PostScript

LETTERS

Heterogeneity in male to female risk for Parkinson's disease

We read with interest the recent meta-analysis of seven studies that reported that the age-adjusted incidence of Parkinson's disease was 1.5 times greater in men than in women.[1] However, this meta-analysis excluded several informative studies (such as those with <50 patients and those restricted to older cohorts) and did not explore heterogeneity in the male to female (M:F) ratios. We were also unable to replicate some of the data used in the meta-analysis. For example, we believe it misquoted some crude incidence rates as being age-adjusted (eg, the studies from Ferrara and Olmstead County).

In the process of updating our previous systematic review of studies on the incidence of Parkinson's disease,[2] we performed a new meta-analysis of age-adjusted M:F incidence ratios for Parkinson's disease and attempted to identify the causes of heterogeneity. Additional studies published between January 2002 and April 2005 were identified using the same search strategy and inclusion criteria as those in the previous review.[2] Where possible, the age-standardised M:F incidence ratio for each study was calculated with the Confidence Interval Analysis software V.1 by applying the age-specific female incidence rates to the corresponding male population. In three studies, an age-adjusted M:F relative risk (RR) given in the original publication was used instead.

Meta-analysis of the natural logarithm of age-standardised M:F ratio (logSR) estimates was performed using a DerSimonian and Laird random effects model. Heterogeneity was formally assessed using the I^2 statistic and explored using retrospective meta-regression analyses, which assessed the influence of study location (dichotomised Western *v* Asian) and the mean age of onset in the incident parkinsonian cohort (mean age of onset/diagnosis <70 years of age *v* onset diagnosis ⩾70 years of age). Additionally, we assessed publication bias with a funnel plot of the logSR. The influence of individual studies was assessed by omitting each study one-by-one and recalculating the pooled estimates. All meta-analyses were carried out using STATA V.8 software.

In all, 17 relevant studies including more than 2500 people with Parkinson's disease were identified (table 1). No evidence of publication bias was found. The pooled estimate for the age-standardised M:F ratio was 1.46 (95% confidence interval (CI) 1.24 to 1.72, p<0.001), but there was a high level of heterogeneity ($I^2 = 85\%$). Removal of individual studies altered the pooled estimate only marginally (between 1.42 and 1.51), with the 95% CIs all comfortably excluding the null value. Meta-regression analysis showed that studies from the West gave significantly greater M:F ratios than those from Asia (table 1; RR from meta-regression 1.58, 95% CI 1.12 to 2.22, p = 0.009) and that studies in which the mean age of subjects with Parkinson's disease was ⩾70 years (pooled M:F ratio 1.67) gave significantly greater M:F ratios than those with a mean age <70 years (pooled M:F ratio 1.23, RR from meta-regression 1.38, 95% CI 1.06 to 1.81, p = 0.018). However, heterogeneity remained high within the <70 and ⩾70 years age subgroups ($I^2 = 80\%$ for both) and for the Western studies subgroup ($I^2 = 84\%$).

Our analysis on a larger dataset gave a very similar overall result as that of the previous meta-analysis,[1] with an M:F ratio of 1.46 versus an RR of 1.49. However, there was significant heterogeneity between studies, which was only partly explained by mean age of onset and study location. We found evidence that the M:F difference in the incidence of Parkinson's disease increases with age of onset. Several individual studies have reported similar findings with little difference between the incidence in men and women <60 years of age.[5 6 8] The reason for this remains unclear. It may be due to postmenopausal hormonal changes in women or differential exposure of men and women to environmental risk factors in later life.

We also showed that the M:F difference is significantly greater in Western populations than in Asian populations (specifically Chinese or Japanese) where no significant M:F difference was found. Although this subgroup analysis should be interpreted cautiously (as it was based on only three studies), it is supported by findings from an incidence study from California, which also showed no difference in the M:F ratio in an Asian subpopulation.[5] This finding argues against a

Table 1 Sex differences in the incidence of Parkinson's disease

Study location	Year	Population		Number of cases	Mean age of onset (years)	Age-standardised M:F ratio (95% CI)
		Age (years)	Size			
Western populations						
Southwest Finland[2]	1976	All	402 988	179	61.6	0.90 (0.50 to 1.50)*
Poznan, Poland[2]	1989	All	1 308 000	163	66.6†	1.34 (1.06 to 1.67)
Ferrara, Italy[2]	1991	All	187 381	394	62.6	1.01 (0.86 to 1.17)
Manhattan, USA[2]	1995	All	213 000	83	76.3	1.53 (1.07 to 2.12)
Navarra, Spain[2]	1999	All	523 563	86	69.5	2.11 (1.58 to 2.76)
Olmstead, USA[2]	1999	All	95 000	154	70.8†	2.12 (1.70 to 2.61)
Turku, Finland[2]	1999	All	196 864	NS	64.8	1.90 (1.40 to 2.60)*
Italy[3]	2000	65–84	4341	42	76.5†	2.14 (1.43 to 3.07)
Tartu, Estonia[4]	2003	All	156 417	264	68.8	0.97 (0.75 to 1.26)*
California, USA[5]	2003	All	4 776 038 person-years	588	70.5	1.82 (1.63 to 2.02)
Rotterdam, The Netherlands[6]	2004	⩾55	6839	67	77.5†	1.34 (0.91 to 1.91)
Central Spain[7]	2004	⩾65	5160	30	79.1†	2.39 (1.44 to 3.74)
Cambridge, UK[8]	2004	All	700 000	201	70.3	1.36 (1.11 to 1.65)
Aberdeen, UK[9]	2006	All	148 600	50	76.1	2.30 (1.55 to 3.28)
Pooled age-adjusted M:F ratio						1.57 (1.33 to 1.86)
Asian populations						
29 provinces, China[2]	1991	All	3 869 162	58	69.2†	0.87 (0.55 to 1.32)
Ilan County, Taiwan[2]	2001	All	75 579	15	67.0†	1.03 (0.45 to 2.04)
Wakayama, Japan[10]	2002	All	1 080 000	183	73.2†	0.97 (0.76 to 1.21)
Pooled age-adjusted M:F ratio						0.95 (0.78 to 1.16)
Total pooled age-adjusted M:F ratio						1.46 (1.24 to 1.72)

M:F, male:female.
*Age-adjusted RR from original publication.
†Mean age calculated crudely from age-stratified number of cases.

fundamental protective effect of oestrogen, which would be expected to be present in all populations. The fact that the M:F ratio in Asian populations remains different from that in other ethnic groups with regard to those who move to a Western country suggests that there may be genetic influences on the M:F risk of developing Parkinson's disease. However, further high-quality studies on incidence are required both from Asia and from the West to confirm that these ethnic differences are indeed real.

In summary, therefore, although there is good evidence that men are, in general, about 1.5 times more likely to develop Parkinson's disease than women, this difference is not the same across different studies, and is more pronounced in (and possibly restricted to) people with an older age of onset and in Western populations.

