LETTERS

Sub-acute presentation of Morvan's syndrome after thymectomy

A 70 year old male presented in February 2000 with persistent cough. Chest radiograph revealed a mediastinal abnormality. A computed tomography (CT) scan of the thorax confirmed an anterior mediastinal mass. CT guided mediastinal biopsy was performed but proved inconclusive. The patient declined further invasive investigation for 2 years. After follow up CT showed significant enlargement he underwent surgery in September 2002. An excellent post operative recovery was made. Histology confirmed a minimally invasive thymoma.

However, 6 weeks later he developed progressive proximal leg weakness, lethargy, and night sweats. He described a sensation like "someone touching his legs" and became agitated and restless at night. He was readmitted in November 2002 and on the first night became acutely confused and markedly disorientated with visual hallucinations.

On examination he was agitated and confused. His eyes opened spontaneously, there was no coherent verbalisation, and he withdrew to pain. He was apyrexial although there was marked hyperhidrosis and hypersalivation. Blood pressure was 120/70 mm Hg, and pulse was 98 bpm and regular. He had profuse diarrhoea although his abdomen was soft and non-tender. There were irregular myoclonic jerks of all four limbs predominating in his upper limbs as elbow flexion jerks. There was no startle reaction. Cranial nerve examination was unremarkable. Power and deep tendon reflexes were normal and plantar responses flexor. Intravenous phenytoin was administered with resolution of the myoclonic movements.

Laboratory investigations including electrolytes, auto-antibody screen, and anti-neuronal antibodies were unremarkable. Cerebral spinal fluid (CSF) was clear, colourless, and acellular, CSF glucose was 4.0 mmol/l (2.2–4.4) (serum 6.7), and CSF protein 0.25 g/l (0–0.40). Oligoclonal bands were negative in CSF and serum and no abnormality of the immunoglobulin G pattern was detected. CSF analysis for the 14-3-3 (prion) protein was negative.

Chest radiograph showed postoperative changes. Brain magnetic resonance imaging (MRI) disclosed multiple areas of periventicular and subcortical white matter signal change especially within the right parietal region, felt likely to represent diffuse cerebrovascular changes.

Serial electrocardiograms (ECGs) demonstrated sinus tachycardia. Serial electroencephalograms (EEGs) showed diffuse slowing only. Nerve conduction studies revealed mild motor conduction slowing (right median 49 m/s, right common peroneal 43 m/s). Sensory nerve amplitudes were small with normal velocities. Repetitive discharges were noted following evoked compound muscle action potential in upper and lower limb motor nerves. Doublet, triplet, and multiplet were recorded in abductor pollicis brevis, tibialis anterior, and extensor digitorum brevis indicating motor axon membrane instability compatible with neuromyotonia (fig 1).

Confusion, visual hallucinations, insomnia, anxiety, sweating, diarrhoea, a slurred dysarthria, and abnormal muscle activity fluctuated dramatically from day to day, but there was a steady overall deterioration. In a lucid interval he scored 68/100 using Addenbrooke's bedside testing of cognitive function (equivalent to a Mini Mental State Examination (MMSE) score of 18/30), performing poorly in orientation, attention/concentration, verbal fluency, and visuospatial abilities. He became chair bound despite little clinical weakness either proximally or distally, and later bed bound. Although never as prominent as on first admission, there was frequent muscle twitching, at best resembling myokymia, at worst multifocal myoclonus. He was transferred to a high dependency unit.

The diagnosis of Morvan's syndrome was based on the clinical phenotype and supported by the nerve conduction studies and the presence of antibodies to voltage gated potassium channel antibodies (VGKC) (165 pmol; normal <100 pmol), 10 weeks post-thymectomy.

At 10 weeks post-thymectomy he had 5 days of plasma exchange (PE). There was rapid improvement in orientation and memory and a cessation of abnormal muscle movements within 5 days. Prednisolone was commenced 40 mg daily and phenytoin continued. He made a dramatic clinical recovery, standing unassisted 10 days post-exchange and mobilising independently by 14 days, with no further muscle twitching. Addenbrooke's test 2 weeks post-PE revealed a score of 78/100 (MMSE 24/30).

Post-PE nerve conduction studies and EMG showed an increase in the motor conduction velocities (right median 56 m/s, right common peroneal 45 m/s) and resolution of the previous features of neuromyotonia. Repeat serum VGKC antibody levels at 1 and 4 months post-PE were within normal limit. EEGs both 2 and 6 months after treatment showed little improvement. MRI 6 months after treatment also showed no change.

