

Case Report

Central nervous system borreliosis mimicking a pontine tumour

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In childhood, facial nerve palsy and headache are typical symptoms of second and third stage neuroborreliosis. While focal demyelination is occasionally observed on MRI scans, the appearance of a tumorous lesion is extremely rare. The case of a 10-year-old girl with neuroborreliosis mimicking a space-occupying lesion in the brainstem, without any previously recognized manifestations of borreliosis, is reported.

Case report

A previously healthy 10-year-old girl developed increasing nausea, vomiting and weight loss of 5 kg within 3 months. In addition, she had a 2-week history of headache and a significant restriction of cervical spine mobility. There was no history of trauma or tick bite. The neurological examination was otherwise normal; papilloedema was not present. There were no EEG abnormalities. An MRI scan without contrast enhancement revealed a mass within the brainstem and spinal cord extending from the pons to vertebra C4. The features suggested a diffusely infiltrating neoplasm, and dexamethasone therapy was started. The patient was then referred to our hospital for further investigation.

A repeated MRI scan of the brainstem and cervical spine without and with gadolinium did not show any contrast enhancement of the lesion (Fig. 1). Although this finding could not exclude a malignant tumour, the differential diagnosis was broadened to include inflammatory and infectious causes. Blood count and serum inflammatory markers were within normal limits. Examination of cerebrospinal fluid (CSF), however, showed a lymphocytic pleocytosis (total leukocyte count $91 \mu\text{l}^{-1}$, lymphocytes $80 \mu\text{l}^{-1}$) without any malignant cells. CSF glucose levels were normal. There was a slight increase in CSF protein of 72.4 mg dl^{-1} and CSF protein electrophoresis showed an increased albumin and α - and β -globulin fraction, revealing a significant disturbance of the blood–brain barrier. In addition, an increased γ -immunoglobulin fraction with oligoclonal banding was demonstrable, indicating intrathecal immunoglobulin synthesis. *Borrelia burgdorferi* IgM and IgG antibody screening by ELISA in serum was positive. IgM

immunoblotting of the serum was negative, but the IgG immunoblot demonstrated antibodies against three specific *B. burgdorferi* antigens, namely outer surface protein (Osp) 17, *Borrelia* membrane protein (BMP) and p21. Furthermore, antibodies directed against non-specific antigens, such as flagellin and a 65 kDa heat-shock protein, were detected. Immunoblotting of the CSF demonstrated IgM antibodies with specificity to *B. burgdorferi* Osp17 and flagellin. Moreover, IgG antibodies directed against Osp17, BMP and flagellin were also demonstrated (Halperin, 1998; Dressler *et al.*, 1993; Wilske *et al.*, 1986). The intrathecal *B. burgdorferi* antibody (IBBA) index was markedly elevated (203.1; normal range 0.5–1.5), confirming intrathecal anti-*Borrelia*-antibody synthesis. Serological and PCR investigations for neurotropic viruses (coxsackievirus A/B, enterovirus, herpes simplex virus 1/2, varicella-zoster virus, Epstein–Barr virus, cytomegalovirus, human herpes virus 6) in blood and CSF were negative at initial assessment and remained negative during follow-up. Based on the diagnosis of neuroborreliosis, the neurosurgical intervention was cancelled.

The girl was treated with intravenous cefotaxime for 14 days. In addition, low-dose corticosteroid therapy was continued for 3 months. Within 1 month, the patient had recovered completely. A follow-up assessment 4 weeks after initiation of therapy still showed a positive *B. burgdorferi* IgM and IgG ELISA in serum. IgG immunoblotting of serum and CSF revealed a decreased intensity of the bands corresponding to Osp17, BMP and flagellin. IgM immunoblotting showed a decreased intensity of the flagellin band in CSF. In contrast, IgM in serum directed against Osp17 and flagellin now became demonstrable and was interpreted as an antimicrobial effect of cefotaxime with subsequent release of antigens and induction of specific antibodies. The IBBA index was 8.4. Four months after the first study, an MRI scan with and without gadolinium enhancement

Abbreviations: BMP, *Borrelia* membrane protein; CNS, central nervous system; CSF, cerebrospinal fluid; IBBA, intrathecal *B. burgdorferi* antibody.