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References

1 **Wooten GF**, Currie LJ, Bovbjerg VE, *et al*. Are men at greater risk of Parkinson's disease than women? *J Neurol Neurosurg Psychiatry* 2004;**75**:637–9.
2 **Twelves D**, Perkins K, Counsell C. Systematic review of incidence studies of Parkinson's disease. *Mov Disord* 2003;**18**:19–31.
3 **Baldereschi M**, Di Carlo A, Rocca WA, *et al*. Parkinson's disease and parkinsonism in a longitudinal study. Two-fold higher incidence in men. *Neurology* 2000;**55**:1358–63.
4 **Taba P**, Asser T. Incidence of Parkinson's disease in Estonia. *Neuroepidemiology* 2003;**22**:41–5.
5 **van den Eeden SK**, Tanner CM, Bernstein AL, *et al*. Incidence of Parkinson's disease: variation by age, gender, and race/ethnicity. *Am J Epidemiol* 2003;**157**:1015–22.
6 **de Lau LML**, Giesbergen PCLM, de Rijk MC, *et al*. Incidence of parkinsonism and Parkinson's disease in a general population. The Rotterdam study. *Neurology* 2004;**63**:1240–4.
7 **Benito-León J**, Bermejo-Pareja F, Morales-González JM, *et al*. Incidence of Parkinson's disease and parkinsonism in three elderly populations of central Spain. *Neurology* 2004;**62**:734–41.
8 **Foltynie T**, Brayne CEG, Robbins TW, *et al*. The cognitive ability of an incident cohort of Parkinson's patients in the UK. The CamPaIGN study. *Brain* 2004;**127**:550–60.
9 **Taylor KSM**, Counsell CE, Harris CE, *et al*. Pilot study of the incidence and prognosis of degenerative parkinsonian disorders in Aberdeen, United Kingdom: methods and preliminary results. *Mov Disord* 2006;**21**:976–82.
10 **Morioka S**, Sakata K, Yoshida S, *et al*. Incidence of Parkinson's disease in Wakayama, Japan. *J Epidemiol* 2002;**12**:403–7.

An unusual presentation of optic neuritis and the Pulfrich phenomenon

The Pulfrich effect (named after Carl Pulfrich) is a well described visual stereoillusion observed when a swinging pendulum bob is viewed through a neutral density filter in front of one eye.[1] Although the bob is moving in a frontal plane, the path seems elliptical. The effect arises from the fact that dimming a stimulus with a neutral density filter slows signal conduction velocity between the eye and the cortex. The visual cortex interprets this as a false depth or disparity cue as the object appears in a different location in the two eyes.[2]

Suppose an object happened to be moving from left to right, at a constant distance from the observer. Then, no matter what the (fixed) distance to which the eyes happened to be converged, any given instant, the dual images of the object, reversed by the optics of the eyes, would be moving right to left with some particular retinal disparity proper to the real distance between the object and observer.

Now, if a filter happened to be before the left eye (the Pulfrich effect), the response in the right eye effectively would be advanced somewhat. The advance would change the percept so that, for judgement of depth, the image in the right eye were advanced farther to the left than otherwise it would have been. This change in disparity would be the same as the change caused by removing the object to a distance farther away from the observer. Thus, by the geometry, placing a filter before the left

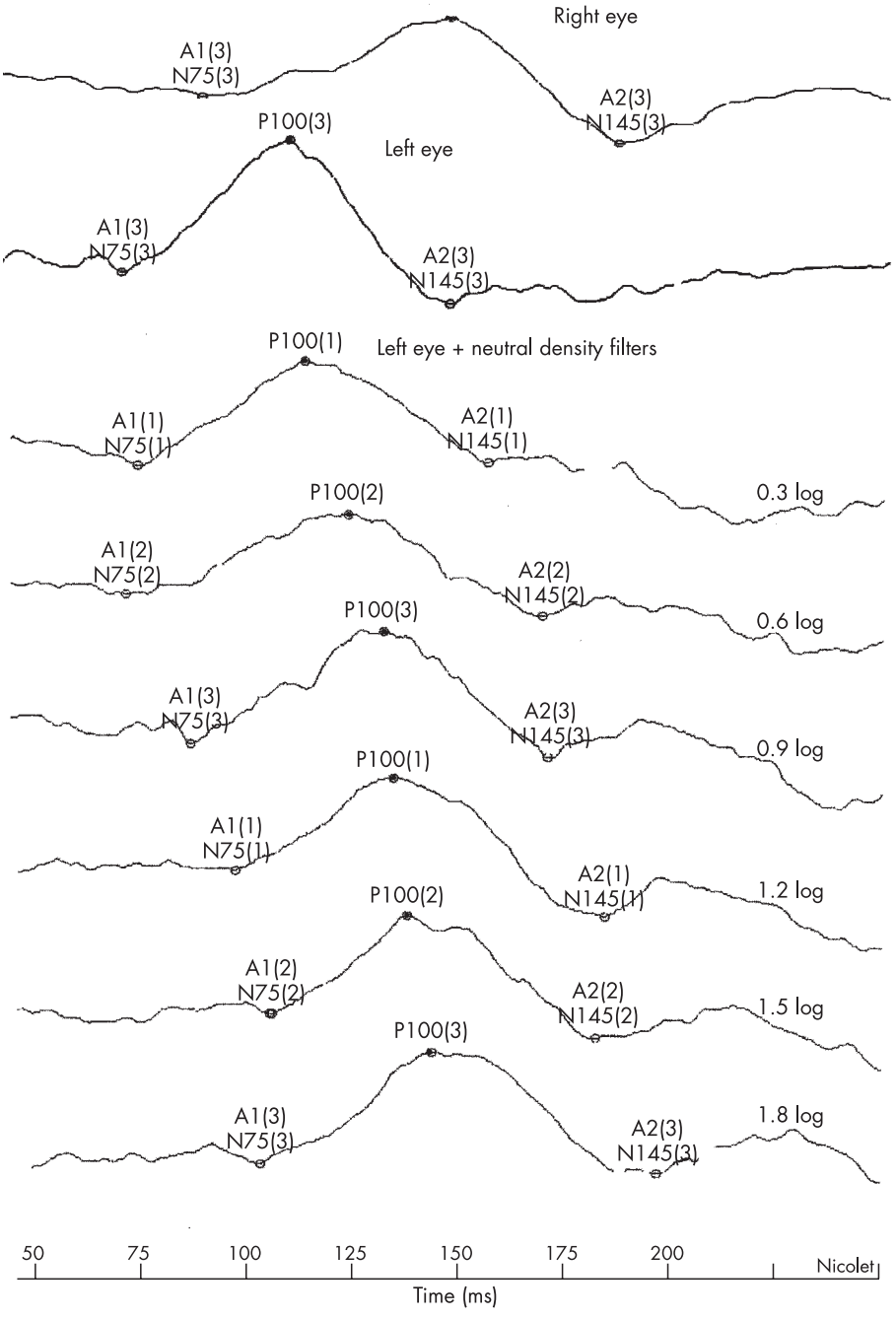

Figure 1 The visual evoked response of the right and left eye at diagnosis and the increase in the P100 value when a neutral density filter of increasing strength is placed in front of the normal eye.

eye would be expected to increase the binocularly perceived distance of an object moving left to right, and this is just what is observed. The magnitude of the change in disparity caused by a filter is approximately proportional to the speed of the moving object.

The Pulfrich effect can be demonstrated spontaneously (ie, without a neutral density filter) in patients with multiple sclerosis because of the delayed optic nerve conduction seen after unilateral optic neuritis in multiple sclerosis.[3] The detrimental impact of the Pulfrich effect on sporting performance with the use of a neutral density filter has previously been described.[4] The Pulfrich phenomenon is normally seen in patients with clinical signs of optic neuropathy, such as an afferent papillary defect or colour vision abnormalities. Here, we report the case of a patient who presented with the solitary complaint of reduced sporting performance without any other associated symptoms or clinical signs.

A 33-year-old man presented to the accident and emergency department with problems playing squash. Over a 1 month period, he had noticed difficulty hitting the squash ball. If the ball was hit to his right side he returned it with ease. However, if it was placed to his left side he missed it consistently. He had no other visual symptoms and had no significant past medical history.

On examination, his visual acuity was 6/4 in both eyes. He had no relative afferent pupil defect, no manifest or latent deviation. His ocular range of movement was normal with no evidence of internuclear ophthalmoplegia. He showed normal coordination and cerebellar function. Colour vision (100 Hue Test, total error score right eye = 20, left eye = 36) and visual fields were also normal. At this point a Pulfrich-like phenomenon was suspected. A pattern electroretinogram (ERG) and pattern visual evoked potential (VEP) were therefore performed.

