

A Case of Dengue Encephalitis with Double Doughnut Sign

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Abstract

Dengue is the fastest-growing mosquito-borne infection in the world. Encephalitis is an uncommon neurological manifestation of Dengue Infection. A unique radiological finding of the double doughnut sign is associated with dengue encephalitis. The term 'double doughnut sign' was coined to describe lesions of the thalamus on each side of the brain. MRIs in some patients with Japanese encephalitis and herpes encephalitis can also show this sign, prompting inclusion of these diseases in the differential diagnosis. However, further research is needed to determine whether this finding is the most critical predictor for diagnosing dengue encephalitis. Our goal is to shed light on a rare MRI finding of the double doughnut sign in a patient with dengue encephalitis through this case report.

Keywords: Dengue, Encephalitis, Flavivirus, Mosquito borne encephalitis, Thalamus.

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Introduction

Dengue is the fastest-growing mosquito-borne infection in the world.^[1] Dengue is caused by Flaviviruses and transmitted by the Aedes mosquito. Dengue virus was previously never linked with neurotropism; however, new studies have shown the possible CNS invasion by the virus. Neurological implications of Dengue include encephalopathy, encephalitis, ADEM, myelitis, GBS, stroke, and ophthalmic complications.^[2] In dengue patients who present with neurological symptoms, brain imaging like MRI is performed routinely. A peculiar finding on MRI known as the 'Double doughnut sign' has been associated with dengue encephalitis.

Case Presentation

A ten-year-old male child with complaints of fever, headache, and body aches from the last five days was referred to our hospital in an intubated state. Two days after the onset of symptoms, the patient developed irrelevant talk and diminished sensorium, and on the fifth day (i.e., the day of referral), he developed status epilepticus. At the time of admission, his GCS was E1VTM2, pupils 3mm BERL, neck rigidity present, plantars were bilateral extensor. Lab investigations showed leukopenia and thrombocytopenia (1,20,000/mm³) with mild elevation in SGOT and SGPT. His ELISA IgM antibodies for Dengue were positive. The rest of

the investigations, including workup for the causes of fever with thrombocytopenia, were performed and came out to be negative. CSF analysis showed 40 cells/mm³, lymphocytic pleocytosis, mild elevation in proteins (72 mg/dl) with normal range glucose. PCR on the CSF sample was negative for all the virus panels, including flaviviruses, i.e., Dengue. MRI performed on the patient showed bilateral symmetrical thalamic lesions with brain stem involvement and small petechial hemorrhages in the centre of the lesions. The patient was diagnosed with Dengue encephalitis and treated with antiepileptic drugs and other intensive symptomatic support, but unfortunately, the patient succumbed to his illness.

Discussion

The term "double doughnut sign" was first described for Dengue in a case study reported in India by Kumar A. S. et al. in 2017 to describe the characteristic MRI findings associated with dengue encephalitis.^[3] It was coined to explain the bilateral thalamic lesions, which were hypointense on T1-weighted and hyperintense on T2 and fluid-attenuated inversion recovery (FLAIR). The center of the lesions showed intense diffusion restriction with the presence of hemorrhage on susceptibility-weighted images giving the appearance of a double doughnut.

