri-lesional swelling, peri-ocular swelling, malaise, weight loss and loss of appetite. Majority of the ulcers were located in the head and neck region. Treatment of the cases with antibiotics and prophylaxis for the close contacts, as well as decontamination of the animal reservoir yielded a good result with 0% mortality. However, duration of hospital stay ranges from 14 days to 20 days.

Conclusion: Human vaccination especially for individuals whose work bring them in contact with animals or animal products, coupled with animal vaccination will be a

more economic way in mitigating against this disease bearing in mind the associated morbidity and mortality associated with it.

INTRODUCTION

Case 1

M.K was a 5year old girl. She was the only Ebola survivor in her immediate family. She resided with her relatives at Temporary Village of Lower Tambaka Chiefdom, 15 miles Northwest of Kamakwei, Karene District. The caregivers were farmers but the village was known for cattle rearing. She presented at Kamakwei Wesleyan Hospital, Kamakwei on account of 3 days history of right sided facial rash and swelling. She was apparently well until about 3 days prior to presentation, when she developed a rash on the right cheek which was said to be insidious in onset, non-itching, initially painless, reddish and about the size of pimple but progressively increase in size leading to the formation of a pustule which subsequently rupture to form a painful ulcer with associated swelling of the right eye. There was no associated fever, reduction in urine output, weight loss, loss of appetite and visual impairment prior to presentation. There was no similar ulcer or swelling in any other part of the body, no history of similar symptoms in the past, no history of allergy in the past and no history of insect stings. There was no associated cough, difficulty with breathing, vomiting or passage of loose stool.

There was no history of similar symptom in any other members of the family she resided with. Immunization history could not be ascertained. There was no history of previous hospital admission.

Examination revealed a young girl that was not pale; she was not jaundiced, a febrile and a cyanotic. However, she had enlarged sub mental and cervical lymph node enlargement. Examination of the head and neck revealed diffuse swelling of the right aspect of the face with complete closing of the right orbit with difficulty in opening the right eye. However, there was good direct and consensual light reflex. There was associated ulcer measuring about 3cm in diameter with a black eschar at the centre, non- communicating with the buccal cavity, painful with swelling of the surrounding skin. There was associated swelling of the upper and lower lips with deviation of the lips to the affected part with associated difficulty in

opening the mouth. Poor dental hygiene was noticed; however no swelling of the gum or dental anarchy was noticed. Other systemic examinations were essentially normal. The diagnosis of Cutaneous Anthrax was made. The differential diagnoses were Cellulitis, Hypersensitivity Reaction and Chronic Peri-odontitis. She had the following investigations done: Full blood count – which came out as Hb-10g/dl, white blood cell count- 8,500/cmm (neutrophils-60%, lymphocytes- 40%, eosinophils - 0%, basophil-0%); Retroviral screening- non reactive; Urinalysis – essentially normal; Electrolytes, urea and creatinine- essentially normal and wound smear was taken for microscopy, culture and sensitivity, blood sample was equally taken for blood culture. Treatment was initiated with intravenous ceftriaxone at 75mg/kg/ day, intravenous metronidazole at 2.5mg/kg/dose thrice daily and daily dressing of the wound with povidone iodine. The close contacts were given Ciprofloxacin 500mg b.d and caps doxycycline 100mg b.d for 2 weeks. The District Surveillance team was contacted where blood sample was taken to be sent to the reference laboratory for ELISA. Significant improvement was recorded. However, the index case absconded from the hospital with the relatives. The result of the ELISA was confirmatory.