At 8 months post-PE, on 10 mg prednisolone daily he remained asymptomatic aside from fatigue. His wife reported that apart from irritability his personality and memory were essentially back to normal, although on repeat Addenbrooke's he scored only 82/100. He has even returned to playing golf.

Discussion

Since Morvan's original publication only a few cases have been described. The majority appear to be a paraneoplastic manifestation.[1 2] The discovery of VGKC antibodies in several of these cases, as seen in many cases with neuromyotonia,[3] has suggested that Morvan's syndrome may be an autoimmune disorder. Whether VGKC antibodies play a pathogenic role in the encephalopathy as they do in the peripheral nervous symptoms is as yet unclear. Others[1 2] have suggested that the VGKC antibodies may cross the blood–brain barrier and act centrally, binding predominantly to thalamic and striatal neurons[2] causing encephalopathic and autonomic features. The reversibility of the encephalopathy with plasmapheresis does suggest that the encephalopathy is also mediated by serum factors. Liguori *et al* reported the presence of weak CSF oligoclonal bands, absent in the serum, supporting a central immunological role.[2] There are also

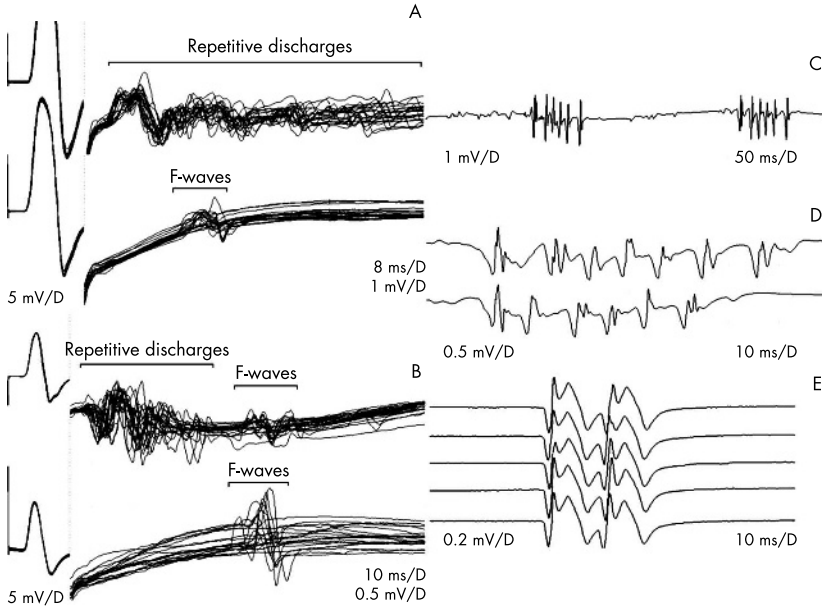

Figure 1 (A) Upper trace: recordings (superimposed) from abductor pollicis brevis following stimulation of the median nerve at the wrist. Note the repetitive discharges that completely obscure any F responses which may have been generated. Lower trace: following treatment the repetitive discharges have completely disappeared and normal F waves are now visible. (B) Similar to A; recordings before (upper trace) and after (lower trace) treatment from extensor digitorum communis following stimulation of the common peroneal nerve at the ankle. The repetitive discharges subside after 45 ms allowing the F responses to be seen. (C, D, E) Spontaneous bursts of neuromyotonic discharges in the form of multiplets (C and D) and doublets (E) with intraburst frequencies of up to 120 Hz. C and D are bursts of the same motor unit displayed at different sweep speeds.

reports of non-paraneoplastic limbic encephalitis associated with raised serum VGKC[4] suggesting that these antibodies may give rise to a spectrum of neurological disease presenting with symptoms arising peripherally, centrally, or both.[5] However in our case and the case reported by Lee *et al*[1] oligoclonal bands were absent in CSF and serum, and CSF immunoglobulin profiles were unremarkable.

The natural history of Morvan's is highly variable. Two cases have been reported to remit spontaneously. In one of these cases remission was associated with a fall in the serum level of VGKC antibodies. Others have required a combination of plasmapheresis and long term immunosuppression,[1 2] although in one of these cases the patient died shortly after receiving PE.[2] Other fatalities without remission have been described by, amongst others, Morvan himself. Cardiac involvement in some cases may increase vulnerability to sudden death.

Thymectomy has previously been a proposed treatment for Morvan's syndrome. This is the first reported case of Morvan's syndrome presenting post-thymectomy. Morvan's syndrome normally presents with a slow insidious onset over months to years.[1 2] Our case is unique in that presentation was over days, just weeks post-thymectomy, and responded to a single PE course with low dose immunosuppression. We hypothesise that surgery may have precipitated a rise in the serum VGKC antibodies levels, which were cleared by one course of PE resulting in remission as supported by the drop in serum VGKC levels. Although potentially a low risk of thymectomy, it is an important complication to recognise because of the dramatic reversibility to treatment.

