

SHORT REPORT

Micturitional disturbance in herpetic brainstem encephalitis; contribution of the pontine micturition centre

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Abstract

Micturitional disturbance is rarely mentioned in human herpetic brainstem encephalitis although the pontine tegmentum, called the pontine micturition centre, seems to regulate the lower urinary tract in experimental animals. The case of a 45 year old man, who developed subacute coma and hiccup-like dysrhythmic breathing, and needed assisted ventilation is reported. Examination of CSF showed mononuclear pleocytosis and antibody against herpes simplex virus type 1, but the opening pressure was 90 cm H₂O. Brain CT showed brain swelling, predominantly in the posterior fossa, and bilateral subdural effusion. Herpetic brainstem encephalitis was diagnosed, and he received 900 mg/day vidarabine. On regaining consciousness, he had left trochlear nerve palsy, left corectopia, ageusia, and urinary retention. Brain MRI showed right side dominant, bilateral pontine segmental lesions extending slightly to the midbrain and medulla. After two weeks he was able to urinate but showed nocturnal urinary frequency, urinary incontinence, and voiding difficulty. Urodynamic studies showed a residual urine volume of 350 ml and detrusor hyporeflexia on voiding. Micturitional disturbance gradually disappeared together with the neurological signs. The bilateral pontine tegmental lesions in this patient are similar to those in previous findings on brainstem strokes, evidence of the presence of a pontine micturition centre in humans.

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The pontine tegmentum, also called the pontine micturition centre, has an essential function in urinary evacuation. Lesioning and electrical or chemical stimulations in animals¹⁻³ show that the pontine micturition centre is located adjacent to,³ or includes,² the locus

coeruleus^{1,4} and lateral dorsal tegmental nucleus.⁵ A pontine storage centre also exists just ventromedial or lateral to the pontine micturition centre. Recently, we found micturitional disturbance in patients with brainstem stroke.⁶ Their MRI showed that the responsible sites are comparable with those reported in experimental studies.¹⁻³ Herpes simplex virus type 1 (HSV-1) infection also causes brainstem lesions^{7,8} characterised by acute onset of multiple cranial nerve palsies, ataxia, and pyramidal tract involvement. Disturbances of consciousness and respiration are not uncommon. Micturitional disturbance is rarely reported in this disease. We here describe the micturitional disturbance of a patient with herpetic brainstem encephalitis who showed bilateral pontine tegmental lesions on MRI.

Case report

A 45 year old, previously healthy man developed band-like headaches around the bilateral occipitotemporal area which responded partially to analgesia but continued for five weeks, changing to a persistent throbbing headache in the bilateral frontal area. A week after onset he was admitted to our hospital. On admission his body temperature was normal, and he was alert and responded well, although his neck was stiff and the Kernig sign was positive. The ocular fundi, pupils, extraocular muscles, and other cranial nerves were intact, and coordination of the limbs was normal. Tendon reflexes were active and symmetric with no extensor planter responses. Sensations to pin prick and position were normal. The second day after admission he gradually became somnolent. On the fourth day he was comatose and had no oculocephalic reflex, hiccup-like dysrhythmic breathing, and a fever of 38.5°C. An indwelling urinary catheter was used to monitor urinary volume, and he was placed on assisted ventilation. Peripheral blood analysis showed normal findings. An EEG showed diffuse slowing, without periodic synchronous discharge. Brain CT detected diffuse brain swelling, particularly in the posterior fossa, and bilateral subdural effusion with niveau. Examination of CSF showed a low opening pressure of 90 cm H₂O, mild mononuclear pleocytosis of 10 /mm³, and increased

