on both sides involving the vestibulospinal tracts bilaterally (figure C). Patients 2 and 3 also had high intensity areas in the same areas. Apart from lesions in this area, all showed high signal intensity areas in the cerebral white matter.

This preliminary study shows that latencies of a vestibulospinal reflex can be prolonged in multiple sclerosis. As in these three patients the VEMPs were remarkably delayed rather than simply abolished as occurs in patients with peripheral vestibular lesions,^{2,4} the VEMP delay could be attributed to demyelination either of primary afferent axons at the root entry zone or secondary vestibulospinal tract axons rather than to lesions involving vestibular nucleus neurons. The MRI findings in these patients were not inconsistent with this proposition. Measurement of VEMPs could be a useful clinical test to evaluate function of the vestibulospinal pathway and for detecting subclinical vestibulospinal lesions in suspected multiple sclerosis.

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Sensory ataxia as the initial clinical symptom in X-linked recessive bulbospinal neuronopathy

X-Linked recessive bulbospinal neuronopathy (X-BSNP) has previously been described as a disease in which the first clinical symptoms which occur concern the motor system. A weakness of the shoulder and pelvic girdle muscles as well as cramps and muscle pain in the proximal limbs are normally found in the early stages.¹⁻³ The onset of X-BSNP generally ranges between the ages of 25 and 50 years; the disorder then shows a slow but continuous progression of

symptoms.¹⁻³ An involvement of facial and bulbar musculature with fasciculations and atrophy of these muscles and, therefore, often dysarthria and dysphagia, are common symptoms of an advanced stage.^{1,3} Nevertheless, life expectancy does not seem to be considerably reduced.¹ Sensory impairment was reported to be minimal or non-existent.¹⁻³

Pathoanatomical studies showed that a degeneration of both the lower motor and primary sensory neurons represent the underlying pathological process for the clinical symptoms.⁴ The pathogenetic link between the abnormally expanded CAG trinucleotide repeat in the first exon of the androgen receptor gene which is found in affected patients and the depletion of the anterior horn cells and the primary sensory neurons with consecutive axonal degeneration of the dorsal root fibres has not been established yet.^{4,5} Although central and peripheral sensory conduction has been shown to be highly abnormal with absent or markedly prolonged sensory action potentials, most of the time the clinical findings of only a little sensory impairment do not correspond well to this electrophysiological constellation.^{1,3} We report sensory ataxia as the initial clinical symptom in a patient with X-BSNP.

A 63 year old retired journalist felt like "walking on pillows" for the first time when he was 45 years old. During the subsequent years the distally accentuated and symmetric loss of sensibility for touch, temperature, pain, position, and vibration was progressive in the legs—and later—also in the arms. At the age of 48 he noticed fasciculations of the facial muscles and a slow development of a painless, bilateral weakness of the proximal muscles of the lower and upper limbs. No related disease was found in his father's family; nothing is known about the maternal side of his family history.

The clinical examination of the patient showed a severe sensory gait ataxia as well as a dyspraxia of his hands. Other symptoms were a tremor of the hands and occasional spasms of the oral and pharyngeal musculature. The functions of other cranial nerves were normal. Spontaneous fasciculations of the buccal muscles and less often of the proximal and distal limb musculature were seen. Deep tendon reflexes could generally not be detected and there were no pathological reflexes. A proximally accentuated weakness and amyotrophy of the legs and arms as well as a distally accentuated hypaesthesia for all qualities was found. There were no cognitive deficits, cerebellar ataxia, or gynaecomastia.

Laboratory results were not abnormal (including plasma testosterone, follicle stimulating hormone, luteinising hormone, and glucose tolerance) except for a raised creatine kinase (354 U/l). The CSF examination also showed no abnormalities. Motor nerve conduction velocities were only slightly reduced whereas sensory action potentials were absent. Electromyography showed the typical features of chronic denervation in the proximal muscles of the lower and upper limbs as well as in the tongue. Motor evoked potentials showed normal central conduction times but partially prolonged latencies with stimulation of the cervical and lumbal roots. With tibial and median nerve stimulation no somatosensory evoked potentials were found neither at the cervical or lumbal nor at the cortical recording sites. Brain MRI was normal. The genetic analysis showed 42 CAG trinucleotide repeats within the androgen receptor gene (normal length 11-34 repeats),

which is a valuable criterion in the diagnosis of X-BSNP.⁵

The example of our patient shows that the electrophysiological findings of the sensory system may correspond well to the clinical syndrome in X-BSNP. It is not clear why patients with X-BSNP in most cases do not show significant sensory impairment although substantial loss of the primary sensory neuron has been proved. We hope that findings as in this case report may be an incentive for us to work for a better understanding of the problem as to why a specific neuronal degeneration can lead to a less specific pattern of clinical symptoms.

