



Rabies Encephalitis in Morocco Diagnostic and Prophylactic Challenges Illustrated by Two Clinical Cases

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Abstract

Rabies is a viral zoonosis that is almost always fatal, causing approximately 60,000 human deaths annually, primarily in Africa and Asia where canine rabies remains endemic. We report two clinical cases of fatal rabies encephalitis that occurred in Morocco. In both cases, Reverse Transcription Polymerase Chain Reaction (RT-PCR) performed on multiple sample types confirmed the ante-mortem diagnosis. These cases illustrate the technical progress made in rabies diagnosis in Morocco while highlighting the limitations of centralized testing. Targeted and effective measures are essential to reach the global strategic goal of "Zero by 30," which aims to eliminate human deaths from dog-mediated rabies by 2030.

Keywords: Rabies; Encephalitis; Morocco; Diagnosis

Introduction

Rabies is an acute viral zoonosis caused by *Rabies lyssavirus*, characterized by neurotropism and severe encephalitis that is almost always fatal [1,2]. In Morocco, rabies remains endemic and poses a persistent public health problem. Furthermore, Morocco's upcoming co-hosting of the 2030 FIFA World Cup presents an opportunity to strengthen the fight against this zoonosis.

This work describes two clinical cases of fatal human rabies encephalitis occurring in Morocco and discusses national rabies prevention measures, with a view to eliminating human deaths from canine rabies by 2030 [3].

Patients and Methods

Patient 1: A 23-year-old man was bitten on the right leg by a stray dog three months before admission. No prophylactic measures were taken. Clinical examination on admission revealed psychomotor agitation with hydrophobia and hypersalivation.

Patient 2: A 58-year-old man was scratched by a stray dog on a pre-existing skin lesion of the right hand one week before symptom onset. On admission, he presented with febrile confusion and involuntary movements.

Saliva, Cerebrospinal Fluid (CSF), and nuchal skin biopsy samples were collected from both patients for rabies virus testing. Viral RNA was extracted from the samples using an EZ Advanced XL automated extractor (Qiagen[®]). Viral RNA was detected by Real-Time Reverse Transcription PCR (RT-PCR) using the Light Mix Modular Rabies Virus kit (TIB Molbiol), which targets the Nucleoprotein Gene (N gene) of the rabies virus.

In both patients, viral RNA was detected concomitantly in saliva, CSF, and nuchal skin biopsy, confirming advanced viral dissemination at the time of diagnosis (Figure 1). An ante-mortem diagnosis was thus established, which is rare in resource-limited settings.

Despite prompt management in the intensive care unit, both patients died within a few days of admission.

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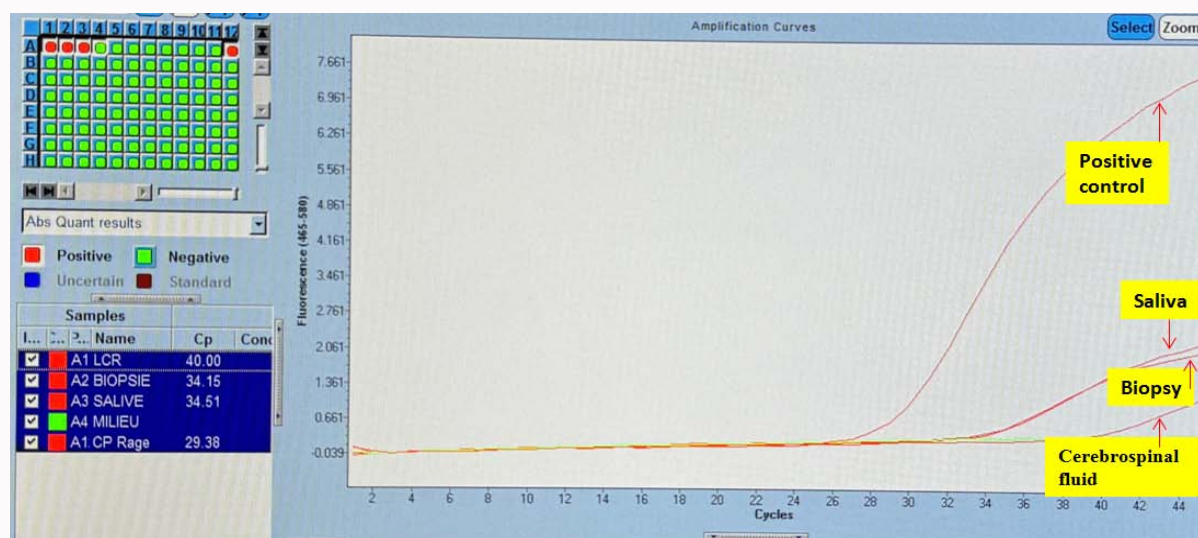