The pattern ERG was normal but the pattern VEP showed an abnormal P100 between 126–132.5 ms in the right eye with a normal P100 in the left eye (fig 1) indicative of conduction delay within the right optic nerve. An MRI brain scan was then performed. FLAIR image sequence revealed two discrete lesions in the deep white matter on the right hemisphere and one lesion on the right anterior visual pathway. The findings were consistent with demyelination. Referral to the neurologist was arranged to decide on the need for further treatment.

In order to improve this patient's symptoms it was decided that reversal of the Pulfrich effect could be beneficial. VEP measurements were repeated using neutral density filters of incremental values placed in front of the normal eye. The VEP was brought to approximate the abnormal eye (fig 1). With increasing neutral density filters, the VEP amplitude was almost unaltered but the latency progressively increased. This filter was then prescribed in a pair of squash goggles. Further review showed an improvement in his sporting performance.

There was a 41 ms delay between the VEP of this man's eyes. The delay would result in the ball being apparently in a different spatial location for each eye. At 20 m/s this would correspond to a spatial difference of 82 cm. For fast moving ball games it is therefore easy to appreciate why unilateral delays in optic nerve conduction can create significant hand–eye coordination problems which would not be apparent for stationary targets. The increased difficulty in hitting the ball on the left side with a right sided pathology may relate to the fact that on this side the ball would be misjudged such that it would be appear to be further away than it was and so would be played late. On the right side, conversely, it would appear closer and hence would be played earlier but with a greater chance of connecting with the ball.

In this patient the only symptoms related to reduced sporting ability. Other tests performed in the clinic were all normal. Specialised electrophysiological testing and MRI imaging were required to determine an organic basis for his unusual presenting complaint. This case highlights how a simple theoretical concept can be applied to a clinical situation and the need to consider Pulfrich-like symptoms as a possible indicator of demyelinating disease even in the presence of otherwise normal clinical examination.

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References

1 **Pulfrich C**. Die stereoskopie im Dienste der isochromen und heterochromen photometrie. *Die Naturwissenschaften* 1922;10: Heft 25, 553–64.
2 **Rushton D**. Use of the Pulfrich pendulum for detecting abnormal delay in the visual pathway in multiple sclerosis. *Brain* 1975;**98**:283–96.
3 **Anzai A**, Ohzawa I, Freeman RD. Joint-encoding of motion and depth by visual cortical neurons: neural basis of the Pulfrich effect. *Nat Neurosci* 2001;**4**:513–18.
4 **Hofeldt AJ**, Hoefle FB, Bonafede B. Baseball hitting, binocular vision, and the Pulfrich phenomenon. *Arch Ophthalmol* 1996;**114**:1490–4.

Braille alexia: an apperceptive tactile agnosia?

Alexia for Braille reading is rarely reported.[1–6] A further case is presented in which the clinical features may give some insight into the neurobiological mechanisms.

Neurological consultation was requested 17 days after apparently uncomplicated coronary artery bypass grafting in a 73-year old right-handed woman who complained that she could no longer read properly. Blind from birth because of anophthalmia, she learned to read Braille at age 7 years using her left index finger, or middle finger if the index finger became ''tired'' (the right hemisphere may have better discrimination for complex spatial patterns[4 7]). She was a proficient Braille reader, normally reading 8–10 book chapters per day; however, on initial recovery from the operation, she could not read at all. Matters improved over the following days but her reading was still much slower than preoperatively (1–2 book chapters/day) and she reported making errors when reading, necessitating re-reading, although she had no difficulty understanding what she read. Past medical history was unremarkable, aside from a right carotid endarterectomy performed several months previously.

On examination, her spoken language was fluent with no evidence of motor or sensory aphasia. There was no left-sided sensory neglect or extinction, and no finger agnosia. Testing stereognosis in the left hand, she was able to identify a pen, ring, paper clip and watch, but was slow to identify a key, could not decide on the denomination of a coin (50p, heptagonal or 10p, circular) and thought a £1 coin was a badge, although she identified this immediately with the right hand. Two point discrimination was 3 mm on the pulp of the right index finger (minimum spacing possible between tines) but 5 mm on the pulp of the left index finger. As she had never learned letters or Arabic numerals, it was not possible to test for graphanaesthesia.

MRI of the brain showed a few punctate high signal hyperintense lesions on T_2 weighted and FLAIR sequences in the subcortical white matter, thought to be ischaemic in origin, including one subjacent to the right motor cortex in the region of the internal watershed between the anterior and middle cerebral artery territories (fig 1). In addition, there was marked acquired global brain atrophy, including the occipital lobes.

Three months later, she had still not returned to her previous level of reading fluency. A working diagnosis of Braille alexia due to an apperceptive tactile agnosia was made, of uncertain aetiology: acute onset and partial recovery strongly suggested a vascular event, supported by the structural brain imaging appearances, although neurodegenerative disorders first manifesting with acute postoperative language problems have been reported.[8]

Previous reports of Braille alexia are rare, and clinically heterogeneous with respect to early or late onset of blindness, premorbid fluency of Braille reading and presence or absence of additional neurological signs such as aphasia and hemiparesis, these differences reflecting lesion location and aetiology (vascular, neoplastic, neurodegenerative).[1–6] Sensory limb symptoms, but without clinical or neurophysiological correlate, have been reported.[5] In those cases undergoing neuroimaging, structural correlates have included bilateral occipital infarctions[5] and selective calcarine atrophy in a patient with visual hallucinations,[6] findings which correlate with functional imaging

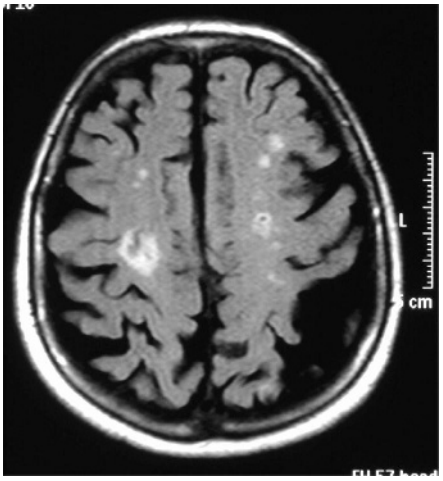

Figure 1 Axial MRI of the brain (FLAIR) showing hyperintense white matter signal change subjacent to the right motor cortex, and marked parieto-occipital brain atrophy.

studies showing that visual cortical areas process tactile information in Braille readers.[9] Dissociation between verbal and musical alexia in Braille has been reported following left middle cerebral artery infarction in a professional organist blind from childhood.[3]

Braille alexia, the tactile homologue of pure alexia (alexia without agraphia), a category specific visual agnosia, may result from disruption of different, possibly overlapping, psychoperceptual mechanisms, some analogous to those postulated in pure alexia.[10] It may reflect problems integrating tactile information over the temporal or spatial domains, associative forms of agnosia (or tactile simultanagnosia). A frontal–parietal network may contribute to the integration of perception with action over time,[11] and right hemisphere lesions may be associated with impaired integration of spatial information from multiple stimuli.[12] Alternatively, Braille alexia may reflect perceptual impairment, an apperceptive form of agnosia. As Braille characters are close to the limits of normal perceptual resolution, impaired light touch perception following damage to the primary sensorimotor cortex or its connections may result in degraded tactile identification and slowed Braille reading speed.

