

# Reversible dentate nucleus and corpus callosum lesions in acute Legionnaires' Disease

Karan Topiwala, Karan Tarasaria, Avinash Prasad

## CASE REPORT

A 41-year-old man presented with a two-day history of fever, malaise and diarrhoea. He was disoriented to time and situation with mild dysarthria on neurologic examination. He was found to be hyponatremic (132 mmol/L) and a chest X-ray showed left lower lobe consolidation. He was started on broad-spectrum antibiotics including two doses of Metronidazole. MRI of the brain without contrast showed T2/FLAIR hyperintensities within bilateral DN and in the central aspect of the splenium of the corpus callosum (CC) (Figure 1). His urine *Legionella Pneumophila* serogroup-1 antigens came back positive and antibiotics were de-escalated to Levofloxacin for two weeks. On his five-week post-hospitalization follow-up, he was noted to have persistent dysarthria for which he continued to work with speech therapy twice a week. Repeat MRI brain with and without contrast six weeks from his initial MRI scan showed a complete resolution of the previously noted abnormal signal hyperintensity within the dentate nuclei and the corpus callosum. He was subsequently seen in clinic ten weeks from discharge and was noted to be asymptomatic.

## DISCUSSION

The dentate nucleus is the largest and most lateral of the four deep cerebellar nuclei, placed directly adjacent to the vermis and the roof of the fourth

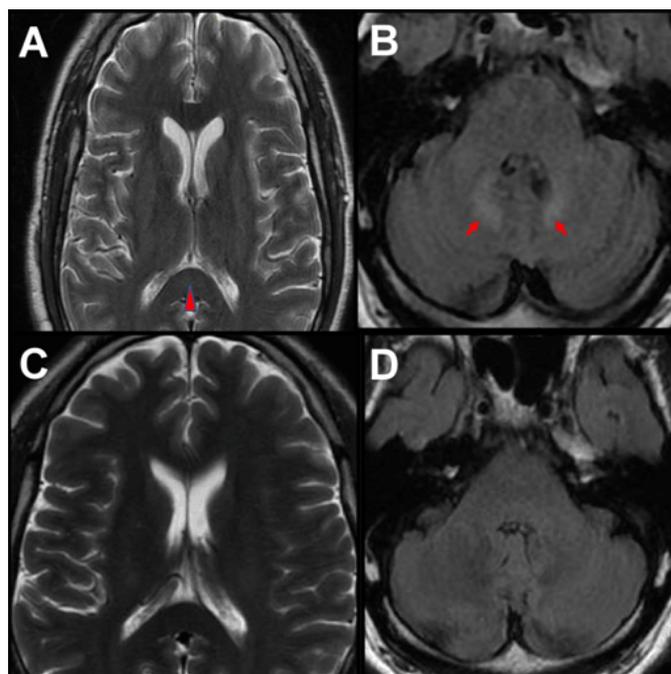


Figure 1: MRI Brain without contrast; MRI brain showing T2-hyperintensity (A) in the center of the splenium of the corpus callosum and FLAIR hyperintensity of bilateral dentate nuclei (B) with interval resolution (C, D) on follow-up imaging performed seven weeks later.

ventricle bilaterally. It receives ascending proprioceptive projections of the spinocerebellar tracts via the inferior cerebellar peduncles, as well as descending projections from the motor cortex. Efferent pathways comprise of the dentato-rubral outflow to the contralateral ventro-lateral thalamus [1]. Neuroimaging abnormalities of the dentate nuclei have a broad differential diagnosis. Bilateral T2-weighted-MRI hyperintensities of the Dentate Nucleus (DN) are seen with metabolic disorders (maple syrup urine disease, canavan's disease and glutaric aciduria-type-1) and metronidazole toxicity [1]. Since the first case report of Metronidazole induced reversible DN/CC lesions in 1995, all subsequent cases have documented at least a four-week exposure to the antibiotic with or without supra-therapeutic levels, making it an unlikely cause of our patient's presentation [2]. Inherited metabolic

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disorders were unlikely since they typically present in infancy and are rapidly fatal when left untreated. On the other hand, T1 hyperintensity of the bilateral DN is suggestive of blood products (hypertensive bleeds) or mineralization (Iron deposition seen in multiple sclerosis and neurodegenerative conditions or Calcium deposition characteristic of Fahr's disease). However, neither did our patient have T1 signal change on his initial MRI, he also did not have any corresponding susceptibility artifact on his gradient ECHO sequence that would suggest the presence of blood or calcium. While gadolinium deposition can produce T1 signal change in the dentate nuclei, our patient had had fewer than three gadolinium-enhanced imaging studies prior to this presentation making it an unlikely etiology. 40-50% of patients with acute Legionnaires' Disease (LD) can develop neurologic symptoms such as ataxia, dysarthria and confusion [3]. While most have normal MRI findings, functional imaging with single photon emission tomography (SPECT) has often shown cerebellar perfusion abnormalities [4]. Two of seven patients with LD described by Johnson et al. had abnormal findings on head CT scan, one showed cerebral edema while the other had multifocal lesions with subsequent development of necrotizing hemorrhagic leucoencephalitis [5]. Spieker et al [6] and Sommer et al. [7] described diffuse subcortical white matter changes consistent with Acute Disseminated Meningoencephalitis (ADEM). Two patients who presented with seizures following acute LD were found to have bilateral mesial temporal FLAIR hyper intensities [8]. A 44-year-old man with *Legionella bozemanii* pneumonia was found to have bilaterally symmetrical foci of demyelination in the brainstem [9]. Reversible lesions of the posterior corpus callosum have been described with a variety of disorders such as Marchiafava-Bingnami disease, haemolytic-uraemic syndrome, rotavirus infection, acute cerebellitis and High altitude cerebral oedema (HACE) [10]. These patients often present with ataxia and dysarthria, which is hypothesized to result from cerebellar diaschisis [3]. Similar to these case reports, our patient demonstrated reversible splenial T2-hyperintensities with spontaneous clinico-radiological resolution over the next eight weeks. However, DN involvement in acute LD has rarely been reported. The exact pathophysiology of such injury remains elusive, with neuropathologic evaluation showing anoxic injury with rare instances of direct gram-negative bacterial invasion [11]. *Legionella* is also known to produce cytotoxins that can generate cell-membrane pores in eukaryotic cells resulting in cell death from osmotic lysis, which may explain the subsequent development of cytotoxic edema [10]. Most patients with neurologic symptoms in acute LD improve spontaneously with resolution of the lung disease and do not need any form of pharmacologic therapy [10].

## CONCLUSION

LD is commonly associated with cerebellar symptoms and dysarthria. These are hypothesized to result from cerebellar diaschisis resulting from reversible DN and CC lesions seen infrequently on MRI. The symptoms are typically reversible without any treatment. While anoxic injury with rare direct bacterial invasion of the DN has been noted at autopsy, bilateral dentate nuclei lesions on MRI in acute LD, is an uncommonly reported finding.

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**Conflict of Interest**

Authors declare no conflict of interest.

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