

Case study of rare incidence of gas gangrene caused by *Raoultella ornithinolytica*

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Gas gangrene is a bacterial infection that produces gas in tissues. It is fast spreading, potentially life-threatening and needs to be addressed promptly. In this case report, we present a patient that presented with gangrene of his left foot. He was first seen in the emergency room where blood cultures and x-rays were obtained. The patient was then promptly treated with OR debridement of the site and the cultures obtained intraoperatively revealed a rare organism, *Klebsiella ornithinolytica* (currently called *Raoultella ornithinolytica*). In addition to the OR debridement, the patient was treated with 6 weeks of IV antibiotics.

Keywords: gas gangrene, osteomyelitis, amputation

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Gas gangrene is a form of tissue necrosis that can be life-threatening. It often occurs at the site of trauma, or recent surgical site, however, can present without an irritating event. Populations at high risk for developing gas gangrene include those with diabetes and atherosclerosis. If suspicion for gangrene is present, it is imperative to obtain tissue and fluid cultures, blood cultures, x-ray, CT scan or MRI of the area. Surgery should be performed quickly to remove dead and infected tissue. Although it is well established that *Clostridium* spp. causes gas gangrene; non-clostridial involvement is possible. In the present case, x-ray findings indicated gas formation and additionally, *Klebsiella ornithinolytica* was recovered from surgical specimens. Based on both radiological and microbiological evidence, the diagnosis of *Klebsiella Ornithinolytica* gas gangrene was established. The patient was treated for 6 weeks with IV antibiotics.

Case Study

A 56-year-old Caucasian male presented to the ER with a 3-day history of foul-smelling discharge from his right foot after having a 5th met resection 2 months ago at a civilian facility. The patient was having constant pain in the foot over the past 2 weeks. Over the last 3 days, he also noticed a redness that was going up the leg along with bluish discoloration of the fourth digit accompanied by edema. There was tenderness of the 4th digit on palpation along with the metatarsal head dorsally despite patients self-described neuropathy of his feet. The patient said that over the last day he had developed fever, chills, and nausea. His medical history was significant for uncontrolled diabetes, hypertension, cocaine abuse, and tobacco abuse.

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Figure 1 Demonstrating Gas Gangrene of 4th proximal phalanx.



Figure 2 Post-operative radiographs of Partial 4th ray resection.



Figure 3 Post-operative radiographs of transmetatarsal amputation.

The patient had a 5th ray resection from an outside facility and was unable to give us any other details nor records from that hospitalization.

Inspection at the time of his first visit revealed a 3.5cm x 1.5 cm opening to the fifth metatarsal resection surgical site of the right foot. There was surrounding erythema to the surgical site and forefoot with lymphangitis streaking accompanied by a purplish discoloration to the fourth digit with pain to palpation. Also noted were calor and malodor. The dorsum of the foot was erythematous and edematous over the 4th digit and fourth metatarsal. There was a local increase in skin temperature on the dorsal aspect of the left foot compared to that of the contralateral foot. The dorsalis pedis and tibialis posterior pulses were easily palpated and capillary return was within normal limits. His initial temporal temperature was 100.7. The inguinal lymph node palpation was negative. The chest radiograph obtained displayed no evidence of an acute cardiopulmonary abnormality. Significant lab findings were an erythrocyte sedimentation rate of 37, white blood cell (WBC) count of 16.8, Glucose of 305 and cultures of

the wound obtained in the emergency room revealed *Klebsiella ornithinolytica*, *Enterococcus faecalis* and *Streptococcus anginosus*. Blood cultures were taken in the emergency room and the results were negative.

Routine radiographs performed at our center showed lucency through the medial base of the residual 5th metatarsal could represent a nondisplaced fracture or residual osteomyelitis within the bone. Also seen was soft tissue air consistent with gas was seen medial to the 4th proximal phalanx. There was no adjacent osseous erosive change to suggest osteomyelitis within the 4th toe (Figure 1). Because of the presence of gas on the x-ray, the plan was to bring the patient the same day to the operating room for resection of 4th ray and incision and drainage of the same area without closure followed by IV antibiotics.

Under general anesthesia and with the use of an ankle tourniquet, utilizing a 4-cm racket incision that incorporated the existing lateral surgical incision, the fourth digit was disarticulated at the fourth metatarsophalangeal joint and sent to pathology. Deep tissue cultures were obtained in this area. Necrotic tissue was noted to the plantar aspect, and there was a foul smell noted without purulence. All necrotic tissue was removed and the distal aspect of the fourth metatarsal was freed of all soft tissue attachments and utilizing a sagittal saw, the bone was resected at the mid-shaft of the fourth metatarsal. The resected bone was sent to pathology. The remaining bone of the fourth metatarsal was noted to be firm, and there was no surrounding necrotic tissue. The surrounding areas were probed, and no abscesses were noted. The operative site was copiously lavaged with Betadine-infused saline. Betadine-soaked Iodoform gauze packing was used to fill the void in the 4th metatarsal with a 3cm area remaining opened for drainage. After surgery, he was placed on IV antibiotics that included Zosyn 3.375 gram every 6 hours and Vancomycin 1 gram every 12 hours for the suspected osteomyelitis. Pathologically, the examination revealed acute osteomyelitis of the toe and metatarsal head with the bone margin free from osteomyelitis and the soft tissue margins of amputation were free from acute inflammation. Cultures taken intra-operatively displayed *Klebsiella ornithinolytica* [1,2,3,4,5,6,7,8] which was susceptible to Zosyn.

For the next 6 days, the patient stayed as an in-patient without complications while the pain diminished, constitutional symptoms of infection disappeared and WBC improved to 8.8. He was discharged after 6 days and sent home on Augmentin for two weeks and seen as an outpatient in the podiatry clinic. Over the next 6 weeks, the patient had no local or constitutional signs of infection while the incision site closed.

Discussion

Raoultella ornithinolytica (formerly *Klebsiella ornithinolytica*) is a Gram-negative aerobic bacillus which belongs to the family Enterobacteriaceae. However, human infections caused by bacteria of the genus *Raoultella* are uncommon. A search of the available literature shows only a handful of documented infections with this presentation. It is likely due to the patient's history of poorly controlled diabetes, with a history of cocaine and continued tobacco use, that caused a compromise to his immune system. Due to the dusky appearance of his fourth digit as well as gas on the radiographs, it was medically necessary for a partial ray resection of the fourth metatarsal. After the operative procedure, the patient was started on IV vancomycin and IV Zosyn. After cultures returned patient was switched to Augmentin.

We have described an unusual presentation of bony involvement with soft tissue gas which was a result of an unusual organism. Though infection is rare, *Raoultella ornithinolytica* can cause significant and possibly limb and life-threatening infection. As previously stated there are only a handful of cases where this level of destruction has been noted due to this particular organism. It is important as clinicians to remember that patients who have an immunocompromised status may encounter organisms that are out of the ordinary and may require increased care. Even though this organism is rare the treatment for the resulting gas gangrene is straightforward. We are fortunate that this patient presented to the emergency department when he did. We establish a definitive treatment plan in order to prevent a more aggressive amputation. Unfortunately, do to the sequela of this procedure the patient was left with an unstable forefoot which ultimately led to a transmetatarsal amputation. The transmetatarsal amputation site healed uneventfully.

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