Figure 1: Real-time amplification curves (targets and rabies virus positive control) from one of the two patients, run on the Cobas 4800.

Discussion

The incubation period of rabies is entirely asymptomatic and lasts on average about six weeks, with a usual range of 2 to 3 months [7]. However, it can vary considerably, from as little as 7 days to more than a year, and exceptional cases of up to 6 years have been reported [4].

The short incubation period in the second patient is probably explained by the location of the wound on the hand, which, like the face, is rich in nerve endings, promoting rapid ascent of the virus to the central nervous system [5].

Clinically, the furious form is the most common in adults and is characterized by agitation and autonomic signs (hypersalivation), phobic spasms (hydrophobia, aerophobia), and rapid progression to coma.

The first patient presented with the classic furious form. In the second patient, the presentation was neuropsychiatric, reflecting more extensive limbic and mesencephalic involvement, probably related to faster viral kinetics or individual susceptibility [6].

Molecular confirmation of rabies by multi-target RT-PCR on saliva, CSF, and nuchal skin biopsy is currently the method of choice for establishing an ante-mortem diagnosis [7]. Real-time RT-PCR offers high sensitivity and specificity for detecting viral RNA in various clinical samples [8].

In our cases, this approach allowed rapid confirmation of the clinical suspicion in both patients. In Morocco, rabies diagnostic testing is concentrated at the Pasteur Institute of Morocco in Casablanca and the Mohammed V Military Teaching Hospital in Rabat. This centralization limits the capacity for rapid diagnosis in remote regions, where exposures to the virus are nonetheless frequent.

For both patients, no Post-Exposure Prophylaxis (PEP) was administered because rabies immunoglobulin and vaccine were available only in municipal centers and, unfortunately, not in hospital emergency departments. This limits their prophylactic use after an exposure, since emergency departments are where dog bite victims usually go first for care.

Morocco faces persistently endemic canine rabies, a large dog population, and growing international exchanges (tourism, migrant transit). The upcoming co-hosting of the 2030 FIFA World Cup in Morocco should be an opportunity to strengthen intersectoral coordination (health, agriculture, environment) to combat rabies [9]. The availability of rabies immunoglobulin and vaccine in hospital emergency departments has become essential to ensure that bite victims do not miss prophylactic treatment. Continuing training in bite management should be an integral part of the training programs of medical and surgical emergency departments.

This study is limited to the analysis of two clinical cases, which precludes any statistical generalization to the national situation. The epidemiological data cited depend on the reliability of current surveillance systems, which, although improving, may still underestimate the true burden of the disease, particularly in the most remote areas.

Conclusion

The two cases of rabies encephalitis diagnosed in our laboratory confirm that rabies is almost always fatal once neurological signs have appeared. They also highlight the variability of clinical presentations and the vulnerability of rural populations to dog-related injuries in the absence of immediate post-exposure prophylaxis.

Ante-mortem confirmation by real-time RT-PCR illustrates the technical level achieved in rabies diagnosis in Morocco but also underscores the need to expand these diagnostic capacities beyond the main centers. The sustainable reduction of the risk of human rabies in Morocco requires coordinated strengthening and integrated "One Health" governance, combining cutting-edge molecular surveillance with mass animal vaccination, which together are the only means of definitively eliminating the virus nationwide beyond the horizon of the 2030 World Cup.

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