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Urinary retention associated with mild rhombencephalitis

The importance of the pontine tegmentum as the micturition centre responsible for urinary voiding has been well established from animal studies.[1] A cliniconeuroradiological study showed that the nuclei involved are the pontine reticular nucleus and the reticular formation, located adjacent to the locus ceruleus and the medial parabrachial nucleus.[2] This micturition centre, which is thought to coordinate detrusor sphincter activity during micturition, probably conveys its efferent fibres through the bulbospinal pathway to the spinal parasympathetic nucleus.

We describe a patient with suspicion of mild viral rhombencephalitis presenting with acute urinary retention because of a lesion affecting the dorsal tegmentum of the medulla and the pontomedullary junction bilaterally. Reports on urinary retention caused by bulbar lesions other than stroke and tumours are rare but emphasise the importance of this often neglected association.

Case report

A 34 year old Nepali construction worker, with no past medical history, presented with suprapubic pain because of acute urinary retention and was admitted for observation. In the weeks before admission he had complained of mild headache and dizziness. The headache responded well to paracetamol. There was no history of orogenital ulcers, and he had received no recent vaccinations.

On admission, he was conscious and alert, with normal cognitive examination. There was no neck stiffness. Fundoscopy, pupil reflexes, accommodation, and vertical and horizontal eye movements were normal. Bulbar function was intact. There was generalised hyperreflexia, including the jaw jerk, with equivocal plantar responses. There was no indication of spinal cord or cauda equina syndrome on sensory examination. Coordination and gait were normal. He had urinary retention (550 ml), which was managed with an indwelling catheter. General examination revealed an afebrile patient with normal vital signs. Skin testing for tuberculosis was negative. Peripheral blood analysis showed normal findings: the erythrocyte sedimentation rate was 4 mm/h and the white blood cell count was 8500/μl (60% neutrophils and 27% lymphocytes). Magnetic resonance imaging (MRI) of the spinal cord including the cauda equina was normal. However, MRI of the brain stem revealed a symmetrical bilateral abnormal high signal on T2 weighted images in the medulla and pontomedullary junction (fig 1). Cerebrospinal fluid (CSF) analysis revealed features of aseptic meningitis (105 cells/mm^3 with 96% lymphocytes and 4% neutrophils, and normal protein, glucose, and IgG). Serum autoantibody, viral serology tests, and CSF smear and cultures did not contribute to the diagnosis. Neurophysiological investigations (visual evoked and somatosensory evoked potentials) were normal. A urogram showed an atonic bladder. Organic obstructive urological disease was excluded radiologically, and no urological cause for the urinary retention could be identified. On the basis of the neurological findings, there was involvement of the pyramidal tracts and the micturition centre or its efferent pathways. The differential diagnoses included mild viral rhombencephalitis, acute demyelinating disorder (multiple sclerosis or acute disseminated encephalomyelitis), or an underlying autoimmune disorder (for example, neuro-Behçet disease). Three weeks after admission, the neurological symptoms gradually disappeared. Repeat CSF analysis and spinal MRI were normal. MRI of the brain stem revealed regression of the hyperintense lesions on the T2 weighted images.

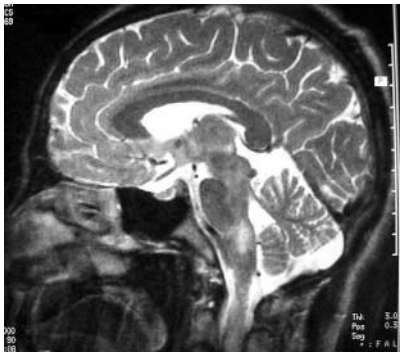

Figure 1 Magnetic resonance imaging of the brain stem (sagittal view). T2 weighted images on admission show hyperintense focus in the tegmentum of the medulla oblongata, extending from the pontomedullary junction downward.

Comment

Although this patient was likely to have suffered from a mild, probably viral rhombencephalitis, the true diagnosis remains unclear. We speculate that parainfectious demyelination or direct viral invasion was likely to have been the cause of the patient's neurological presentation. Intriguingly, a similar case was reported by Komiyama *et al*, in which a 30 year old man had urinary retention, mild horizontal gaze paresis, and hypaesthesia around the mouth and fingers.[3] In their case, the MRI findings revealed several amorphous lesions in the pons and cerebellum, in addition to a well defined lesion in the right dorsolateral tegmentum of the upper pons. CSF analysis showed a mild increase in protein but only 3 cells/mm^3. In contrast to their patient, the lesions in our case were bilateral and extended from the medulla to the pontomedullary junction, but showed a similar rate of disappearance (four weeks).