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References

1 **Gloning I**, Gloning K, Weingarten K, *et al*. Uber einen Fall mit Alexie der Brailleschrift. *Wien Z Nervenheilkd Grenzgeb* 1954;**10**:260–73.
2 **Birchmeier AK**. Aphasic dyslexia of Braille in a congenitally blind man. *Neuropsychologia* 1985;**23**:177–93.
3 **Signoret J-L**, van Eeckhout P, Poncet M, *et al*. Aphasie sans amusie chez un organiste aveugle. *Rev Neurol Paris* 1987;**143**:172–81.
4 **Perrier D**, Belin C, Larmande P. Trouble de la lecture du Braille par lésion droite chez une patiente devenue aveugle. *Neuropsychologia* 1988;**26**:179–85.
5 **Hamilton R**, Keenan JP, Catala M, *et al*. Alexia for Braille following bilateral occipital stroke in an early blind woman. *Neuroreport* 2000;**11**:237–40.
6 **Maeda K**, Yasuda H, Haneda M, *et al*. Braille alexia during visual hallucination in a blind man with selective calcarine atrophy. *Psychiatry Clin Neurosci* 2003;**57**:227–9.
7 **Rudel RG**, Denckla MB, Spalten E. The functional asymmetry of Braille letter learning in normal, sighted children. *Neurology* 1974;**24**:733–8.
8 **Larner AJ**. ''Dementia unmasked'': atypical, acute aphasic, presentations of neurodegenerative dementing disease. *Clin Neurol Neurosurg* 2005;**108**:8–10.
9 **Sadato N**. How the blind see Braille: lessons from functional magnetic resonance imaging. *Neuroscientist* 2005;**11**:577–82.
10 **Farah MJ**. Visual agnosia. *Disorders of object recognition and what they tell us about normal vision*. Cambridge: MIT Press, 1995.
11 **Quintana J**, Fuster JM. From perception to action: temporal integrative functions of prefrontal and parietal neurons. *Cereb Cortex* 1999;**9**:213–21.
12 **Carmon A**, Benton AL. Tactile perception of direction and number in patients with unilateral cerebral disease. *Neurology* 1969;**19**:525–32.

Acute myelopathy selectively involving lumbar anterior horns following intranasal insufflation of ecstasy and heroin

We report a patient who developed acute myelopathy after intranasal insufflation of amphetamines and heroin. The functional prognosis was very poor; after 4 months, she remained paraplegic. MRI imaging showed selective T2 hyperintensity and intense enhancement confined to the spinal anterior horns and lumbar nerve roots and plexus. This unique MRI pattern, together with neurophysiological data, suggests that the pathological process at the first primary affected spinal anterior horns (SAH), conditioning motoneuron cell death, and then nerve roots and lumbar plexus as a consequence of wallerian degeneration

Case report

A 17-year-old girl was admitted to the emergency department in a drowsy state and unable to walk after an overdose of intranasal insufflated heroin and amphetamines. After a few hours, drowsiness progressed to stupor, and progressive weakness in all four limbs, mainly involving the lower limbs, developed. At that time, laboratory data showed massive rhabdomyolysis (creatine phosphokinase 36 880 mg/dl) with acute renal failure (ARF), and hepatic failure; medical therapy was promptly started. The patient's past medical history was unremarkable except for habitual use of amphetamines (ecstasy) and cannabinoids since the age of 12 years. The previous week she had insufflated heroin about once a day; the previous night she reported a double dose of heroin consumption, and a high dose (approximately 1 g) of intranasal insufflation of amphetamines. The next day the patient was alert and cooperative but complained about diffuse muscle pain and tenderness, prevailing in the lower limbs, where weakness rapidly worsened to flaccid, areflexic paralysis.

Urinary chromatography detected amphetamines (3-4-methylendoxymethamphetamine (MDMA) 7680 ng/ml, 3-4-methylenedioxyamphetamine 2000 ng/ml) and opiates (>2000 ng/ml, morphine 228 ng/ml). CSF protein content was slightly increased with no intrathecal Ig synthesis; glucose, chlorine and cells were within the normal range. All virological analyses, including HIV, were negative. Rhabdomyolysis related ARF completely normalised by day 10, with resumption of spontaneous diuresis; from that time on, no more myalgias were reported. Muscle weakness promptly improved in the upper limbs to normal strength while flaccid paralysis persisted in the lower limbs. The patient had no sensory symptoms or signs, and no sphincteric abnormalities were observed.

Motor evoked potentials recorded from foot muscles were absent from day 9 onwards; both sural nerve sensory action potentials (SAPs) and tibial somatosensory evoked potentials (SSEPs) were normal. On day 16, electromyography revealed complete unexcitability of the leg motor nerves, together with fibrillation potentials without any voluntary electromyographic activity in all lower limbs and paraspinal muscles innervated by L3–S1 roots. Quantitative sensory test, skin sympathetic reflex and urodynamic test were all within the normal range.

MRI performed at the beginning of symptoms was negative. One month later, MRI showed selective T2 hyperintensity of the anterior horns and signal alteration of lumbar nerve roots, associated with volume increase and intense gadolinium enhancement (fig 1).

Intravenous high dose steroid therapy was started with no clinical benefit. MRI signal alteration and enhancement of the nerve roots almost completely disappeared while signal alteration of the anterior horns remained, although it was reduced in intensity. Four months later, the patient was still paraplegic.

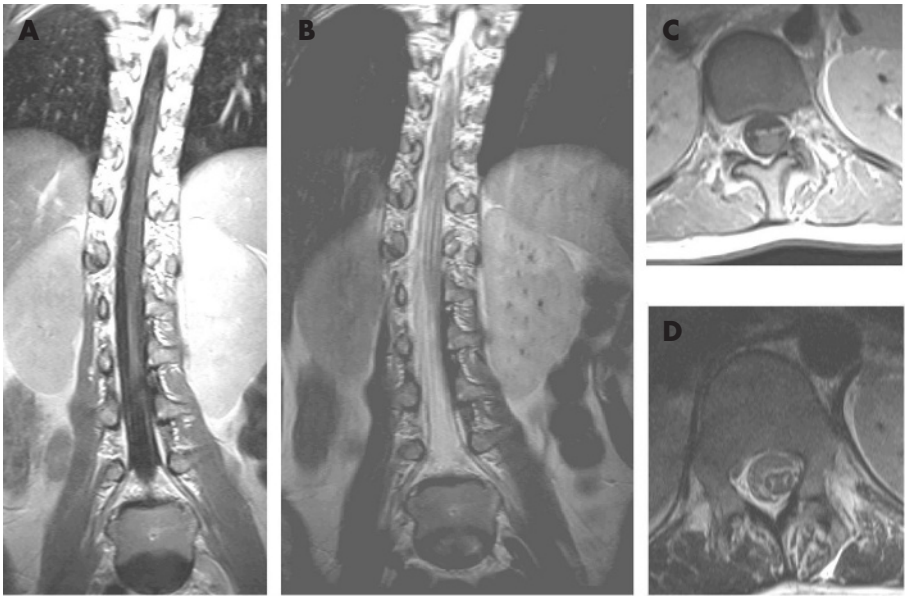

Figure 1 MRI imaging. (A) Post-gadolinium (standard dose) T1 weighted MRI image, coronal view: linear enhancement along the nerve roots is evident. (B) T2 weighted MRI image, coronal plane: widespread T2 hyperintensity along nerve roots is more evident on the right side. (C) Post-gadolinium (standard dose) T1 weighted MRI image, axial view: selective anterior horn intense enhancement is seen. (D) T2 weighted MRI image, axial plane: selective anterior horn T2 hyperintensity is noted.