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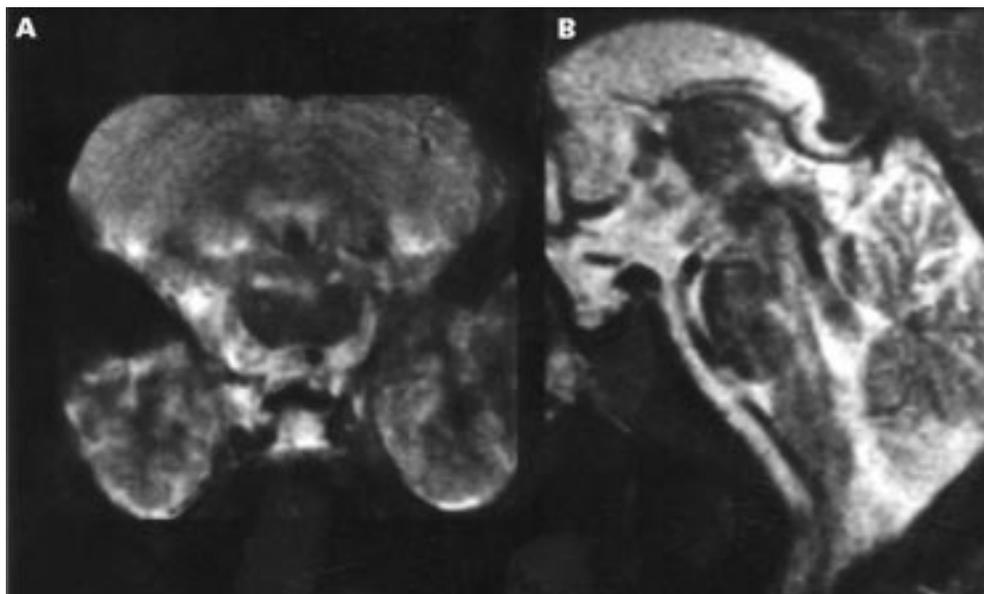


Figure 1 MRI (A Axial plane R-L, B sagittal plane; T2 weighted image, TR 2500, TE100). Abnormally high signal intensities present in the right side dominant, bilateral pontine tegmentum, and extend slightly to the midbrain and medulla.

total protein of 93 mg/dl. Antibody values against HSV-1 in the CSF and the serum respectively were 0.583 and 1.864 in the IgG enzyme immunoassay and 1:32 and 1:256 in the complement fixation test.⁹ The antibody index was 8.5 (albumin 60 mg/dl in CSF and 4100 mg/dl in serum). Herpetic encephalitis, predominantly in the brainstem, was diagnosed.

Aciclovir (1200 mg/day) was started, but was without benefit. On treatment with 900 mg vidarabine/day, 24 mg dexamethasone/day, and 900 ml mannitol/day, he gradually regained normal consciousness on the 32nd day. Brain oedema and subdural effusion had disappeared on the follow up brain CT. A CSF examination gave a normal opening pressure of 150 cm H₂O, no pleocytosis, and mildly increased total

protein of 44 g/dl. At this time, after removal of the urinary catheter, he had left trochlear nerve palsy, left corectopia, ageusia, and urinary retention, and needed clean, intermittent catheterisation. Brain MRI showed right side dominant, bilateral pontine segmental lesions extending slightly to the midbrain and medulla (fig 1), but no apparent cerebral lesion. He gradually became able to urinate and to walk to the toilet. On the 44th day, as he still had nocturnal frequency, urinary incontinence and voiding difficulty, urodynamic studies were made.

The methods and definitions used for the urodynamic studies conformed to the standards proposed by the International Continence Society.¹⁰ Neither urinary tract infection nor organic obstructive urological disease were

