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## CLINICAL VIGNETTE

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### A Case Concerned for Rabies Exposure

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A 28-year-old male presented to the ED after a bite from a Coati, a member of the raccoon family, from Mexico 3 days ago. The animal is his aunt's pet. While playing with it, he accidentally stepped on her tail triggering a right forearm bite. The Coati did not appear sick, with no recent bites and his aunt is able to observe her for any behavioral changes. He described mild pain around the bite on his right forearm and was concerned for an infection. Patient denied numbness, weakness, discharge, redness, warmth, tingling to wound. He also denied dizziness, nausea, vomiting, dry mouth, muscle spasms, fever, or chills.

His vital signs were unremarkable. The right mid forearm had a 2x2cm animal bite with no discharge or surrounding swelling, redness, or tenderness noted. He was neurovascularly intact with good pulses and normal range of motion.

The local department of health was consulted concerning the case and jointly decided with physician that rabies prophylaxis was not indicated. He was discharged with prophylactic amoxicillin/clavulonate. Patient understood to follow up with his aunt concerning the animal's condition and to return to the ED for any new symptoms or changes in the behavior of the animal.

#### **Background**

Rabies has the highest case fatality rate of any infectious disease. Rabies is caused by several different species of the neurotropic viruses in the Rhabdoviridae Family, genus *Lyssavirus*.<sup>1,2</sup> The virus spreads from peripheral nerves to the central nervous system which produces neuronal dysfunction including autonomic instability. The virus amplifies in the muscle tissue near inoculation and enters local motor and sensory nerves.<sup>3</sup> It then migrates in a retrograde direction to nerve cells in the spinal cord and the brain. There is significant replication of the virus in highly innervated areas, such as the salivary glands.<sup>4,5</sup>

Host susceptibility to infection is dependent on several factors including: virus variant, size of viral inoculum, degree of innervation at the site of the bite and host immunity and genetics.<sup>5</sup>

#### **Epidemiology**

Rabies is found worldwide except for in Antarctica, New Zealand, Japan, Sweden, Norway, Spain and some Caribbean

Islands.<sup>6</sup> The World Health Organization estimates approximately 60,000 people die of rabies each year which is attributed to inadequate control of rabies in domesticated animals.<sup>7</sup>

In developing countries, the majority of rabies are obtained from a dog bites. In the United States, canine rabies is uncommon due to rabies vaccination. Most cases occur from bats, raccoons, skunks and foxes. The majority of human cases are transmitted from bats with many patients not reporting an actual bite but only being in the same vicinity of a bat.

Most transmission of rabies occur from saliva exposure from an animal bite. However, there are rare cases of exposure from laboratories or transplantation of tissue or organs.

The incubation period is usually one to three months after exposure, but can range from a few days to many years.<sup>8,9</sup> Exposure from highly innervated sites, such as the face, have shorter incubation periods.

#### **Clinical Presentation**

The prodromal phase lasts between a few days to one week. There are non-specific symptoms, including low-grade fever, chills, malaise, myalgias, weakness, fatigue, anorexia, sore throat, nausea and vomiting, headache and at times photophobia. Patients may have symptoms at their wound site including paresthesias, pruritis and pain. The presence of paresthesias surrounding the site of a known wound is suggestive of rabies infection.<sup>10</sup>

As the infection progresses, two forms evolve; the more common encephalitic "furious" rabies and the paralytic "dumb" rabies. The course of the disease is influenced by many factors including, the extent of the bites, proximity to the head and the amount of secretions from the bite.

Encephalitic rabies is most characterized by hydrophobia. This occurs in 33-50% of patients and is triggered from involuntary pharyngeal muscle spasms when attempting to drink. Another feature that occurs less often is aerophobia. A draft of air may cause involuntary muscle spasms to the pharyngeal, diaphragmatic and accessory inspiratory muscles. This can cause asphyxiation and respiratory arrest.

Facial muscle spasticity can cause grimacing and hyperextension of neck and back muscles, referred to as opisthotonos. Additional findings include autonomic instability, dysphagia,

dysarthria, vertigo or diplopia. Agitation and combativeness are also common. Patients progress to coma, paralysis and areflexia with ultimate death due to respiratory arrest and vascular collapse.

Less commonly, patients may progress to ascending paralysis from the site of the wound or limb after the prodromal phase. Hydrophobia is rare. Patients will also have muscle fasciculations and loss of deep tendon reflexes. The paralysis progresses to the muscles for swallowing and respiration, which eventually leads to death.