Discussion

Rhabdomyolysis, ARF, acute hepatotoxicity and transverse myelitis (TM) are well known complications of intravenous heroin assumption.[1 2] A single case of acute myelopathy as a consequence of heroin inhalation has been reported following, in common with other cases, a period of abstinence preceding the event; moreover, recovery was almost complete 1 month later.[1] No cases of acute MDMA myelopathy are known; rhabdomyolysis is known to complicate MDMA consumption.[3]

This case particularly highlights selective involvement of the lumbar motoneurons, as supported by neurophysiological and neuroradiological evidence. Unexcitability of motor fibres and complete denervation in the lower limbs and paraspinal muscles, with spared SAPs and SSEPs, suggest damage of SAH and/or ventral root axons. MRI confirmed selective T2 hyperintensity confined to the SAH and nerve roots, with intense enhancement in both, spreading from D10 up to the conus (fig 1). This unique MRI pattern has never been reported previously to our knowledge, and differs from MRI patterns observed in TM and radiculitis. In TM, MRI can sometimes show an inflammatory lesion localised within the cord, usually not involving more than 3–4 vertebral segments (more often at the dorsal level), hyperintense in T2 weighted images and with nerve root sparing. In the acute phase, enhancement is generally present, but not involving the nerve roots.[4] In radiculitis (eg, Guillain–Barré syndrome), MRI signal alterations are commonly localised to spinal anterior roots, without any involvement of the spine.[5] Moreover, the MRI pattern did not suggest a spinal infarction. The anterior spinal artery derives from a single anterior radiculo-medullary artery (Adamkiewicz artery) that arises from L3 upwards; spinal infarction is rare and occurs mostly in the cervical spine. MRI abnormalities on sagittal T2 weighted images in our patient are not consistent with typical ''pencil-like'' hyperintensities and cord enlargement.

Therefore, taken together, the clinical, neuroradiological and neurophysiological data suggest that the pathological process primary affected SAH conditioning motoneuron cell death, and then nerve roots and lumbar plexus as a consequence of wallerian degeneration.

Suggested pathogenetic mechanisms of heroin associated acute myelopathy include hypotension watershed zones ischaemia, vasculitis and hypersensitivity reaction. Among the most credited hypothesis is the possibility of a direct toxic effect of heroin.[1 2] In our case, we speculate that a pathogenetic role played by MDMA cannot be excluded and may contribute towards an explanation of some of the atypical features such as the lack of a clear period of abstinence from heroin, as described in most cases of opiate toxic myelopathy, and the unusually high dose of MDMA inhaled. Moreover, it has been proved that the lumbar motoneurons express high levels of serotonin receptors (mediating MDMA effects) whereas opiates receptors are three times more represented in the dorsal horns compared with the ventral horns of the spinal cord.[6]

This case increases our knowledge of the possible severe acute toxic effects of intranasal insufflation of heroin and ecstasy, often considered by the public as ''safe'' drugs. The selective involvement of the anterior horns of the spinal cord indicates a poor functional prognosis and suggests a specific, but still unknown, pathogenetic effect on the spinal motoneurons, possibly toxic or immunopathological in nature.

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References

1 **McCreary M**, Emermann C, Hanna J, *et al*. Acute myelopathy following intranasal insufflation of heroin: a case report. *Neurology* 2000;**55**:316–17.
2 **Buttner A**, Mall G, Penning R, *et al*. The neuropathology of heroin abuse. *Forensic Sci Int* 2000;**113**:435–42.
3 **Liechti ME**, Kunz I, Kupferschmidt H. Acute medical problems due to Ecstasy use. Case-series of emergency department visits. *Swiss Med Wkly* 2005;**135**:652–7.
4 **Choi KH**, Lee KS, Chung SO, *et al*. Idiopathic transverse myelitis: MR characteristics. *AJNR Am J Neuroradiol* 1996;**17**:1151–60.
5 **Byun WM**, Park WK, Park BH, *et al*. Guillain–Barre syndrome: MR imaging findings of the spine in eight patients. *Radiology* 1998;**208**:137–41.
6 **Morales M**, Battemberg E, Bloom F. Distribution of neurons expressing immunoreactivity for the 5HT3 receptor subtype in the rat brain and spinal cord. *J Comp Neurol* 1998;**385**:385–401.

Unusual case of tick borne encephalitis with isolated myeloradiculitis

Tick borne encephalitis (TBE) virus causes the most important arthropod transmitted disease in central Europe. In endemic areas, TBE has an incidence of 1.2 per 10 000 and a mortality of approximately 1%. The TBE virus is a neurotropic human pathogen. The most common presentations are meningitis (49%), meningoencephalitis (41%) and meningoencephalomyelitis (10%).[1] Patients with concomitant spinal cord involvement are thought to be affected more severely and mechanical ventilation is often necessary.[2]

We present an unusual TBE case with an isolated myelitis without signs of meningitis or meningoencephalitis.

Case report

A 43-year-old man from the Black Forest area, Germany, who had not had TBE vaccination developed symptoms of gastroenteritis with fever (diarrhoea, nausea and vomiting) lasting for approximately 1 week. Two days after recovery from the gastrointestinal symptoms he experienced severe pain in his shoulders followed by proximal pareses of his brachial muscles without signs of meningism. As the symptoms were not ameliorating during the following days, the patient was admitted to hospital. At that time he had severe pareses of the upper extremities and mild pareses of the lower extremities. All tendon reflexes appeared very brisk but pyramidal signs were absent. Sensory testing was normal. The patient recalled a tick bite several weeks ago, after having collected mushrooms in the forest.

The following laboratory findings were abnormal: increased C reactive protein 8 mg/l, leucocytosis 12 200/µl, cerebrospinal fluid with mild pleocytosis (49 cells/µl: 80% lymphocytes, 20% monocytes), a clearly increased total protein content (2070 mg/l), local IgM synthesis of 83.5% and an increased IgG index of 0.81. Serological testing of the CSF and serum showed positive IgM and IgG antibody reactivity against TBE virus. A virus specific IgG CSF/serum index of 3.69 (normal value <2) confirmed high intrathecal specific antibody production. Coinfection with *Borrelia burgdorferi* was excluded. Moreover, there was no evidence of further possible aetiologies, such as infection by *Treponema pallidum*, herpes simplex virus 1 and 2, varicella zoster virus, enterovirus, HIV, Epstein–Barr virus or cytomegalovirus, or evidence of a vasculitis or collagenosis.

On electromyography and electroneurography, axonal lesions were seen in the left deltoid (C5/6), the left triceps (C7/8) and the left abductor digiti minimi manus (C8/Th1). There was normal neurography of the right and left radial nerve, the left ulnar and the left median nerve, and thus a brachial plexus lesion was excluded. In summary, there was evidence of a polyradiculitic or anterior horn lesion from C5 to Th1 (maximum at C5 and C7).

Motor evoked potentials showed delayed central motor conduction to both legs and the right arm. Tibial somatosensible evoked potentials were pathological on the left side, also with a central delay. The clinical and electrophysiological pattern was compatible with an incomplete myelitis involving the anterior horn cells.

Spinal MRI performed 25 days after symptom onset was normal. To exclude mild encephalitis, cranial MRI and electroencephalography were performed. Both examinations showed normal findings.

The patient recovered slowly and incompletely over the following weeks. The pareses were slightly improved, in particular the pareses in the distal upper extremities. The weakness of the proximal arm muscles remained almost unchanged.

Discussion

The most frequent symptoms of TBE are meningitis, meningoencephalitis or meningoencephalomyelitis. Polio-like syndromes with polyradiculitic manifestations can complicate the disease.[3–5] These reported cases of myeloradiculitis in TBE virus infections, however, showed additional signs of meningoencephalitis or cranial nerve involvement.[5] To the best of our knowledge, only one case with an isolated anterior horn lesion of the C3 to the Th1 level has been reported.[6] Even in this case, cranial MRI showed two cerebral lesions.