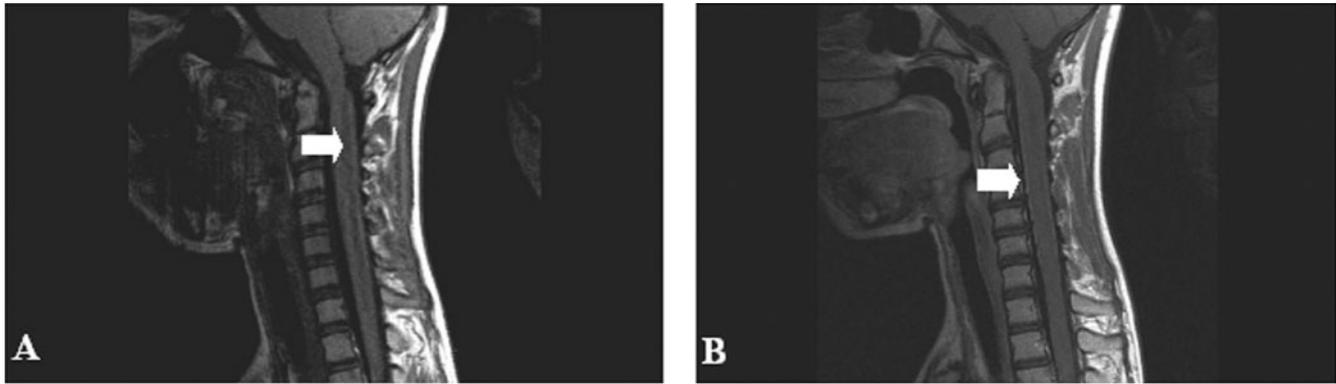


Fig. 1. MRI scan of the brainstem and cervical spine without (A) and with (B) gadolinium. (A) Diffuse central increase in signal intensity within the spinal cord from the medulla oblongata to vertebra C4 (arrow). (B) No contrast enhancement of the lesion; slight contrast enhancement in the ventral part of the myelium (arrow).

was repeated. The original lesion had almost resolved. At this time, CSF showed a normal cytology but immunoblotting of IgM and IgG was still positive. The protein electrophoresis was abnormal with a decreasing but still elevated IBBA index (3.4). Ten years of follow-up were uneventful.

Discussion

Neurological symptoms are observed at the second and third stage of borreliosis. They are less common in children than in adults. The clinical features of neuroborreliosis have been described in previous publications (Halperin, 1998, 2003; Singh & Girschick, 2004). Manifestations of the second stage include meningitis, cranial neuritis or radiculoneuritis, whereas the tertiary stage, or chronic neuroborreliosis, often presents with parenchymal involvement mimicking multiple sclerosis, polyneuropathy, viral encephalitis, vasculitis, encephalopathy, psychiatric illness or myelopathy. However, chronic (tertiary) neuroborreliosis is very uncommon in adults and occurs rarely in children. Childhood neuroborreliosis presents as acute meningitis in most cases, and the neurological findings of facial paralysis and/or the nonfocal encephalopathic complaints of headache and disturbed cognitive functions are the neurological features in more than 90%. Generally, the symptoms are very variable and develop within weeks to months after the tick bite. In up to 90% of children an erythema migrans precedes the neurological symptoms (Halperin, 2003). Paediatric or adult patients with an abrupt onset of neurological symptoms due to a central nervous system (CNS) space-occupying lesion caused by borreliae are extremely rare. We report the first manifestation of abrupt brainstem symptoms such as nausea, vomiting and headache in CNS borreliosis in a child due to a single infiltrating mass within the brainstem. To our knowledge, there is only one report of a male adult presenting with a space-occupying lesion on MRI scan due to CNS borreliosis (Dryden *et al.*, 1996). MRI findings in neuroborreliosis most

commonly include white matter abnormalities, reflecting focal areas of inflammation (Halperin, 1998). Curless *et al.* (1996) reported the case of a 15-year-old boy with an abrupt onset of brainstem dysfunction due to multiple demyelinating lesions in the pons and several areas of the cerebrum. In a case series of eight children with neuroborreliosis, Belman *et al.* (1992) reported four children with multiple focal lesions predominantly in the white matter. One child also had a periventricular lesion; another one had an additional lesion in the brainstem.

In our patient, CSF lymphocytic pleocytosis, the increase in CSF protein, the pathological CSF protein electrophoresis and the absence of malignant cells in CSF indicated an infectious origin of the spinal lesion. Serology and the finding of a highly elevated intrathecal antibody synthesis with specificity for *B. burgdorferi* (Dressler *et al.*, 1993, 1994; Hauser *et al.*, 1997) confirmed a CNS infection with *B. burgdorferi*, while infections with neurotropic viruses were excluded. The diagnosis was supported by the resolution of neurological symptoms after antibiotic therapy with a standard 2-week course of cefotaxime. However, a preceding tick bite had not been observed by the patient and there had not been a history of erythema migrans. Nevertheless, our patient illustrates the importance of taking neuroborreliosis into consideration as a differential diagnosis to CNS neoplasm.

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