Brain stem control of micturition has been reviewed by Sakakibara and Fowler.[4] Urinary retention is extensively described in patients with brain stem tumours or strokes. In the series of patients with brain stem tumours, the majority of the lesions were located in the pons and medulla, while in patients with

brain stem strokes the lesions were exclusively located in the pontine tegmentum. Therefore it is likely that the efferent pathways originating from the pontine micturition centre were affected at the level of the medulla in our patient. This case shows that transient urinary retention with minimal neurological symptoms can be associated with medullary lesions, and is probably caused by direct viral infection or by parainfectious demyelination.

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Long term continuous bilateral pallidal stimulation produces stimulation independent relief of cervical dystonia

Idiopathic cervical dystonia is the most common form of focal dystonia in adults.[1 2] It is characterised by involuntary, sustained contractions of the cervical muscles and produces abnormal head movements or postures. Although deep brain stimulation (DBS) of the globus pallidus internus (GPi) is now accepted in the treatment of a wide spectrum of dystonias including cervical dystonia (for a review, see Krauss[3]), the mechanisms underlying its beneficial effects on dystonia remain unclear. We report a patient in whom continuous long term (22 month) bilateral pallidal stimulation eventually produced stimulation independent relief of cervical dystonia.

This 54 year old right handed man had a one year history of involuntary head rotation toward the left. He had no previous exposure to neuroleptics and no family history of dystonia. On admission in June 2000, he manifested severe cervical dystonia with neck pain characterised by left and posterior head turn and tilt (fig 1A). The right sternocleidomastoid muscle was contracted and hypertrophied. His cervical dystonia decreased in the supine position or when performing a sensory trick which consisted of putting his right hand on his chin or neck. On the Toronto western spasmodic torticollis rating scale (TWSTRS), his total severity score (TSS) was 25 (maximum = 35), and his total disability score (TDS) was 21 (maximum = 30).

Brain magnetic resonance imaging showed no obvious abnormalities. Sequential pharmacological trials including diazepam (4×2 mg/day), trihexyphenidyl (4×2 mg/day), tiapride (3×25 mg/day), and sulpiride (3×50 mg/day) produced unsatisfactory results. Botulinum toxin (BTX) treatment is now established as a treatment of choice in patients with cervical dystonia, while bilateral pallidal stimulation is still an investigational treatment. However, at the time of these trials, the use of BTX injections was not approved in Japan for the treatment of cervical dystonia. The patient was referred for surgery after informed consent had been obtained from both him and his family.

Quadripolar DBS electrodes (model 3387, Medtronic Inc, Minnesota, USA) were implanted as previously described.[4 5] The target points were determined to be 2 mm anterior and 20 mm lateral to the midpoint of the anterior to posterior commissure line, and 1 mm dorsal to the third ventricle floor. The most ventral contacts were placed exactly on the target points (fig 1B, C). As six day stimulation tests confirmed the beneficial effects of DBS, a receiver for the external transmitter was implanted (Mattrix transmitter, model 3272, Medtronic). The cervical dystonia and neck pain were markedly alleviated within minutes of initiating DBS.[4] Extensive trials showed that optimal results were produced at a frequency of 60 Hz, pulse width 500 μs, and amplitude 6.0 V.[4 5] As the external stimulator that we first employed permitted bipolar but not monopolar stimulation, contact 0 was used as the cathode and contact 1 as the anode. Upon stimulation, the cervical dystonia was markedly alleviated (fig 1D), with TWSTRS TSS and TDS of 6 and 5, respectively. By contrast, when stimulation was discontinued, the dystonic symptoms reappeared immediately and resumed at the preoperative level (fig 1E).