The prognosis of these cases with polio-like symptoms seems generally to be poor, with only slow and minor recovery, and persistent severe amyotrophy and pareses.[4 6]

We have presented the second case of a patient with an isolated myelitis caused by a TBE virus infection. In contrast with the patient described by Beer *et al*,[6] our patient

not only showed impairment of the anterior horn neurons but also involvement of the descending spinal pathways suggestive of incomplete transverse myelitis. This presumption was supported by the clinical finding of brisk tendon reflexes and a central conduction delay demonstrated by motor evoked potentials. Respiratory muscles were not affected. An additional polyradiculitis cannot be differentiated from an anterior horn lesion by clinical symptoms or electrophysiologically. One argument in favour of a polyradiculitis was the clearly increased total protein in our patient. MRI did not disclose any spinal cord lesion. A low incidence of cerebral or spinal MRI lesions in TBE infection has also been reported elsewhere.[1] Thus MRI is of limited value in the diagnosis of TBE.[1] This may be explained by the rapid resolution of early T2 hyperintensities. Resolution of MRI lesions despite the limited clinical improvement after 6 weeks has been described by Beer *et al*.[6] This seems to be in contrast with lesions in brain parenchyma in which a good correlation between clinical improvement and restitution of T2 abnormalities has been found.[2]

This unusual case shows that even in patients presenting with incomplete transverse myelitis without signs of meningitis or meningoencephalitis, a TBE virus infection should be considered as a differential diagnosis.

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References

1 **Kaiser R**. The clinical and epidemiological profile of tick-borne encephalitis in southern Germany 1994–98: a prospective study of 656 patients. *Brain* 1999;**122**:2067–78.
2 **Bender A**, Schulte-Altedorneburg G, Walther EU, *et al*. Severe tick borne encephalitis with simultaneous brain stem, bithalamic, and spinal cord involvement documented by MRI. *J Neurol Neurosurg Psychiatry* 2005;**76**:135–7.
3 **Aendekerk RP**, Schrivers AN, Koehler PJ. Tick-borne encephalitis complicated by a polio-like syndrome following a holiday in central Europe. *Clin Neurol Neurosurg* 1996;**98**:262–4.
4 **Kuntzer T**, de Marval F, Ochsner F, *et al*. Flavivirus meningo-encephalomyelo-radiculitis: respiratory failure and bibrachial amyotrophy. *Schweiz Med Wochenschr* 1995;**125**:634–8.
5 **Schellinger PD**, Schmutzhard E, Fiebach JE, *et al*. Poliomyelitic-like illness in central European encephalitis. *Neurology* 2000;**55**:299–302.
6 **Beer S**, Brune N, Kesselring J. Detection of anterior horn lesions by MRI in central European tick-borne encephalomyelitis. *J Neurol* 1999;**246**:1169–71.

Mild clinical expression of Lambert–Eaton myasthenic syndrome in a patient with HIV infection

Neuromuscular complications of HIV are related to immunodeficiency, direct cytotoxicity of the virus or side effect of the treatments. Autoimmune disorders involving the nervous system, including Guillain–Barre syndrome, myositis and vasculitis, have been described in association with HIV. Neuromuscular junction autoimmune diseases such as myasthenia gravis have been occasionally reported in patients with HIV, whereas the Lambert–Eaton myasthenic syndrome (LEMS) has never been described. We report an unusual case of paucisymptomatic LEMS in a patient with HIV infection.

Case report

A 42-year-old non-smoker, HIV positive, black African male was referred to us with a 2 year history of progressive but fluctuant weakness of the lower limbs. Comorbidities included chronic inactive hepatitis B with undetectable viraemia and a history of L4–5 laminectomy for a spinal canal stenosis. Treatment with highly active antiretroviral therapy (HAART) was initiated 6 months before hospitalisation, although neither biological nor clinical signs of immunosuppression were detected.

At the time of admission, he did not complain of diplopia, speech or swallowing, but had a dry mouth as the only autonomic symptom. Examination of the cranial nerves revealed a bilateral ptosis that was not modified by Simpson's test (ie, ptosis worsened by effort). Examination of the upper limbs was normal except for symmetrical weak tendon jerks. Examination of the lower limbs revealed a paresis, which predominated on the iliopsoas muscles (grade 4 on the Medical Research Council scale). The muscle palpation and the sensory multimodal examination were normal. The findings from the remainder of his neurological and general examination were normal.

A repetitive low rate stimulation (3 Hz) test revealed a significant decrement of up to 40% in the upper limb muscle (fig 1A). High rate (50 Hz) stimulations, in contrast, induced an incremental response, from mild (+80%, fig 1B) to marked (+750%, fig 1C). Single fibre electromyography performed in the left extensor digitorum communis confirmed a severe defect of neuromuscular transmission with a marked increase in jitter and numerous blockings (fig 1D). These results were highly suggestive of LEMS.[1]

Serum autoantibodies directed against voltage gated calcium channels (VGCC) were positive (72 PM, normal range $\leqslant$45 PM), and their presence were confirmed 1 year after hospitalisation (107 PM). Other autoantibodies which tested as negative were antiacetylcholine receptor, antimuscle specific tyrosine kinase, antismooth muscle, antistriated muscle, antithyroglobulin, antithyroperoxidase and antinuclear antibodies.

Paraclinical investigation, including total body CT and positron emission tomography scan, prostate specific antigen, carcinoembryonic antigen, total testosterone, alpha-fetoprotein, beta2-microglobulin and immunoelectrophoresis of serum protein were normal. HTLV-1 serology was negative. Total $CD4^+$ cell count was $>400/mm^3$, and viraemia was <50 copies/ml. Brain and spinal cord MRI and quadriceps surgical biopsy were also normal.

The patient received intravenous immunoglobulin G infusions (0.4 g/kg) over 5 days, associated with pyridostigmine (up to 600 mg/day), with no effect on symptoms. Introduction of 3,4-diaminopyridine was refused by the patient. At the 1 year follow-up, the patient

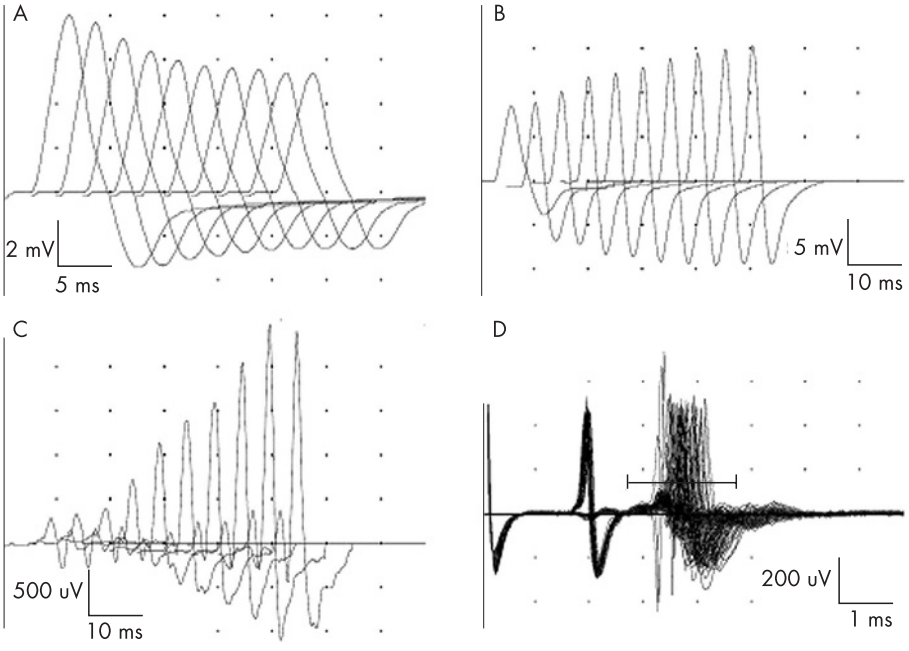

Figure 1 (A) Low rate (3 Hz) repetitive stimulation test; recordings at the left hand over the abductor digiti minimi. A 40% decrement is recorded. Note the continuous decrease in M response from the first to the 10th stimulus, which is not the usual myasthenic pattern but is suggestive of Lambert–Eaton myasthenic syndrome, and the amplitude of the initial M response within the normal range (8.6 mV). (B) High rate (50 Hz) repetitive stimulation test; recordings at the left hand over the abductor digiti minimi. A mild 80% increment is recorded. (C) High rate (50 Hz) repetitive stimulation test; recordings at the left foot abductor hallucis brevis. A marked 750% increment is recorded. Note that amplitude of the initial M response is markedly reduced (0.3 mV). (D) Stimulated (10 Hz) single fibre eletromyography performed in the left extensor digitorum communis. The jitter of the marked muscle fibre potential is strongly increased at 213 μV, and there is a 51% rate of blocking.

was clinically stable with persistence of fluctuant weakness that was sometimes exacerbated and sometimes ameliorated by exercise. The biological, oncological and immunological screenings remained unchanged.

