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Isolated oculomotor nerve paralysis in Lyme disease: MRI

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Abstract Lyme disease is a cause of illness involving multiple organ systems, including, in 10–15 % of cases, the nervous system. Peripheral radiculoneuritis, cranial neuritis, encephalitis and myelitis are among the neurological manifestations found in the second and third stages. We present the MRI findings in isolated oculomotor nerve involvement by Lyme disease and discuss the differential diagnosis.

Key words Oculomotor nerve paralysis · Lyme disease · Magnetic resonance imaging

Introduction

The neurological presentations of Lyme disease are extremely variable. Cranial neuropathies are observed in the second stage. The third, fourth and seventh cranial nerves are most severely and most frequently affected [1–3].

Case report

A 12-year-old girl was referred for cranial MRI because of chronic, recurrent borreliosis. Since the age of 7 she had suffered from recurrent oculomotor nerve paralysis. She presented with right ptosis, double vision and headache when she was 5 years old. Examination revealed an incomplete oculomotor nerve paralysis and meningism. She had a history of tick bites. The history led to the suspicion of borreliosis, confirmed by the laboratory findings of an elevated serum and spinal fluid IgG level and a pleocytosis in the spinal fluid. The patient was treated with antibiotics, and the symptoms resolved. Two years after the first admission, she again suffered acute attacks of headache, fever, and oculomotor nerve palsy; laboratory testing showed positive borrelia serology in serum and cerebrospinal fluid. The diagnosis was second-stage Lyme disease, with mononeuritis. However, treatment did not relieve the oculomotor palsy.

From that time until admission to our hospital there was no further treatment or follow-up examination. She was admitted again with headache that had slowly increased in severity over some days and a persistent oculomotor nerve palsy. Routine blood examination, CT and EEG were normal. MRI revealed a 4-mm, rounded mass of low intensity in the right side of the interpeduncular fossa (Fig. 1). Contrast-enhanced images showed a well-defined lesion with sharp margins directly at the base of the oculomotor nerve (Fig. 2). On T2-weighted images, this segment of the nerve gave higher signal than its fellow. The other cranial nerves and brain parenchyma were normal. The patient underwent conventional panangiography, which was completely normal.

The lesion was therefore considered a manifestation of chronic, recurrent borreliosis with oculomotor neuritis.

Discussion

Lyme disease is an inflammatory condition caused by the spirochaete *Borrelia burgdorferi* which affects multiple organ systems, including the lymphatic system, the joints and the nervous system [1]. It has three clinical stages. The main symptoms in the first stage are erythema chronicum migrans and lymphadenosis benigna cutis. The second stage of the disease includes arthritis,

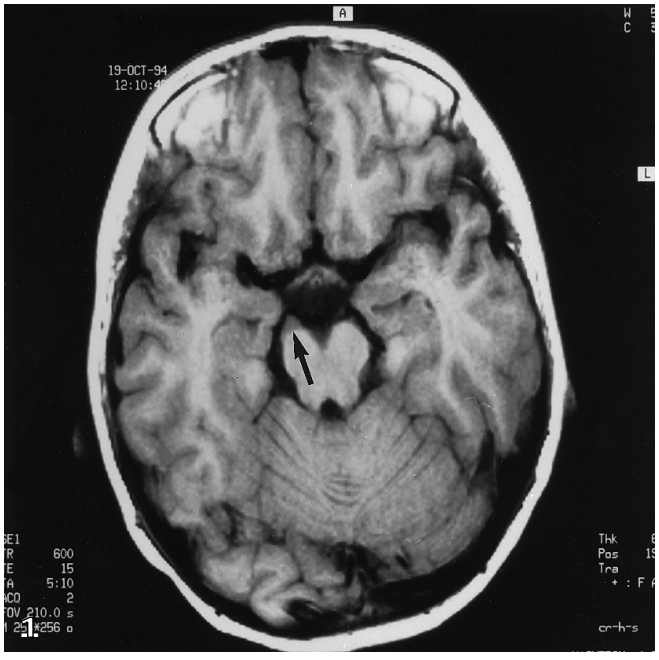

Fig. 1 Axial T1-weighted image through interpeduncular fossa reveals low-signal swelling of right oculomotor nerve *(arrow)*