With stimulation, the patient was able to return to his job and resume his normal life. However, he began to complain that using the external transmitter was inconvenient. Moreover, he was afraid of the immediate return of his cervical dystonia when he discontinued stimulation—for example, when replacing the battery or taking a bath. Therefore, in June 2001 the external transmitter receiver was replaced with internal pulse generators (IPGs) (Itrel III, Medtronic Inc). Extensive trials showed that optimal results were produced at 60 Hz, 450 μs, and 2.6 V. Monopolar stimulation was applied using contacts 0 and 1 as the cathode and the pulse generator as the anode. At this optimal setting, his TWSTRS TSS and TDS were 5 and 5, respectively. Continuous bilateral pallidal stimulation allowed him to continue a normal life. With two active electrodes stimulating (at 60 Hz, 450 μs, and 2.6 V) for 24 hours a day, the battery life of the Itrel III is about 24 months. Thus, in April 2003 (22 months after placement of the DBS electrodes), revision of the IPGs was carried out before depletion of the batteries. This was the first time of discontinuation of the DBS since the implantation of the IPGs. Expecting that his cervical dystonia would reappear as usual when stimulation using the external transmitter was discontinued, we planned to switch on the generators immediately after surgery. However, without stimulation, the cervical dystonia did not worsen and at the time of writing (fig 1F) his TWSTRS TSS and TDS continue to be 6 and 5, respectively. Compared with the values obtained before the implantation of the DBS electrodes, there was approximately 76% improvement in the cervical dystonia. Pharmacotherapy had been continued unchanged from before the surgery: diazepam (4×2 mg/day), trihexyphenidyl (4×2 mg/day), tiapride (3×25 mg/day), and sulpiride (3×50 mg/day).

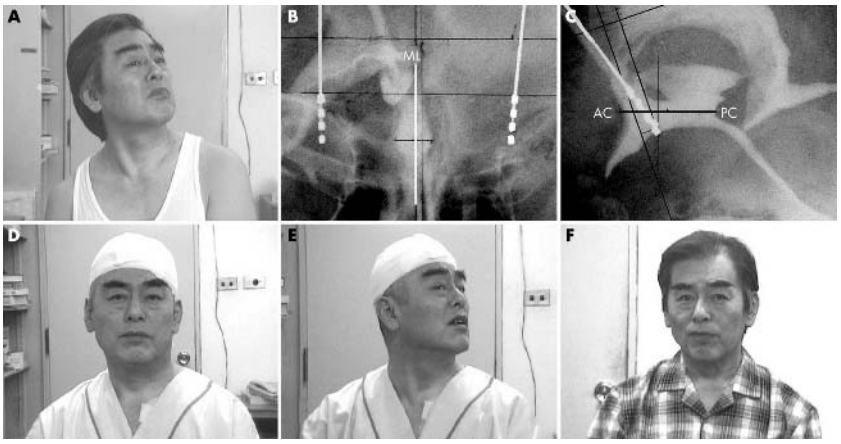

Figure 1 (A) Photograph taken before implantation of the deep brain stimulation (DBS) electrodes. Note severe cervical dystonia characterised by left and posterior head turn and tilt. The right sternocleidomastoid muscle was contracted and hypertrophied. (B, C) Location of the electrodes superimposed on the frontal (B) and lateral (C) view in selective third ventriculography. The target points are indicated by asterisks. AC, anterior commissure; ML, midline; PC, posterior commissure. (D, E) Photographs taken 10 days after implantation of the DBS electrodes. On stimulation with the external stimulator, cervical dystonia was markedly alleviated (D). In contrast, upon discontinuation of stimulation, the dystonic symptoms reappeared immediately and returned to the preoperative level (E). (F) Photograph taken six months after discontinuation of the GPi DBS with internal stimulators. Without stimulation, there was marked relief of the cervical dystonia.

Comment

Interestingly, long term (about 22 months) continuous bilateral GPi DBS with IPGs produced stimulation independent relief of this patient's cervical dystonia, although short term (less than 24 hours because of limited battery life) and discontinuous DBS with the external transmitter had not yielded such beneficial effects. We cannot exclude the possibility that spontaneous remission of the cervical dystonia occurred[1] during the use of IPGs. However, our experience with this patient suggests that chronic GPi DBS may result in normalisation of the altered basal ganglia related motor circuits that are implicated in the occurrence of dystonia,[6–8] and that over time the normalised state may persist independently of DBS. Alternatively, chronic GPi-DBS may lead to the reorganisation of the functional anatomy of the motor circuits at unknown levels, thus resulting in suppression of dystonia. Long term remission of idiopathic cervical dystonia after BTX treatment has also been reported.[9] It is presently unknown whether peripheral BTX injection and GPi-DBS share a common mechanism in producing remission of cervical dystonia. From a practical standpoint, in patients undergoing GPi-DBS for cervical dystonia treatment, it may be necessary to apply DBS as continuously as possible and to avoid any unnecessary discontinuation of the IPGs. In addition, when battery depletion makes it necessary to revise the IPGs, it may be advisable to determine whether further stimulation is actually needed in these patients.