Discussion

LEMS is a rare disorder that can be paraneoplastic (60%) or non-paraneoplastic (40%). In both forms autoantibodies to VGCC are implicated.[1] In our patient, LEMS was established by clinical features (weakness sometimes ameliorated by exercise, autonomic symptoms, weak tendon jerks) and suggestive electromyography findings associated with positive anti-VGCC antibodies, known to be disease specific.[2]

Apart from HIV infection and HIV related treatments, we did not find any other trigger for the appearance of LEMS. The oncological screening was normal and no other concomitant autoimmune markers were detected. Interestingly, the spectrum of reported autoimmunity in HIV patients is increasing.[3] In addition, HIV infection may lead to molecular mimicry, known to be a common mechanism of autoimmunity. Furthermore, HIV infection has been associated with B cell stimulation and many autoantibodies are reported in HIV patients.[3] Sustained immune restoration secondary to the initiation of HAART has been associated with the appearance of autoimmune diseases, but neither significant immunosuppression nor high viraemia, or opportunistic infection, has been detected. In addition, no other neurological complication of HIV secondary to immunodeficiency or direct cytotoxicity of the virus was observed.[4] Neuromuscular junction autoimmune disorders such as myasthenia gravis have been reported previously in HIV patients,[5] whereas LEMS has never been described in association with HIV.

In this case report, the appearance of LEMS may have been triggered by modulation of the immune system secondary to HIV infection, although a fortuitous association cannot be excluded. Nevertheless, the mild clinical expression persisting after 1 year of follow-up, despite the absence of treatment, remains unusual and may suggest a direct influence of the virus on autoimmunity. Interestingly, other examples of a milder phenotype of the disorders already exist in HIV infected patients, such as progressive multifocal leukoencephalopathy. In addition, improvement in myasthenia gravis symptoms in HIV infection turning into AIDS has been described.

In conclusion, this report underscores (i) the possible link between autoimmune disorders and HIV and (ii) that investigation of a HIV patient with unexplained fluctuant weakness should include exploration of LEMS.

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References

1 **Newsom-Davis J**. Lambert–Eaton myasthenic syndrome. *Rev Neurol (Paris)* 2004;**160**:177–80.
2 **Motomura M**, Johnston I, Lang B, *et al*. An improved diagnostic assay for Lambert–Eaton myasthenic syndrome. *J Neurol Neurosurg Psychiatry* 1995;**58**:85–7.
3 **Zandman-Goddard G**, Shoenfeld Y. HIV and autoimmunity. *Autoimmun Rev* 2002;**1**:329–37.
4 **Manji H**, Miller R. The neurology of HIV infection. *J Neurol Neurosurg Psychiatry* 2004;**75**(Suppl 1):i29–35.
5 **Authier FJ**, De Grissac N, Degos JD, *et al*. Transient myasthenia gravis during HIV infection. *Muscle Nerve* 1995;**18**:749–51.

Resolution of transverse sinus stenoses immediately after CSF withdrawal in idiopathic intracranial hypertension

The cause of idiopathic intracranial hypertension (IIH) remains unknown but catheter venography has shown that many patients have intracranial venous hypertension proximal to transverse sinus stenoses. These stenoses have subsequently been demonstrated on magnetic resonance and CT venography and it has been proposed that by reducing the passive resorption of CSF, intracranial venous hypertension due to these stenoses might be the cause of IIH. However, CSF withdrawal reduces venous sinus pressures, implying that venous hypertension is a secondary phenomenon.[1] Moreover, resolution of transverse sinus stenoses has been reported in three patients with IIH treated by CSF diversion procedures.[2 3] We report a patient with IIH in whom catheter and CT venography showed transverse sinus stenoses which resolved immediately after CSF withdrawal by lumbar puncture (LP).

Case report

A 35 year old woman presented with a 2 year history of headache and transient visual obscurations. She had papilloedema and constricted visual fields but no focal neurology. MRI of the brain was normal. At LP, the opening pressure was 35 cm H_2O with normal CSF constituents. IIH was diagnosed and treatment started with acetazolamide 250 mg three times daily.

One year later the patient was referred to our institution with persistent headaches and papilloedema for consideration of a CSF diversion procedure. Magnetic resonance venography at this time suggested stenoses in the anterior part of both transverse sinuses and she was further investigated to establish the degree and reversibility of these stenoses with reference to possible stenting.

Direct retrograde cerebral venography and CT venography were performed before and after drainage of 45 ml of CSF by LP. The opening pressure was 26 cm H_2O and closing pressure 2 cm H_2O. The baseline catheter venogram recorded a pressure of 30 mm Hg in the superior sagittal sinus and gradients of 19 mm Hg across stenoses at the anterior ends of both transverse sinuses (fig 1A). The right transverse sinus was dominant. Immediately after CSF withdrawal, sagittal sinus pressure fell to 7 mm Hg, the right transverse sinus stenosis resolved (fig 1B) and the pressure gradient resolved. The left transverse sinus was not re-examined. CT venography confirmed the morphological changes, showing expansion of both transverse sinuses (figs 1C, D). With these

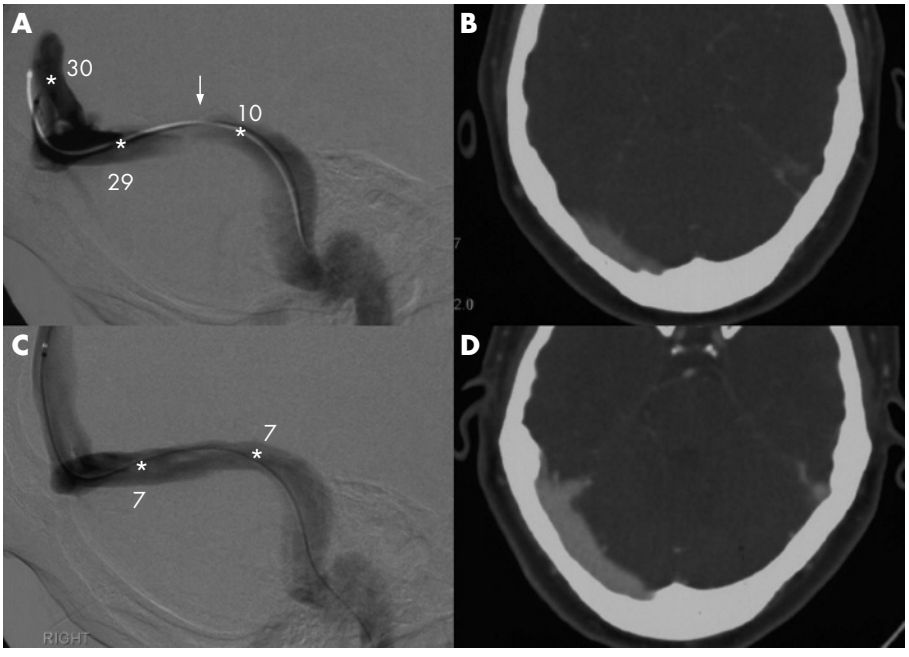

Figure 1 (A) Cerebral venogram, tilted lateral view, shows a stenosis in the anterior part of the right transverse sinus (arrow). Numbers denote pressure (mm Hg) at each asterisk. (B) CT venogram axial source image shows a generally narrow right transverse sinus with a stenosis anteriorly. (C) Cerebral venogram after lumbar puncture (LP) shows resolution of the right transverse sinus stenosis and no pressure gradient. (D) CT venogram 1 h after LP confirms the right transverse sinus stenosis has resolved, with a general increase in sinus calibre. The left transverse sinus is not in the plane of section but responded similarly.

results the patient was considered unsuitable for stenting.

