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A Case Report: Radiologic Findings of Central Nervous System and Pulmonary System Involvement of Rabies Infection

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Abstract Rabies is neurotropic viral infection involving the central nervous system. It results rapid neurological deterioration and almost progress to the death. Rabies infection may be manifest extraneural involvement in various systems. In this case report we aim to give a review of rabies infection and report radiologic findings of this condition. We report a case of 18-year-old male biten by a dog 20 days ago who presented altered mental status, irritability, hypersalivation and agitation. The diagnosis of rabies was made based on exposure history, typical clinical symptoms and radiologic findings. Rabies diagnosis is essentially clinical. Brain MRI was used to differentiate it from other encephalitis.

Keywords: *Rabies, encephalitis, pneumonia, MRI, CT*

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1. Introduction

Rabies is acute, rapidly progressing encephalomiyelitis caused by the virus Rhabdoviridae family, Lyssavirus genus [1]. It is most frequently transmitted to humans via biting, scratching or licking of infected animals usually a dog in developing countries and bat in developed countries [2]. Human-to-human transmission is very rare [3]. While rabies is a significant public health problem in developing countries, the disease is preventable with proper vaccination and post-exposure prophylaxis. The World Health Organization estimates that rabies kills 35,000- 55,000 people each year [4]. Typically incubation period is around 2 weeks to 2 months [5]. Prodromal symptoms include fever, malaise and tingling at the site of exposure. Initially the virus is present at the wound site. Then the virus reaches central nervous system along the peripheral nerves. After the encephalitis the virus spread other organs along peripheral nerves [6]. Central nervous symptoms may be paralitic or encephalitic form. Also there may be extraneural involvement such as pulmonary sistem in our case. Bilateral pneumonia is rare extraneural manifestation in rabies infection. This condition is often associated with a poor prognosis and high mortality rate.

2. Case Presentation

A previously healthy 18-year-old male patient presented to the emergency department with a history of being bitten by a dog 20 days prior to admission. Initially, he was treated conservatively for the dog bite wound and was discharged. However, he began to experience worsening neurological symptoms, leading to hospitalization.

Upon admission, the patient was found to have bilateral basal ganglia hyperdensity on computed tomography (CT) scans, suggesting overhydration (Figure 1). Magnetic Resonance Imaging (MRI) revealed pathological signal changes in the basal ganglia, consistent with a possible autoimmune response to the dog bite (Figure 2 Figure 3 Figure 4 Figure 5). The patient was treated with corticosteroids and immunosuppressive therapy.

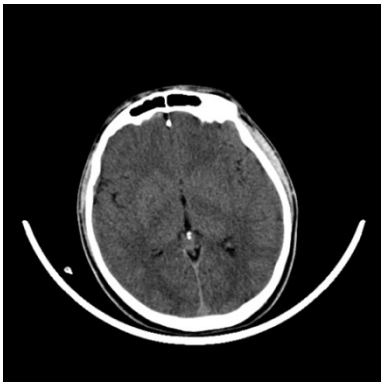

Figure 1. Bilateral basal ganglia hyperdensity on computed tomography (CT) scans

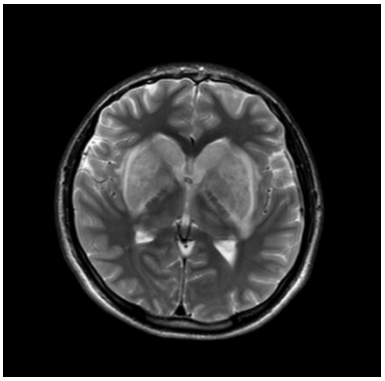

Figure 2. Axial T2 MRI series show hyperintensities in bilateral basal ganglia

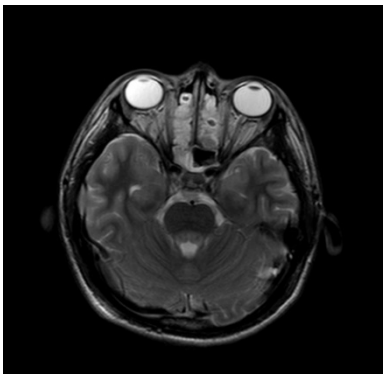

Figure 3. Axial T2 MRI series show hyperintensity in dorsal pons

Despite initial improvement, the patient's condition deteriorated rapidly, and he became increasingly lethargic and short of breath. A repeat CT scan of the lungs revealed bilateral pneumonia (Figure 6 Figure 7 Figure 8 Figure 9 Figure 10). The patient's condition continued to deteriorate, and he ultimately succumbed to his illness.