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Neuroleptic malignant syndrome without fever: a report of three cases

Although fever is considered to be a cardinal feature of neuroleptic malignant syndrome, we report on three patients who were afebrile but had all the other features of the neuroleptic malignant syndrome. This paper highlights the need to suspect neuroleptic malignant syndrome and immediately initiate investigation and appropriate management in any patient who develops rigidity and clouding of consciousness while receiving antipsychotic medication, thus averting potentially lethal sequelae such as death.

The neuroleptic malignant syndrome (NMS) is an uncommon but potentially fatal idiosyncratic reaction characterised by the development of altered consciousness, hyperthermia, autonomic dysfunction, and muscular rigidity on exposure to neuroleptic (and probably other psychotropic) medications.^{1,2}

According to the DSM IV criteria,³ prominence has been given to signs of increase in temperature (>39°C) and muscular rigidity. These must be accompanied by two or more of: diaphoresis, dysphagia, tremor, incontinence, altered consciousness, tachycardia, blood pressure changes, leucocytosis and raised creatine kinase concentrations. Some researchers have also advocated that a pyrexia in excess of 38°C or 39°C is necessary for the diagnosis of NMS.^{4,5} However, on reviewing the literature since 1965, we found three previous case reports highly suggestive of NMS occurring without fever.⁶⁻⁸ We report three patients who had all the major features of NMS but were afebrile during the entire course of their illness. These cases were seen within a 1 year period from July 1998 to July 1999.

A 52 year old man who was on treatment for postpsychotic depression presented after an act of deliberate self poisoning with a

rodenticide. As he became acutely disturbed and violent in the ward he was given several injections of intramuscular haloperidol, and he received no further antipsychotic medication. On the next day he developed severe rigidity associated with profuse sweating and marked autonomic instability. His heart rate was 120 beats per minute and was irregular. His blood pressure showed wide fluctuations and there was urinary incontinence. He then became confused and went into a state of semiconsciousness. There was no increase in body temperature. The creatine phosphokinase concentration was 1575 IU on the 2nd day and 6771 IU on the 4th day of his illness, and the white cell count was 17 000/mm³ (neutrophils 60%, leucocytes 30%, eosinophils 6%, macrophages 4%). As the patient did not have any increase in body temperature there was doubt as to the diagnosis. In standard medical texts fever was recorded as a necessary finding in NMS. However, a medline search contained reports of three patients with NMS in the absence of fever. The patient was immediately started on bromocriptine at a dose of 2.5 mg three times a day. By the 5th day of treatment his condition improved with the autonomic disturbances disappearing and the rigidity subsiding. His creatine phosphokinase concentration became normal after 5 days of treatment.

A 20 year old man was started on 10 mg trifluoperazine twice a day for schizophrenia with catatonic features and discharged after being given a depot injection of 40 mg flupenthixol intramuscularly. Five days later he was readmitted due to progressively increasing stiffness of his body, difficulty in swallowing, drowsiness, and incontinence of urine. On examination he was very rigid and semiconscious, but opened his eyes to deep pain, and had severe diaphoresis which drenched the bed clothes. However, he had no rise in body temperature. His heart rate was 130 beats per minute, respiratory rate 28 per minute, and his blood pressure showed marked fluctuations. The creatine phosphokinase assay done on the 2nd day gave 2109 IU/l and the white blood cell count was 12 400/mm³ (neutrophils 93%). Other investigations including analysis of his CSF was normal. We made a tentative diagnosis of NMS, even though the patient did not have fever, as we had treated a patient with NMS presenting without fever previously. The neuroleptic medication was stopped and he was started on 2.5 mg bromocriptine three times a day. As the response was poor the dose was gradually increased to 10 mg three times a day. He made a relatively slow recovery and came out of the comatose state after 1 week of treatment and autonomic disturbances and rigidity disappeared after 10 days of treatment. On discharge from hospital on the 14th day after starting bromocriptine his creatine phosphokinase was 230 IU/l.