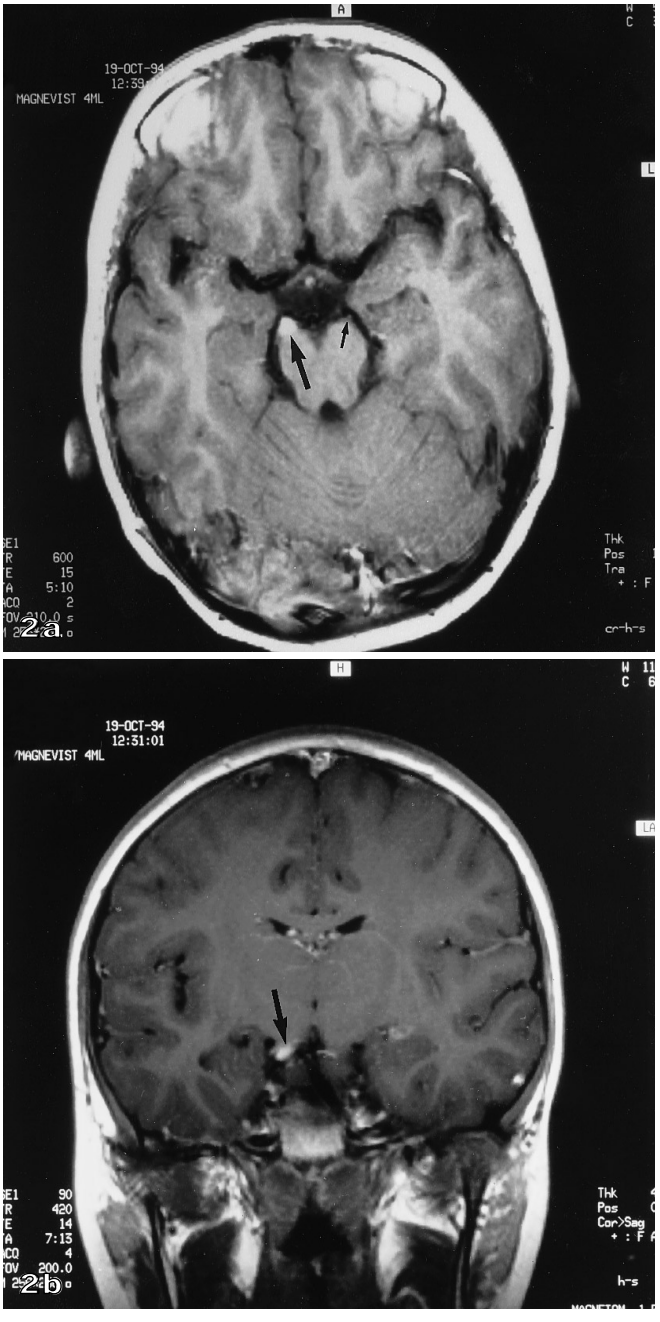

Fig. 2 **a** Axial contrast-enhanced image demonstrates abnormal enhancement of the swollen right oculomotor nerve *(arrow)*; compare the normal left nerve *(small arrow)*. **b** Coronal image. Note abnormal enhancement the cisternal portion of oculomotor nerve *(arrow)*

carditis and meningopolyradiculitis. In this stage, neurological manifestations are lymphocytic meningitis, radiculoneuritis and cranial neuritis. The meningitis often develops without fever. The facial nerve is the most commonly involved cranial nerve; the palsy may be unilateral or bilateral and may be an isolated finding. Cranial nerves III-VI or VIII can be involved. In the third stage the disease involves the joints, skin (acrodermatitis chronica atroficans) and there is demyelination of the central nervous system (CNS). Sequelae are common even after treatment in this stage. There may be considerable overlap of the stages [1–6]. Treatment is with antibiotics, and varies depending on the duration of the disease and the age of the patient. The exact mechanism for CNS manifestations of Lyme disease is not known; however, both injury to neural tissues by direct spirochaetal invasion and vasculopathy have been postulated [2, 7, 8].

In cranial neuritis, the affected segments appear thickened and give low signal on T1-weighted images; they frequently enhance with contrast medium, possibly due to hypervascularity of both nerve and perineural tissue and/or disruption of the blood-nerve barrier [4, 5, 9]. The differential diagnosis on MRI in oculomotor neuritis includes neuroma, sarcoidosis, and normal (physiological) enhancement of the oculomotor nerve. Contrast enhancement has also been reported in patients with viral meningitis, leukaemia, neuroma, CNS lymphoma, HIV infection, neurofibromatosis, ophthalmoplegic migraine, the Tolosa-Hunt syndrome, syphilis, demyelinating optic neuritis or postradiation optic neuritis [10]. Lyme disease can be difficult to diagnose because of its protean symptoms, which may occur in various combinations. The diagnosis of neuroborreliosis is based on history, serology, treatment response, MRI and

exclusion of other neurological disorders. It seems that the distinction between oculomotor neuritis and other lesions cannot be made on the basis of MRI alone; however, for examination of the cranial nerves, MRI is clearly ideal. In this case clinical findings, laboratory data and the MRI findings confirmed to our minds the the diagnosis of neuroborreliosis. All other diagnoses appeared very unlikely and many were excluded.

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BOOK REVIEW

Haller, J.O., Slovis, T.L.: Paediatric Radiology: Second Edition. Springer 1995.
ISBN 3-540-59059-5, hardcover, DM 128,00

The second edition of this book is aimed squarely at the physician or surgeon involved in the care of children who may, during the course of work, come into contact with paediatric radiology. The book is derived predominantly from a series of teaching sessions provided over many years by Joseph Reed from the Children's Hospital, Mitchigan. These lectures have been adapted into a comprehensive primer in paediatric radiology. The book covers the whole spectrum of paediatric radiology from the neonatal unit onwards. The thrust of the book is towards imaging strategies in specific areas and for specific problems, together with extensive advice on interpretation of images and the use of varying techniques. For the most part this book is very impressive. The radiographic figures are almost without exception superb. I found the chapter on the chest particularly impressive and I would be happy to recommend this volume to our junior staff as an introduction to paediatric radiology.

Any criticisms I have of this work are essentially minor, and probably reflect the different attitudes to imaging children between North America and the UK. I feel that a text aimed primarily at physicians has too little emphasis on radiation protection. This is covered in the introductory chapter by a short paragraph, with little advice to the referring clinician about radiation protection other than to say that they should trust the paediatric radiologist, who will be using state-of-the-art digital equipment. Unfortunately, not always true on this side of the Atlantic. The recommendation that the minimal number of films for an abdominal radiographic examination should be three, including supine, erect and prone would seem excessive to many radiologists outside North America. Similarly, the use of a lateral chest radiograph in all circumstances is also often unnecessary. Further, in the section on urinary tract infection, the IVU is described as being a low-radiation examination which is, I think, misleading. Provided the reader recognises that this book largely reflects North American practice, I do not think that the above comments detract significantly from what is a first class introduction to paediatric radiology which I would recommend as a valuable addition to any library in a department of clinical radiology or paediatrics.

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