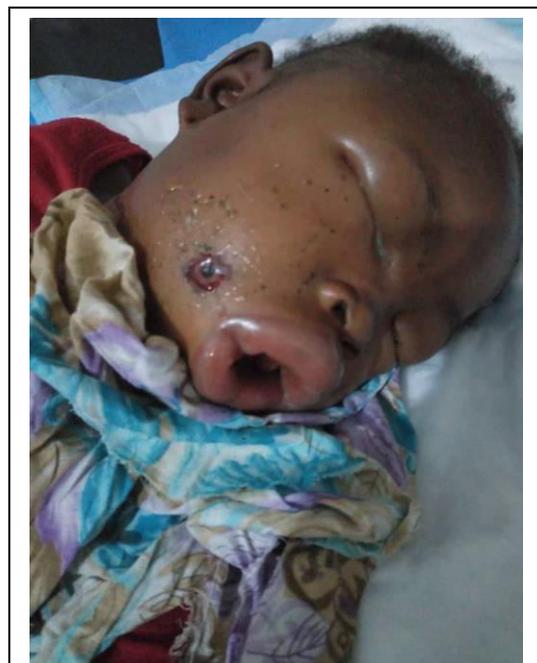


Figure 1: M.K at presentation. The characteristic cutaneous anthrax ulcer with central eschar is seen on her right cheek. (Source-the author, with permission from the patient's parent)

Case 2

J.B.K was a 14year old girl brought to the hospital by the grandmother, she is a Fullah (a tribe in Sierra Leone known for cattle rearing and trading) and she resided with a family that was involved in Cattle rearing. She resided with the family at Romaneh Village, Gbanti- Kamaranka Chiefdom, 25 miles Southwest of Kamakwei, Karene District. She was apparently well until about 3 months prior to presentation when she developed ulcers on the right side of the face, swelling of the right side of the face with ocular swelling and low grade fever. The ulcers were located on the right cheek and the left nostril roof. The ulcers started about the same time as a painless, non itching rash which was about the size of a pimple, reddish and progressively transformed to pustules within two days and subsequently rupture to form ulcers with black eschar at the centre. The ulcer on the cheek subsequently communicated with the buccal cavity and the one at the lateral edge of the right nostril eroded the nostril the nasal bridge within one week of the onset of the rash with associated pain. About the same time, she developed a rapidly progressing swelling of the right half of the face which was worse around the orbit leading to the shift in the facial architecture toward the affected side. There was associated low grade, intermittent fever with significant weight loss and loss of appetite. There was no associated cough, night sweat, loss of sensation or change in colour of the skin. There was no similar ulcer in any other part of the body and no past history of similar symptoms. Since the onset of the symptoms, she had used different types of traditional medicine with no improvement. There was no history of previous hospital admission. There was no history of such symptoms in any other member of the family she resided with. She was involved in the care and milking of the cattle that the family deal with. She was the first of five children in a monogamous setting, her parents and other siblings resided in Guinea. There was no history of cigarette smoking or alcohol consumption. Her examination revealed a young girl who was chronically ill-looking, wasted and dehydrated. A roughly well-circumscribed ulcer was seen on the right cheek, measuring about 2.5cm with dark eschar at the centre with sloughs at the periphery of eschar. Another dirty ulcer was seen extending from the right lateral aspect of the nasal bridge diagonally to the base of the right nostril, extending to the paranasal sinus. The

dimension is about 5.2cm by 1.8cm by 3cm. The floor of the ulcer was sloughy and the edges were irregular. An olive shaped swelling of right lower lid was seen with peau d'orange appearance completely occluding the right globe. Swelling of the right upper eye lid was equally noticed. The underlying globe was however preserved with intact conjunctival, cornea, and lens; direct and consensual eye reflexes were intact. Other systemic examinations were essentially normal.



Figure 2: J.B.K at presentation. The characteristic cutaneous anthrax lesion with central eschar is seen on her left cheek. (Source-the author with permission from the patient and her parents)



Figure 2 and 3: J.B.K at presentation. The characteristic cutaneous anthrax lesion with central eschar is seen on her left cheek. (Source-the author with permission from the patient and her parents)



Figure 4: J.B.K after 1 week of treatment. (Source-the author with permission from the patient and her parents)