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Severe vasculitic neuropathy following influenza vaccination

Current Department of Health (UK) guidelines suggest that all people aged over 65 years should receive annual influenza vaccination. There is a range of adverse medical sequelae associated with this. Two serious complications are Guillain-Barré syndrome[1] and systemic vasculitis.[2 3] The strength of association between influenza vaccination and Guillain-Barré syndrome has been questioned, and little is known of the pathogenesis.[3] Several investigators have reported a close temporal association between influenza vaccination and systemic vasculitis of various classifications.[2 3] Vasculitic peripheral neuropathy was not a feature in any of the reported cases.[2 3]

We report a case of biopsy proven vasculitis, presenting as mononeuritis multiplex, following influenza vaccination. The clinical picture evolved rapidly into a syndrome indistinguishable from axonal Guillain-Barré syndrome. This suggests a differential diagnosis for post-vaccination neuropathy, with implications for management. We believe this is the first report in which there was an associated peripheral neuropathy at presentation. It raises issues about the aetiology and pathogenesis of vaccination associated neuropathy.

Case report

A previously fit and active 72 year old woman was admitted after routine influenza vaccination. She gave a history of progressive distal arm and leg symptoms, tiredness, and anorexia. One week after vaccination she experienced pain in her left buttock which radiated down her left leg. In the following 24 hours she developed weakness in her right hand in a median nerve distribution. This was followed by similar symptoms in the left hand. In the 24 hours before admission her left foot became numb and weak and she complained of general exhaustion and anorexia.

There was no previous history or relevant family history of neurological disorder, and the only drug she used regularly was pravastatin, which she had been taking for three years. She had received similar influenza vaccination on three previous occasions without complications. There was no relevant past medical history.

Examination revealed bilateral median nerve palsies and left lower limb sensory loss consistent with abnormality of the distal sciatic nerve. Cranial nerve examination, including fundoscopy, was normal. General examination revealed a purpuric rash on both ankles. There was no evidence of involvement of other organs.

On admission the erythrocyte sedimentation rate (ESR) and C reactive protein were raised at 105 mm/h and 35 mg/l respectively. Full blood count, urea and electrolytes, uric acid, thyroid function, liver function (apart from reduced albumin (34 g/l)), total protein and electrophoresis, calcium, creatine kinase, glycosylated haemoglobin (HbA1C), hepatitis B surface antigen, vitamin B-12, and folate were all normal. A vasculitic screen—including antinuclear antibody, perinuclear and cytoplasmic antineutrophil cytoplasmic antibody, and rheumatoid factor—was negative. Influenza A and B complement fixation tests were negative. Urinanalysis was normal. The patient declined lumbar puncture.

Nerve conduction studies carried out on admission confirmed a peripheral neuropathy with features of a mononeuritis multiplex syndrome. Motor nerve studies are shown in table 1. Sensory conduction was preserved in both upper and lower limbs.

A skin biopsy of one of the purpuric ankle lesions showed prominent vasculitis involving the small arterioles without granuloma formation. On radial nerve biopsy there was severe axonal loss but no definite vasculitis. No evidence of myelin debris was found.

She was treated with high dose oral steroids, azathioprine, and monthly pulses of intravenous cyclophosphamide. Six weeks later there was evidence of further clinical deterioration, although inflammatory markers were low (ESR 21 mm/h). She had severe distal weakness, sensory loss, and hyporeflexia of all four limbs, suggestive of involvement of all peripheral nerves. She was very disabled, unable to walk or use either hand.

The electrophysiological findings at this stage were indistinguishable from a severe acute motor and sensory axonal neuropathy of Guillain-Barré syndrome type (table 1, study 3). Electromyography demonstrated complete denervation in the small hand muscles bilaterally and severe partial denervation in lower limb groups (the gastrocnemius and tibialis anterior were tested). All sensory action potentials were absent (radial, median, ulnar, and sural groups; tested antidromically). F waves were normal at presentation; however, they were absent in

Table 1 Motor nerve conduction studies

Nerve	Study	DML (ms)	CV (m/s)	Amplitude (distal/proximal) (mV)
Right median	1	4.0	52	1.5/1.5
	2	6.8	–	0.2/0.0
	3	Absent	–	Absent
Left median	1	3.8	37	1.7/0.9
	2	3.8	–	0.5/0.0
	3	Absent	–	Absent
Right ulnar	1	3.0	61	7.0/7.0
	2	3.2	62	2.5/2.5
	3	Absent	–	Absent
Right medial popliteal	1	5.2	40	6.0/6.0
	2	4.6	41	0.5/0.5
	3	Absent	–	Absent

Amplitude, peak to peak amplitude of compound muscle action potential; study 1, at presentation; study 2, two weeks later; study 3, six weeks later.
CV, conduction velocity; DML, distal motor latency.

both upper and lower limb studies at six weeks.