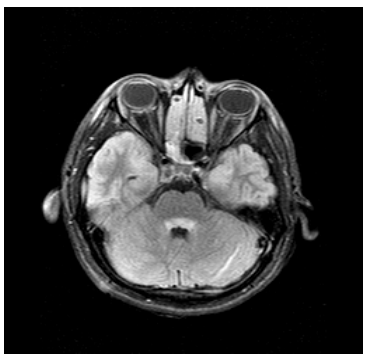

Figure 4. Axial FLAIR MRI series show hyperintensity in dorsal pons

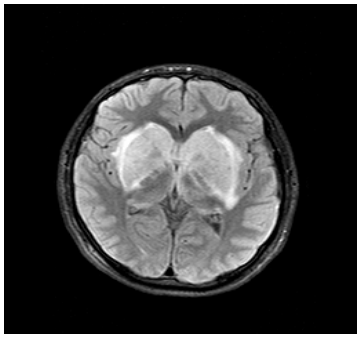

Figure 5. Axial FLAIR MRI series show hyperintensities in bilateral basal ganglia

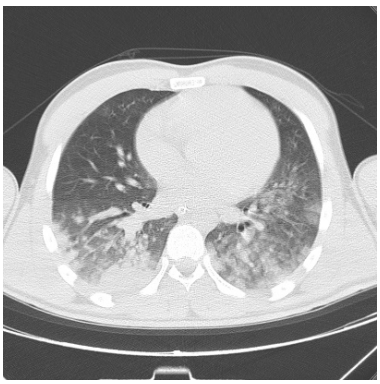

Figure 6. On axial CT examination there was pneumonic consolidation and infiltration dominantly in lower lobe

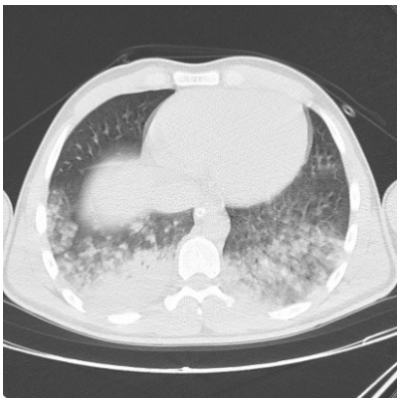

Figure 7. On axial CT examination there was pneumonic consolidation and infiltration dominantly in lower lobe

Figure 8. On coronal CT examination there was pneumonic consolidation and infiltration dominantly in lower lobe

Figure 9. On coronal CT examination there was pneumonic consolidation and infiltration dominantly in lower lobe

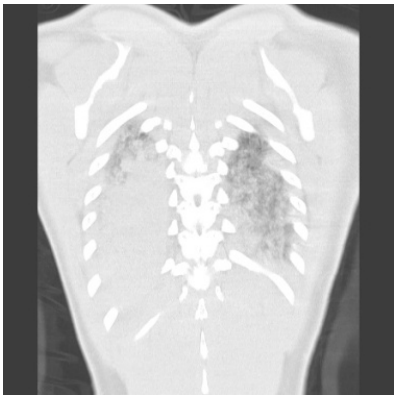

Figure 10. On coronal CT examination there was pneumonic consolidation and infiltration dominantly in lower lobe

This case report highlights the potential for severe and fatal complications following dog bites, even in previously healthy individuals. The diagnosis and management of such cases require a high index of suspicion and a multidisciplinary approach. Further research is necessary to better understand the underlying mechanisms and to develop effective treatments for this condition.