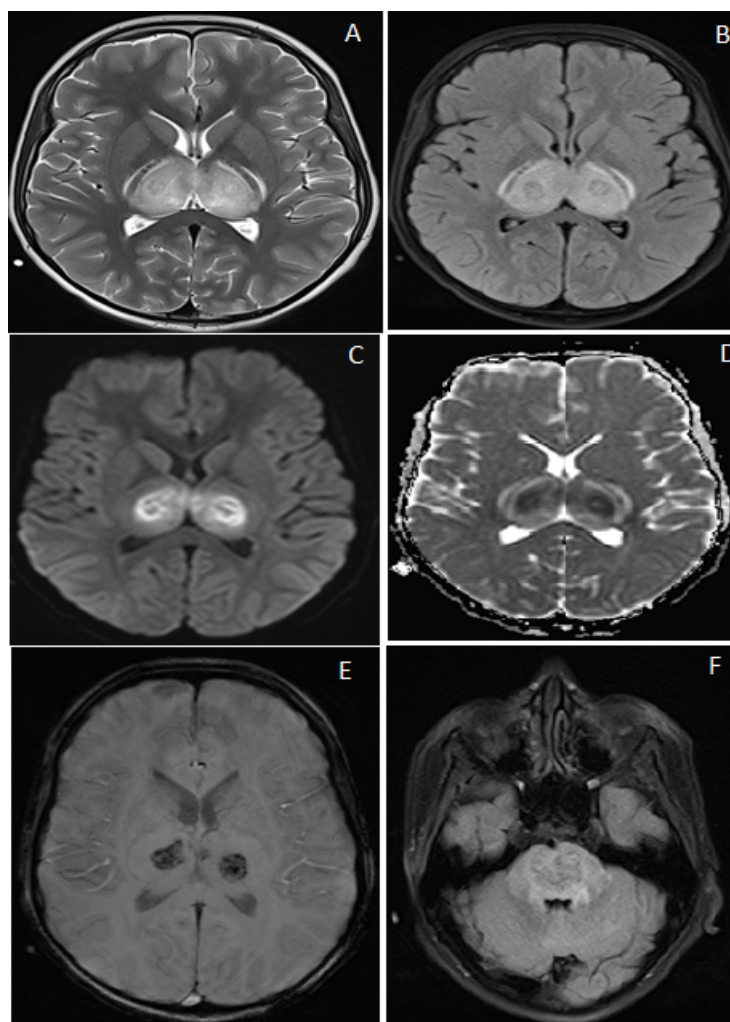


Figure 1: MRI BRAIN - T2WI (A) and Flair (B) Images Show Hyperintense lesions in bilateral thalamus which shows intense diffusion restriction in the center. DWI (C) and ADC (D) with hemorrhage in the center of thalamic lesions on SW1 images (E). Flair Images (F) showing Hyperintensity in Pon s.

Following this, more evidence emerged as different authors reported similar MRI findings in dengue encephalitis.^[4-8] Thus, MRI has been considered the modality of choice compared to the CT scan for brain imaging in encephalitis, although the findings in the early phase can be insignificant. Dengue encephalitis is postulated to occur because of direct neuronal injury causing cerebral edema and hemorrhage secondary to vascular leak. It most commonly involves the basal ganglia-thalamic complex, brainstem, cerebral hemispheres, and cerebellum. These MRI changes have been reported in over 20 patients by Jugal TS et al. in 2017.^[9]

It is vital to differentiate MRI findings (including the double doughnut sign) seen in dengue encephalitis from Japanese encephalitis (J.E) and Herpes encephalitis. Bilateral involve-

ment of ganglio-thalamic complex is also seen with other Flaviviral infections like Japanese encephalitis. Although tissue involvement is similar in both Dengue and JE, hemorrhages are less commonly seen with Japanese encephalitis. Herpes Simplex virus, on the other hand have predilection for temporal and basifrontal lobes but sometimes can involve thalamus and basal ganglion. Thus, MRI picture alone may not always differentiate between different types of viral encephalitis. Still, when coupled with clinical history, serology tests, CSF reports, residing in an area that is endemic to the virus may prompt the physician to form a diagnosis of dengue encephalitis.^[10]

Conclusion

There have been only a few reported cases of dengue encephalitis with the classic double doughnut sign. Therefore, using this finding as a single most important predictor for diagnosing this disease is still under debate and needs further investigation. However, with supporting clinical findings, serology results, and evidence of seasonal outbreaks in an endemic region, the presence of the double doughnut sign makes the diagnosis of dengue encephalitis more plausible.

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