Diagnosis of Untreated Cutaneous Anthrax was made. The differential diagnosis was Basal Cell Carcinoma. She had full blood count done which revealed Haemoglobin concentration of 12g/dl; White blood count of 5,700/cmm (neutrophils-65%, lymphocytes-35%). ESR was 5mm/hr, retroviral screening was non- reactive, random blood glucose was 139mg/dl. Smear sample was taken for microscopy, culture and sensitivity, blood culture and tissue biopsy for histology. She was admitted and treatment was initiated with intravenous fluid normal saline 500mls to alternate with 5% dextrose saline 500mls 6hourly, intravenous ciprofloxacin 200mg 12hourly, oral doxycycline 100mg b.d , intramuscular tetanus toxoid 0.5ml stat, twice daily wound open wound dressing with povidone iodine, oral paracetamol 750mg tds and nutritional support. Surveillance Team was contacted; blood sample was taken from the patient for ELISA at the reference laboratory in Kenema and also from close contacts. Close contacts were commenced on oral ciprofloxacin and doxycycline for two weeks. She had improved marked characterized by significant reduction in the peri-ocular swelling and improvement in the wound. ELISA result was confirmatory.

Case 3

A.S was a nine-month old male child, he was born to a Fullah family (a tribe in Sierra Leone known for cattle rearing and trading) who are known for farming and cattle rearing at Mafakuray Village in Lower Tambaka Chiefdom, about 30 miles North of Kamakwei and very close to Guinea border, Karene District. He presented with approximately a three weeks history of ulcer on the thigh following immunization, 5 days history of rash around the neck and 3 days history of fever. He was apparently well until about 3 weeks prior to presentation when he developed rash at the injection site after receiving immunization at the lateral aspect of the right thigh, the rash was said to be small and popular at the onset but progressively increased in size forming a pustule and subsequently leading to formation of an ulcer with central area of eschar. The ulcer was said to be painless and progressively increased in size. About 5 days prior to presentation, he developed a rash around the chin which became ulcerated

within three days and progressively increased in size. The ulcer was said to be painless with central area of eschar and there was no associated purulent discharge. About 2 days prior to presentation, he developed fever, which was said to be high grade and intermittent. There was no associated neck pain, neck stiffness, vomiting, and passage of loose stool, urinary frequency or crying on micturition. There was no associated cough or difficulty with breathing. There was associated restlessness and poor feeding. There was no previous hospital admission and immunization was up to date. He was the 4th of 4 children born in a monogamous setting, however 2 of his siblings died of childhood illnesses. There were no similar symptoms in other members of the family. Examination revealed a pale and febrile male child with enlarged cervical lymph node. There was a poorly circumscribed ulcer at the middle half of the lateral aspect of the right thigh measuring about 6cm in the widest diameter with central area of dark eschar and slight hypo pigmentation of the surrounding skin. The edges were irregular and the floor was granulating. An elliptical ulcer was seen extending from the right chin (at the midpoint between the lower border of the ear and the mandibular joint) to the base of the jaw on the left. It measured about 8cm by 3cm by 0.5cm with central area of eschar. The floor was sloughy and the edges were raised.

Assessment of Cutaneous anthrax (injection anthrax) was made. The differential diagnoses were injection abscess and soft tissue cellulitis of the neck. He had full blood count done, which revealed haemoglobin concentration of 8g/dl; white blood count of 14,600/cmm (neutrophils- 72%, lymphocytes- 28%); blood film for malaria parasite was negative; retroviral screening was non-reactive. Wound smear was taken for microscopy, sensitivity and culture and blood sample for blood culture. He was subsequently commenced on intravenous ceftriaxone, oral paracetamol and haematinics. He had surgical debridement done and daily wound dressing subsequently. His close contacts were commenced on oral ciprofloxacin and doxycycline. The District surveillance team was contacted and blood sample was taken for ELISA at the reference laboratory. He sustained marked improvement and the result from the reference laboratory was confirmatory.