Review at two months showed some evidence of clinical improvement, but the electrophysiological findings were unchanged. Eight months after her original presentation clinical improvement was still very limited.

Comment

We describe a case of post-vaccination small vessel vasculitis, with involvement of skin and peripheral nerves, which to our knowledge has not been described before. A causal association between vaccination and a rare complication is hard to establish and in our case is presumptive. The key evidence is biological plausibility and the timing of the complication. Previous studies have shown that the time of peak onset of post-vaccination complications was day 9–12 for the Guillain-Barré syndrome[1] and approximately day 12 for vasculitis.[4] Our patient's first neurological event occurred nine days after vaccination.

Our report would lend support to a diversity of pathogenic mechanisms in post-vaccination neuropathy. In our case, vasculitis was clinically suspected because of the appearance of the skin rash and the presentation with mononeuritis. Although the nerve biopsy in this case did not show vasculitis it seems highly probable that the same process accounted for both skin and nerve pathology. A previous case series of nerve biopsies from patients with post-vaccination Guillain-Barré syndrome showed a few scattered histiocytes in the endoneurium along with axonal degeneration.[5] It is unknown whether other cases of Guillain-Barré syndrome after vaccination may have a vasculitic mechanism without prominent clinical features to suggest vasculitis.

Although influenza vaccination is clearly justified on public health grounds, serious complications may result.[4] Our report adds weight to the suggestion that some cases of post-vaccination neuropathy may have a vasculitic aetiology, with treatment implications.

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Isolated hypesthesia in the right V2 and V3 dermatomes after a midpontine infarction localised at an ipsilateral principal sensory trigeminal nucleus

Isolated cranial nerve palsies are often attributed to lesions of the respective nerves along their extraaxial courses. However, ischaemic or haemorrhagic lesions of the brainstem also cause isolated cranial nerve palsies through involvement of the intraaxial segments of the respective nerves. Small lesions of the brainstem can affect the trigeminal nerve only, although isolated trigeminal nerve palsy occurs less frequently than third or sixth nerve palsy.[1] A case of small medullary infarction was reported in this journal, involving the spinal trigeminal tract and nucleus and presenting as painful trigeminal sensory neuropathy. In this report, the patient presented with orofacial pain and abnormal sensation both of which were confined within ipsilateral maxillary (V2) and mandibular (V3) nerve distribution.[2] A similar isolated sensory distribution in the V2 and V3 dermatomes was observed in our patient with a small dorsolateral midpontine infarction involving a principal sensory trigeminal nucleus. Our case was unique because light touch sensory deficit was restricted to the V2 and V3 dermatomes while the V1 dermatome remained intact. In a small number of previous reports, dorsolateral or entry zone infarction or bleeding at the midpons presented as isolated trigeminal nerve neuropathy which involved all trigeminal dermatomes, although some cases tended to show lesser involvement of the V1 dermatome and more marked involvement of the V2 and V3 areas.

Case report

A 51 year old man noticed a rubbing sensation on the right edge of his tongue. Then 9 days after onset, this abnormal sensation extended to the right half of his oral cavity including the tongue, gums, and buccal mucosa. The sensation gradually spread to the lower half of the face, from the mandibular nerve division (V3) to the maxillary nerve division (V2). When he woke up the next morning, he was aware of a slight diplopia lasting a few minutes.

At 2 weeks after onset, he visited our hospital because of hypesthesia in the right half of the oral cavity. He had no past history of stroke, hypertension, diabetes mellitus, or hyperlipidemia. A dental examination was normal. On neurological examination, light touch sensation was decreased in the V2 and V3 dermatomes of the right side of his face including the tongue, lips, upper and lower gums, and the hard palate. An evident boundary existed between the impaired sensory area (V2 and V3) and the intact sensory area (V1). Pinprick and temperature sensation were well preserved in the V2 and V3 areas. Slight weakness of the right masseter was detected. All modalities of sensation were preserved in the ophthalmic nerve division (V1). Corneal reflexes were normal. On examination of other cranial nerves we found no abnormalities, including eye movement and taste. Motor weakness of the trunk and the four extremities was not found. Jaw jerk and deep reflexes in the four limbs were normal. Truncal and limb ataxia was not seen. A blink reflex study showed no delayed latency of ipsilateral R1, R2, or contralateral R2 responses on stimulation of the left or right supraorbital nerve (V1). Brain