### ***Diagnosis and Evaluation***

The diagnosis of rabies is based on a comprehensive patient history and high clinical suspicion. Paresthesias near the wound are highly suggestive of infection. It may be unclear if a patient had been exposed, such as with bats. However, if a patient has an acute progressive encephalitis, rabies should be considered in the differential diagnosis.

Imaging findings are non-specific. CT scans of the brain are initially normal but may show cerebral edema in the late stages of the disease. The hippocampus, hypothalamus and brainstem may show areas of increased T2 signaling on MRI.<sup>11</sup>

Laboratory diagnosis can be made by several tests involving saliva, skin, serum and CSF since a single diagnostic test has limited sensitivity. Positive antibodies to rabies in the blood with no history of vaccine or rabies immune globulin administration is indicative of infection. Additionally, antibodies to the rabies virus in the CSF are signs of infection. Specimens should be sent to the Rabies Laboratory at the Centers for Disease Control and Prevention (CDC) after consultation with the state health department.

### ***Management***

When to Treat: Treatment will focus on initial presentation with concern of exposure to rabies. Post exposure prophylaxis should be given to anyone with suspected or likely exposure to rabies. An exposure includes a bite or scratch from an animal with known rabies or an open wound or mucous membrane exposed to saliva, cerebrospinal fluid, CNS tissue from an animal with rabies.

Indications an animal is rabid include: absence of vaccination, unprovoked attack, recent behavioral changes, recent bites or wounds on the animal. Furthermore, the availability to test or observe the animal for 10 days is valuable.

There are several factors to consider when deciding if post exposure prophylaxis is indicated. These include epidemiology of animal rabies in the area, the species of the exposing animal and the type of contact. Consulting with a local public health agency can provide further assistance in assessing the risk of transmission. Once a thorough risk assessment has been per-

formed and a decision to treat has been made, treatment should be initiated immediately.

Within the United States, majority of transmitted rabies have been due to bat exposures. Therefore, if the bat is not available for testing and a scratch or bite cannot be ruled out prophylaxis should be given. Examples include when individuals wake up and see a bat in the room, an unattended child, a mentally disabled person or an intoxicated person. Foxes, raccoons, skunks and larger carnivores should be presumed to have rabies unless proven otherwise and prophylaxis should be administered if there was an unprovoked attack or bite.

Treatment of animal exposures outside of the United States depends on the rabies epidemiology in the geographic area. In most developing countries, dogs are the primary rabies reservoir therefore if rabies is endemic in the area then post-exposure prophylaxis should be started immediately.

If the animal has been previously vaccinated, without obvious exposures to rabies and can be observed for 10 days, prophylaxis is not necessarily indicated.

How to Treat Rabies: The initial step is proper wound care. Thorough washing with soap and water is recommended. Povidone-iodine should be used if available.

The regimen is dependent on patient's previous immunization history. Patients who have not received rabies vaccinations in the past should be given both rabies immune globulin (RIG) and rabies vaccine. They should receive a one-time dose of RIG and 4 doses of the vaccine on days 0, 3, 7, 14. This was changed from 5 doses after studies showed no further benefit with a 5<sup>th</sup> dose. Immunocompromised patients need an additional vaccine dose on day 28.

If a patient has been previously vaccinated, RIG is not required and the vaccine should be administered on day 0 and day 3.

RIG provides immediate virus-neutralizing antibodies. The recommended dose is 20 international units/kg. It should be infiltrated in and around the area in the wounds as much as possible. Any remaining should be given intramuscularly at another site such as the opposite deltoid. If there is no obvious wound, RIG should be administered to anterolateral thigh or deltoid muscle contralateral to vaccine administration.

The rabies vaccine induces the production of antibodies within 7-10 days and will persist for several years. Administration of vaccine should be done intramuscularly into the deltoid area instead of the gluteal area because the latter may result in lower antibody titers.<sup>12</sup>

### ***Summary***

In the Emergency Department, we are frequently faced with animal bite encounters. Rabies is fatal therefore a comprehensive evaluation must be done to determine if prophylactic

treatment is necessary. In developing countries, the diagnosis is easily recognized with a history of a bite from a known rabid animal. However, in more developed countries the diagnosis is often delayed due to unrecognized exposure such as with a bat bite. Consultation with the local health agency is recommended when deciding if post exposure prophylaxis is necessary. After decision to provide prophylaxis is made, administration should be started immediately. The dosing schedule and administration of RIG and rabies vaccine is dependent on previous vaccination and immunocompetence. It is important to properly administer these medications for greater effectiveness and prevention of vaccine failure.

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