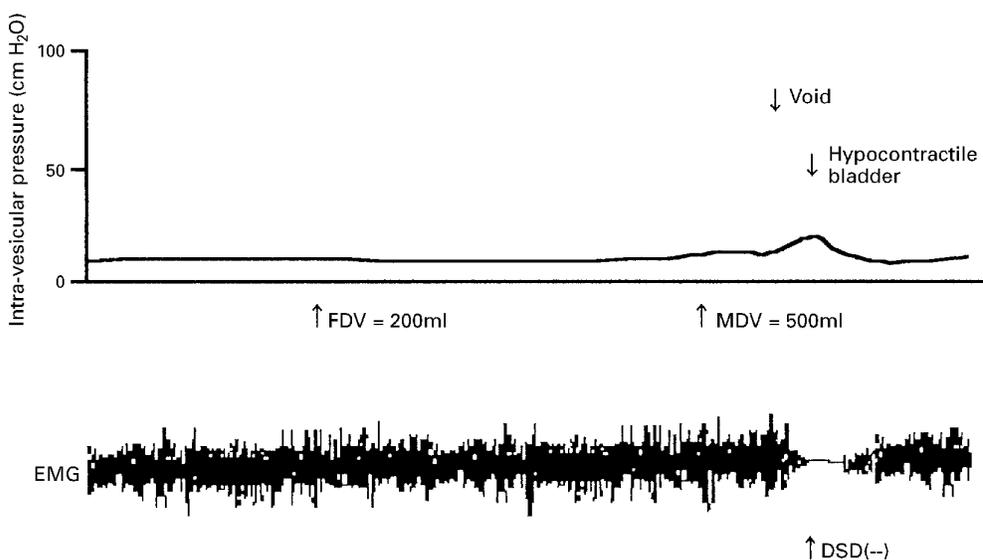


Figure 2 Results of urodynamic studies. Simultaneous recordings of intravesicular pressure (Pves) and external urethral sphincter EMG. Bladder volume at first desire to void (FDV) was 200 ml and at maximum desire to void (MDV) 500 ml. There is no detrusor hyperreflexia. During voluntary micturition (VOID), the detrusor pressure rise was insufficient, evidence of hypocontractile bladder on voiding. EMG activity has disappeared, and there is no detrusor-sphincter dyssynergia (DSD).

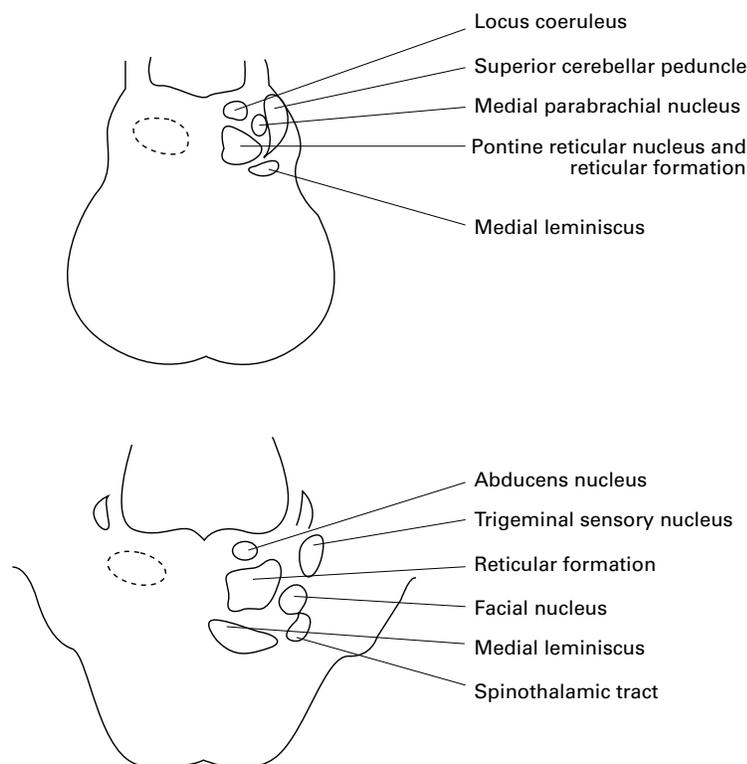


Figure 3 Suspected pontine micturition centre in humans. The dotted circle (pontine micturition centre) includes the pontine reticular nucleus, the reticular formation adjacent to the medial parabrachial nucleus, and the locus coeruleus. (Cited from Sakakibara *et al.*⁶)