Figure 5 and 6: A.S at presentation with characteristic cutaneous anthrax lesion with aeschar at the centre on the right thigh and the chin. (Source-the author with permission from the parents of the patient)

Case 4

D.B was a 20years old local cheese trader (husband was a cattle rearer) from Sanda Loko Chiefdom, She presented with 2 days history of low grade fever, generalized body pain and vesicular rash around the left jaw which later became a painless ulcer. Examination revealed a circular ulcer with a

central eschar and peri-lesional swelling. Diagnosis of cutaneous anthrax was made. Full blood count, retroviral screening, VDRL and ESR were done, and they were essentially normal. Blood culture was requested for but it was not done. She was subsequently treated with ciprofloxacin and doxycycline with good clinical outcome. Her close contacts were given prophylaxis. The surveillance team took her sample and was sent to the reference laboratory and it was confirmatory for anthrax.



Figure 7: D.B at presentation with characteristic cutaneous anthrax lesion around the left jaw-line. (Source- the author with permission from the patients)

SUMMARY OF THE CASES

- Age range- 9/12 to 20yrs
- Sex – M: F – 1:3
- Occupation- Herders/ Farmers
- Clinical features- Incubation period ranged from 1-3days. Three of the patients presented with vesicular rash and one with pustular rash. All the cases presented with painless ulcers with central eschar. There was associated peri-lesional

edema in all the cases. All the patients had lesions in the head and neck region.

- Presence of low grade fever, loss of appetite, wt loss, and lymph node enlargement were not consistent.

The Chief Medical Officer of the country was contacted in all the cases and he deployed both human and veterinary surveillance team to the district. Farms were decontaminated and the animals in the community were treated.

DISCUSSION

Anthrax is a zoonotic bacterial disease caused by the bacterium *Bacillus anthracis*. It is primarily a disease of the herbivores. Humans almost invariably contact the disease directly or indirectly from animal or animal products. Anthrax is considered a disease of public health importance because it is high on the list of potential agents used in biological warfare or bioterrorism and also because of the mortality and morbidity associated with it (mortality can be as high as 90% in pulmonary anthrax if untreated and high as 64% despite treatment in the best centres) [1,2].

Bacillus anthracis is a Gram positive, aerobic, spore-forming bacillus. The infected host sheds the vegetative bacilli on the ground and these sporulate on exposure to the air, these spores are hardy and can persist in the soil for decades. The bacterium is capable of producing toxins which correlate with its virulence. Three toxin components have been identified namely: Protective Antigen (PA); Lethal Factor (LF); and Edema Factor (EF). These three factors interact with each other and the host cells to cause the damages seen in the host [3].

There are three different forms of manifestation of anthrax namely: Cutaneous anthrax; pulmonary anthrax; and intestinal anthrax. Cutaneous anthrax is the most common form and it accounts for 95% of human cases worldwide as seen in the index cases. It is however worth knowing that anthrax does not transfer from person to person [1,2]. Cutaneous anthrax is transmitted when the spores of *Bacillus anthracis* which often appear in infectious animal products get in contact with an area of broken skin as seen in the patients discussed [4]. Cutaneous anthrax has a worldwide distribution but more common in Africa and Southern Asia. Epidemics have been reported in The Gambia, in both North and South America and in South Europe [4,5]. The index cases belong to the Fullah tribe and Limba tribe. The Fullah tribe is one of the tribes in

Sierra Leone who are believed to have migrated from the Republic of Guinea, are known for cattle rearing and petty trading and are found predominantly at the Northern part of Sierra Leone particularly at the border towns with Guinea. The limba tribe are predominantly farmers, and are also involved in animal husbandry. The risk factor associated with cutaneous anthrax in the index patients was handling of animals and animal products. One of the cases also followed intramuscular injection. A similar risk factor identified by Turnbull⁶ in a WHO publication was occupations that brought individuals closer to animal or its products such as farming, butchering, wool sorting, animal hide dealings, animal bone dealings etc. The reported incubation period ranges from few hours to about 3 weeks, most often between 2 to 7 days [6]. In the index patients, it was about 1-3 days.