3. Discussion

Diagnosis is usually made on typical clinical presentations. The diasease progress in 3 phases: prodromal phase, neurologic phase, coma and death. In the prodromal phase there is paresthesia and pain at the wound site, fever, headache, vomiting and irritability. In humans, rabies encephalitis presents in two clinical forms. The first form, classic rabies encephalitis characterized by altered mental status, generalized malaise, inspiratory spasms and autonomic dysfunction is follwed by hypersalivation, hydrophobia and aerophobia [7]. The second form, paralitic rabies is characterized by quadriparesis and bilateral facial weakness [8]. Most routine laboratory examinations are normal or non-spesific. Cerebrospinal fluid examination may be normal, or slight increase in lymphocytes and protein levels may be. Specific anti-rabies antibodies in the CSF may be positive, indicating rabies encephalitis [9]. PCR can detect viral RNA in the saliva, CSF, urine, skin, and brain tissues [9]. Owing to characteristic clinical presentation imaging studies are rarely performed [10]. But MRI is the most sensitive modality for rabies encephalitis. In rabies encephalitis, brain MRI may show increased T2A/FLAIR signal intensity in gray matter of brain parenchyma; basal ganglia, tahalami, hypothalami, brainstem, limbic system, frontal and parietal lobes. Moderate postcontrast enhancement may be seen in this localizations. In the paralytic form of rabies, involvement of spinal cord and medulla are prominent [11,12,13].

Differential diagnosis of rabies encephalitis from an imaging is acute disseminated encephalomiyelitis (ADEM), other viral encephalitis, ischemic encephalitis, rhomboencephalitis and Guillain-Barre syndrome [9,14]. ADEM is an important differential diagnosis of paralytic rabies. In rabies encephalitis MRI findings are symmetrical and dominantly involved deep gray matter structures, in ADEM there is asymmetrical involvement of white matter structures of brain and spinal cord [9,11]. Gray matter involvement, the absence of hemorrhages, and the absence of enhancement during the acute phase of the disease help differentiate rabies encephalitis from Japanese B and other viral encephalitis like herpes simplex encephalitis which usually involve mesial temporal lobes and insular cortex [7,9,10,12] . DWI may be useful to differentiate rabies encephalitis from ischemic encephalitis and mitochondrial diasease, because of rabies encephalitis does not show obvious restriction [9,11]. A typical history of animal bite end rapid progression of the diasease differentiates rabies encephalitis from Guillain-Barre syndrome [9,12]. There is no effective treatment for rabies encephalitis, the management of these patients is palliative and supportive. Typical therapeutic attempts, which if instituted early have in some instances resulted in survival include human rabies immunoglobulin infusion, rabies vaccine, ribavirin, interferon alfa, and ketamine [12].

Also extraneural involvement has been frequently documented in salivary glands and skin, cardiac, pulmonary, hepatic and renal impairment have been described in small proportion of this patients [15]. The pathophysiogy of bilateral pneumonia in rabies not fully understood. It may be related the spread of rabies virus to the lungs, aspiration due to pharyngeal muscle spasms and involvement of respiratory control centers of brain.

The clinical features of pneumonia in rabies encephalitis are non-spesific, include fever, cough and shortness of breath. In severe cases, respiratory failure requiring mechanical ventilation may develop. Laboratory tests, such as chest X-rays and computed tomography can help confirm the diagnosis. In CT examination there is consolidation and pneumonic infiltrations in both lungs. The management of pneumonia primarily supportive, with focus on managing respiratory failure and controlling the symptoms.

4. Conclusion

Rabies presents acute atypical presentation of encephalitis and acute flaccid paralisis. It is rapidly fatal because lack of any curative treatment. It is definitively confirmed by the isolation of the virus from biological samples such as saliva, CSF, hair, or detection of rabies antigens or antibodies.There may be extraneural manifestation of rabies also which spreads various organs along peripheral nerves. Postexposure rabies prophylaxis should be administered immediately after exposure using proper technique according to WHO guidelines to reduce therapy failure.

Conflict of Interest

The authors state that there is no conflict interest.

ACKNOWLEDGEMENTS

The consent form was filled out by the patient.

Abbreviations

MRI- Magnetic Resonance Imaging
CT- Computed Tomography

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