found by digital examination of the prostate and cystourethrography. He had a residual urine volume of 350 ml. Water cystometry showed a bladder volume of 200 ml at first desire to void, and 500 ml at maximum desire to void, without detrusor hyperreflexia. External sphincter EMG showed normal anal and bulbocavernosus reflexes, with no detrusor-sphincter dyssynergia or uninhibited sphincter relaxation. During voluntary micturition the detrusor pressure rise was insufficient, indicative of a hypocontractile bladder (fig 2). His urinary symptoms gradually improved without medication and had disappeared almost completely up to the 60th day with no abnormal uroflowgram or residual urine. A month later left trochlear palsy disappeared, but ageusia has persisted for the past two years.

Discussion

Herpetic brainstem encephalitis was diagnosed because the main clinical features of our patient were acute deterioration of consciousness with absence of the oculocephalic reflex, hiccup-like dysrhythmic breathing, left trochlear palsy, left corectopia, and ageusia, indicative of brainstem involvement.⁸ Antibodies against HSV-1 in the CSF and serum were greatly increased, indicative of HSV-1 infection within the CSF.⁹ Brain CT showed brain swelling, predominant in the posterior fossa. After resolution of the brain oedema, MRI detected bilateral pontine lesions with no apparent cerebral lesion. In the acute phase of illness he had bilateral subdural effusion with niveau. Subdural effusion, occasionally seen in her-

petic encephalitis, particularly in the brainstem type,^{11,12} corresponds to a low CSF pressure.¹³

Micturitional disturbance has rarely been described in herpetic brainstem encephalitis, probably because serious clinical features, such as disturbed consciousness or respiratory arrest, usually mask this disturbance. Antiviral chemotherapy with steroids and ventilatory support ameliorated the acute signs of our patient, but he showed urinary retention which changed to nocturnal urinary frequency, urinary incontinence and voiding difficulty. Urodynamic study results showed the presence of 350 ml residual urine volume, and detrusor hyporeflexia on voiding, evidence of a severe evacuating disorder. Detrusor areflexia occurs in peripheral nerve lesions. Our patient, however, had neither the decreased tendon reflexes nor disturbed sensation in the limbs that indicate peripheral neuropathy. Detrusor areflexia also occurs in cerebral diseases within several months during the shock phase,¹⁴ and may persist for years.⁶ Detrusor hypoflexia in our patient indicates a supranuclear type of pelvic nerve dysfunction as has been reported in vascular diseases⁶ and tumours^{15,16} of the brainstem.

Other than micturitional disturbance, our patient had coma, hiccup-like dysrhythmic breathing, absence of the oculocephalic reflex, and left trochlear palsy with corectopia afterwards, suggestive of brainstem tegmental lesion. Ageusia reflects a lesion of the central gustatory pathway, which travels in the medial part of the medial lemniscus or of the reticular formation.^{17,18} MRI showed right sided dominant, bilateral pontine tegmental lesions that extended slightly to the midbrain and medulla. These lesions explain the neurological findings and contributed to his micturitional disturbance. Holman¹⁹ stated that voiding difficulty could be a sign of posterior fossa tumours. Ueki²⁰ later showed that of the posterior fossa tumours urinary incontinence and voiding difficulty are common in pontine tumour. Betts *et al.*⁵ and Manente *et al.*¹⁶ found voiding difficulty or retention in a patient with a tumour of the dorsal pons. Previously, we showed that micturitional disturbance is common when the pons is affected in brainstem strokes. The lesions detected by MRI were concentrated in the pontine reticular nucleus and the reticular formation adjacent to the medial parabrachial nucleus and locus coeruleus (fig 3).⁶ This region, called the pontine micturition centre in experimental animals,¹⁻³ regulates lower urinary tract function by way of the spinobulbospinal reflex. The lesions in the patient reported here are similar to those in our previous findings and support the presence of a pontine micturition centre in humans.

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