Her symptoms improved for 2 weeks after CSF withdrawal but subsequently regressed. A ventriculoperitoneal shunt with an adjustable flow control valve was inserted 2 months later. She remained asymptomatic for 2 weeks after shunt insertion but then relapsed with headaches. The performance level of the valve was reduced from 2.0 to 1.5, and at the most recent follow-up, 1 year post-shunting, she was asymptomatic with normal visual acuity and no papilloedema.

Discussion

Although many patients with IIH have transverse sinus stenoses, there has been debate over whether these are the cause or effect of raised intracranial pressure (ICP), and if they are an effect, whether they are an epiphenomenon or an exacerbating factor. Patients with IIH may constitute a heterogeneous group with respect to this issue. Increases in ICP can compress the venous sinuses, and secondary compression of the venous sinuses has been demonstrated in a number of patients with IIH. King *et al* showed that the pressure gradients across transverse sinus stenoses in IIH resolved after CSF drainage.[1] Subsequently, investigators using magnetic resonance and CT venography have shown that transverse sinus stenoses in IIH can resolve after CSF diversion procedures. The case we describe implies that in some patients with IIH the calibre of the transverse sinuses responds immediately to changes in ICP.

Unlike CSF diversion, non-invasive reduction of CSF pressure does not seem to effect transverse sinus stenoses. A series of 14 patients with IIH and transverse sinus stenoses were treated with acetazolamide 250 mg twice daily. This normalised CSF pressure in nine patients but in all cases the transverse sinus stenoses persisted unchanged on MR venography.[4] The authors suggested that CSF hypovolaemia induced by CSF diversion procedures causes the stenoses to resolve rather than a direct relationship between sinus calibre and CSF pressure alone. Our patient had a closing pressure of 2 cm H_2O after 45 ml of CSF was withdrawn, which supports this view. This phenomenon might be expected from the Monro–Kellie doctrine whereby a decrease in the volume of CSF within the rigid space of the skull is compensated for by an increase in the volume of blood in the venous sinuses.

Stenting of the transverse sinuses has been proposed as an alternative to CSF diversion procedures in patients with IIH on the assumption that transverse sinus stenoses play some part in causing symptoms.[5] Intuitively, however, patients whose sinuses dilate in response to CSF withdrawal would seem to be inappropriate candidates for stenting. This, in turn, invites questions about what proportion of patients with IIH have sinuses that respond in this way and what would be the role of stenting in these cases. Stenting seems to have been successful in some patients but not in others.[5] It is not known whether the sinuses responded differently to changes in CSF pressure in patients who did well with stenting compared with those who did not because the CSF withdrawal test was not a part of their diagnostic workup. For the same reason it is also not known whether, in patients in whom stenting was successful, the stent addressed the primary cause of raised ICP or simply mitigated an exacerbating factor.

The rapidity with which the calibre of the venous sinuses in these patients can respond to changes in ICP means that imaging should be interpreted with caution. It is now recognised that most patients with IIH have narrowing of the venous sinuses even to the point where those patients with IIH who do not have venous narrowing require some explanation. Perhaps in some of these patients ICP was not raised at the time of the investigation—for example, because of recent LP and CSF drainage. The appearances of the venous sinuses in patients with IIH should be interpreted with reference to the CSF pressure at the time of the examination.

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References

1 **King JO**, Mitchell PJ, Thomson KR, *et al*. Manometry combined with cervical puncture in idiopathic intracranial hypertension. *Neurology* 2002;**58**:26–30.
2 **Baryshnik DB**, Farb RI. Changes in the appearance of venous sinuses after treatment of disordered intracranial pressure. *Neurology* 2004;**62**:1445–6.
3 **Higgins JNP**, Pickard JD. Lateral sinus stenoses in idiopathic intracranial hypertension resolving after CSF diversion. *Neurology* 2004;**62**:1907–8.
4 **Bono F**, Giliberto C, Mastrandrea C et al. Transverse sinus stenoses persist after normalization of CSF pressure in IIH. *Neurology* 2005;**65**:1090–93.
5 **Higgins JNP**, Cousins C, Owler BK, *et al*. Idiopathic intracranial hypertension: 12 cases treated by venous sinus stenting. *J Neurol Neurosurg Psychiatry* 2003;**74**:1662–6.

BOOK REVIEW

Neuromuscular disease. Evidence and analysis in clinical neurology

Michael Benatar. New Jersey: Humana Press Inc, 2006, US$145.00, pp 462. ISBN 92-4-159392

This is a relevant, well written and fascinating book that will be of interest to general neurologists as well as those specialising in nerve and muscle. Michael Benatar attempts to emulate the style of a ''Socratic dialogue'' with a question–answer type format to analyse the complex literature surrounding neuromuscular disease. He frequently cites original studies and small series as well as systematic reviews, and is sceptical of claims made without evidence. It is well laid out, easy to read and with tables adjacent to relevant text. Of course, in any text that reviews current literature, this will with time become dated, but it is a good starting point.

Part 1 is generic, applying to any clinical study, discussing basic epidemiology and statistical analysis, treatment trials and the analysis of prognosis, with clear discussion of logistic regression and survival curves. The rest is in logical anatomical groups.

The usefulness of electromyography (EMG) in the diagnosis of amyotrophic lateral sclerosis, for instance, reminds us that abnormal paraspinal EMG is present in 19% of patients with other neurological disorders, and that EMG of the sternocleidomastoid has a higher sensitivity than that of the tongue, in practice probably performed less often. The evidence for benefit from use of non-invasive positive pressure ventilation, percutaneous endoscopic gastrostomy or riluzole are perhaps less straightforward than many of us assume.

The discussion of chronic inflammatory demyelinating polyneuropathy (CIDP) highlights the eight papers with different electrodiagnostic criteria for this, often prepared for trials, but important to recognise. Fortunately, new criteria for defining CIDP are currently being designed from first principles. Perhaps the limits of available evidence become clear with the reported study that suggests that nerve biopsy may not improve diagnostic performance. In practice, supportive biopsy evidence may be invaluable for the uncertain physician actually starting the immunosuppression. The explosion of knowledge in the field of inherited neuropathies in recent years has left many neurologists confused, and this chapter provides a useful and detailed summary of the main findings in this ever changing world to date. There are extensive tables detailing symptoms, signs and EMG criteria in the main classes, although these mostly consist of heterogenous molecular groups, limiting their usefulness.

There is a useful chapter on carpal tunnel syndrome. Although neurologists may be surprised to hear that meta-analysis showed that reporting nocturnal paraesthesia was not useful diagnostically, they probably will not be surprised that Tinel's and Phalen's tests were hopeless.

Dr Benatar clarifies that in the world of neuromuscular disease, the randomised controlled trial is often lacking, and treatments are frequently used on the basis of extensive uncontrolled literature. This should prove a useful reference book for any clinical neurologist, highlights areas needing further investigation for aspiring researchers and hopefully is the first in a series analysing the evidence in a range of subspecialties.

Carolyn Gabriel

NOTICE

J L Miller, G A James, A P Goldstone, *et al*. Enhanced activation of reward mediating prefrontal regions in response to food stimuli in Prader–Willi syndrome. *J Neurol Neurosurg Psychiatry* 2007;**78**:615–19. The online version of this paper has been replaced with a corrected version containing figures 1–3 in colour.