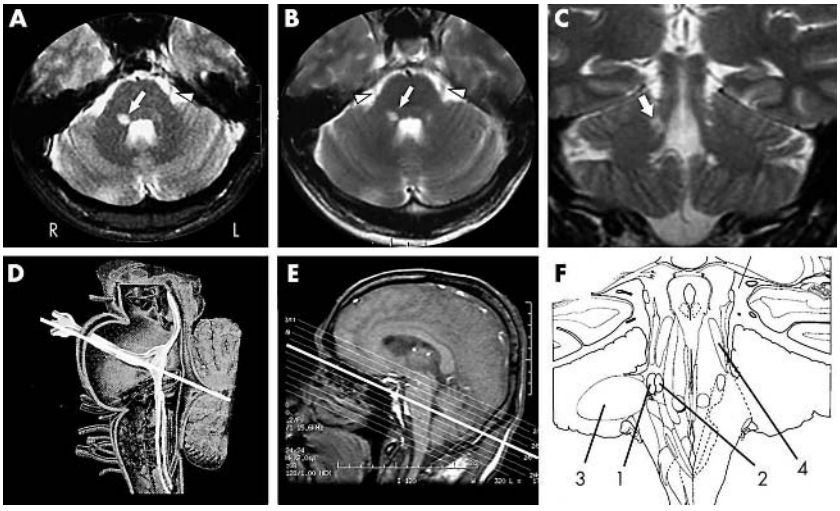

Figure 1 (A) Axial T2* weighted image, (B) axial T2 weighted image, and (C) coronal T2 weighted image, taken 2 weeks after onset, showing a hyperintense lesion (arrow) in the right dorsolateral pontine tegmentum. Exrapontine trigeminal nerves are indicated by arrowheads. (D) A sketch of the intrapontine and extrapontine segments of trigeminal nerves and the trigeminal nuclei. The white thick line indicates the axial slice level used to obtain images (A) and (B). (E) A midsaggital view image with a white thick line indicating slices (A) and (B). (F) A neuroanatomical sketch corresponding to the MR imaging at slice ''C''. 1, principal sensory trigeminal nucleus; 2, motor trigeminal nucleus; 3, middle cerebellar peduncle; 4, superior cerebellar peduncle.

magnetic resonance imaging (MRI) revealed a small T2 hyperintense lesion in the right dorsolateral pontine tegmentum (fig 1), but no additional lesions in the brain. By 3 weeks after onset, his sensory deficits to light touch and the slight weakness of the right masseter had disappeared, although paresthesia remained in the right V2 and V3 areas. Two months after onset, his subjective paresthesia was no longer present.

A characteristic of our case was the restricted sensory impairment in the V2 and V3 dermatomes. The distribution of sensory deficits in our case, a dorsolateral pontine infarction, was very similar to that in a patient with a small medullary infarction reported by Nakamura *et al*.[2] Our patient presented a rubbing sensation and decreased light touch sensation without pain, while the previous case presented orofacial pain and sensory deficit. Root fibres conveying impulses for tactile and pressure senses enter the principal sensory nucleus, while root fibres conveying impulses for pain and temperature senses enter the spinal trigeminal nucleus. The lesion in our case involved the principal sensory trigeminal nucleus and motor trigeminal nucleus, while the previous case involved the spinal trigeminal tract and nucleus. We assumed that the lesion in our case did not involve the tract or nucleus related to pain and temperature senses, because it was relatively small and located in a dorsolateral area of the midpons. For this reason, pain and temperature senses were preserved in our patient.

The size and location of the infarction in our case was very similar to that in a patient reported by Ishii *et al*.[3] The sensory impairment in our case was restricted to the V2 and V3 dermatomes, while the previous case presented numbness and paresthesia over the left upper face, tongue, and buccal mucosa. The motor trigeminal nucleus was impaired in our case but not in the previous case. The lesion in our case was in a slightly dorsal location compared with the lesion of the previous case. The motor trigeminal nucleus was presumably affected in our case, since it is located on the dorsomedial side of the principal sensory trigeminal nucleus.

The most interesting finding of our case is that an evident boundary existed between the impaired sensory area (V2 and V3) and the intact sensory area (V1). As yet, it is not known whether or not a small lesion of the principal sensory nucleus can cause hypesthesia limited to the V2 and V3 areas based on ''segmental distributions'' of the face. Functional MRI activation was studied on brush or noxious stimulation of the V1, V2, and V3 areas of the face.[4 5] However, somatotopic activation in the principal sensory trigeminal nucleus has been unsuccessful. According to Carpenter, neurons carrying sensation from the V1 area are localised in the most ventral part of the principal sensory nucleus, while the V2 and V3 areas are located more dorsally.[6] The explanation for the deterioration of the tactical sense being limited to the V2 and V3 areas is that the lesion in our case involved the intermediate and dorsal portions of the principal sensory nucleus in which fibres of V2 and V3 terminate.

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