Clinical findings in the index cases were vesicular and pustular rashes which later ruptured to become painless ulcers with central black eschar. These findings were consistent with the documented findings. [6,7] Most of the lesions are found on exposed regions of the body as seen in the cases, with the majority having their lesions on the head and neck region, and almost invariably accompanied by marked oedema extending some distance from the lesion and regional lymph nodes enlargement [6,7]. Generally, cutaneous lesions occur singularly but sometimes two or more lesions may be present as seen in Case 2 and Case 3 [5]. Other reported clinical features of cutaneous anthrax include: loss of appetite, weight loss, general body weakness, low grade fever, proptosis, dropping of the eyelids and malaise which were seen in some of the index cases [7,8]. The diagnosis of cutaneous anthrax require high index of suspicion and it is made by demonstrating the organism in smears from cutaneous lesions as seen in the index case, or by blood culture (using 5% sheep blood agar and other routine culture media). Serologic confirmation can be made using gamma bacteriophage testing, indirect hemagglutination, Polymerase Chain Reaction (PCR) or Enzyme-Linked Immunosorbent Assay (ELISA) to detect antibodies to both the organism and the toxin. The best confirmatory precipitation test for anthrax is the Ascoli test (a test in which an antibody raised in rabbits produces a visible precipitate when it reacts with its antigen usually within 15minutes). ELISA was however carried out in the index cases at the country's

reference laboratory. Other ancillary investigations include: white blood cell count which might be normal or raise, packed cell volume might be normal or low; random or fasting blood glucose, so as to rule out hyperglycaemia; and retroviral screening, so as to rule out immune suppression. All the above investigations were carried out on the index patients [5,9].

Penicillin has long been the antibiotic of choice, but where it is contraindicated or in an area where there is high resistance to penicillin, other broad spectrum antibiotics can be used. Ciprofloxacin with doxycycline has a wide range of acceptance as the primary treatment alternative. This combination should however be avoided in children less than 10 years because of its effect on bone growth and bone end plates. Ciprofloxacin may be combined with other antibiotics such as; clarithromycin, clindamycin, vancomycin or rifampicin [5,10]. In the case series, about 50% of the cases were given ciprofloxacin with doxycycline, and the other 50% was given penicillin. Both groups had an excellent outcome. It is worth knowing that the bacilli get killed rapidly by antibiotics but the clinical effects of the toxin may continue for some time afterward. The duration of treatment is debatable, however 1-2 weeks antibiotics duration has been recommended by WHO depending on the severity of the disease, as against the previous sixty days duration. H.M had only two-week course of antibiotics [5,11].

Prophylactic antibiotics are only recommended for persons known to have been exposed to a very substantial dose of aerosol spores in deliberate release scenario or who are strongly suspected to have been exposed to the spores by virtue of their occupation as suspected in household members of the index cases who were all involved in the care of their cattle as well as handling of the animal products [11]. Control of anthrax generally involves treatment of the animal using penicillin with streptomycin. A few countries like the United States of America and Canada however do not permit treatment but an outright disposal of the infected animals, decontamination of the site(s) and items used to test and dispose of the carcasses. Other components of the control measure include initiation of vaccination of other animals as appropriate, human vaccination and development of a good working relationship between veterinary health surveillance team and their human counterpart in zoonotic disease

prevention and control programs [11]. All the above control measures were carried out in the index patients. It is however unfortunate that at the time of writing this case, human anthrax vaccine is not available in the country. This should however be given in countries where it is readily available especially for people whose occupations put them at risk of contact with animals such as sheep, cattle and/or their products.

Effective surveillance is essential to prevention and control programs for anthrax due to its public health importance viz-a-viz its mortality and its use in bioterrorism. Surveillance encompasses mechanism for disease detection, confirmation of diagnosis, reporting, collation of data and feedback of the data to the source. In the index patient, the author was involved in the first three stages of surveillance and equally received feedback at the end of the exercise [11]. Physicians need to have a high index of suspicion for a disease process especially when patients have significant risk factors that can predispose them to such disease. Another important lesson learnt in the case series was the importance of inter-professional cooperation in disease management and control; as exemplified by different professionals that formed both the human surveillance team as well as the veterinary surveillance team, through effective communication skills which every physician must possess. There is still more to be done in the area of advocacy for vaccines especially for vaccine preventable diseases.

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