An 18 year old boy with schizophrenia was on long term antipsychotic drugs. He was admitted with increasing stiffness of the body, drowsiness, and urinary incontinence. On examination he was rigid, had a tachycardia (pulse rate 130 beats per minute) alternating with a bradycardia (pulse rate 50 beats per minute) and his blood pressure showed wide fluctuations. There was no increase in body temperature at admission or during the course of his illness. The creatine phosphokinase concentration was 1450 IU/l on the 2nd day of his

illness and the white cell count was 15 000/mm³ (neutrophils 85%). Antipsychotic medication was stopped and he was started on 2.5 mg bromocriptine three times a day. He made a complete recovery, with the autonomic disturbances and rigidity subsiding within 5 days of treatment. One week later his creatine phosphokinase was 100 IU/l.

The neuroleptic malignant syndrome usually occurs with the use of therapeutic doses of neuroleptic drugs and commonly develops during the initial phases of treatment, when the drug dose is being stepped up, or when a second drug is introduced. However, it can occur at any time during long term neuroleptic treatment with factors such as exhaustion, agitation, and dehydration acting as triggers.¹ The above point is noteworthy especially given the possibility of the occurrence of a variant and uncommon clinical picture such as that described in our paper. There are no specific laboratory findings, but neutrophil leucocytosis and raised creatine phosphokinase concentrations lend weight to the diagnosis.⁹

These three cases illustrate the point that NMS can occur without fever. Our patients had all the features of NMS apart from fever and the response to bromocriptine can be taken as strong evidence that the diagnosis was accurate. Being familiar with this fact and other different ways in which this syndrome can present plus a high degree of suspicion are important in making an early and accurate diagnosis of NMS. In fact, the appearance of muscle rigidity and clouding of consciousness in any patient receiving antipsychotic medication should prompt clinicians to suspect NMS and immediately initiate appropriate investigation and management. A failure to do so may lead to delay or failure to withdraw neuroleptic medication, and thus lead to potentially irreversible sequelae and even death. The first case also illustrates that at times of doubt about the diagnosis of an uncommon presentation of a well described illness, reference to the literature including an immediate Medline search could help in making decisions about appropriate patient management.

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Acute psychosis and EEG normalisation after vagus nerve stimulation

The acute appearance of psychosis on achievement of seizure control and normalisation of a previously abnormal EEG has long been recognised as a clinical entity termed "forced normalisation".¹ Focal and generalised epilepsies are both implicated.¹ Most of the old and new antiepileptic drugs have been implicated in the emergence of psychosis with EEG normalisation.¹⁻²

Chronic vagus nerve stimulation has been proposed as an effective and safe treatment of medically intractable epilepsy, although the mechanism of action and the specific indications of this treatment remain unknown. Side effects are limited and no serious or life threatening damage has been reported.³

The case of a patient with medically intractable epilepsy who developed a schizophrenia-like psychosis when control of seizures and scalp EEG normalisation were achieved through vagus nerve stimulation is presented.

A 35 year old man had had intractable left frontotemporal epileptic seizures since the age of 10 years. He is right handed and left language dominant. Up to the age of 25 years he was almost free of seizures under treatment with carbamazepine and phenobarbital. After that the number of seizures gradually increased and secondary generalised seizures appeared. Phenytoin, carbamazepine, valproic acid, phenobarbital, vigabatrin, lamotrigine, and clonazepam were used in different combinations without an acceptable seizure control. Repeated EEG recordings during the past few years were abnormal with prominent slow activity, long intervals of voltage attenuation, and common bursts of high voltage spike wave complexes recorded mainly at the left frontotemporal area. A high resolution MRI was normal.

In October 1997, a vagus nerve stimulator was implanted because of poor seizure control. During a 12 week baseline preceding the implantation, more than 40 complex partial and one to two secondary generalised seizures every 4 weeks were noted. The patient also experienced bursts of uncounted short lasting complex partial seizures on a few days every month. At the time of implantation medical treatment consisted of 500 mg topiramate and 475 mg lamotrigine daily. The patient had been on this daily dose for 6 months before implantation.

The stimulator output was progressively increased over 1 month from implantation. The final parameters were: pulse rate 30 Hz, 5 minutes off, 30 seconds on, 1.5 mA intensity, and 500 ms pulse width. During the subsequent 2 months, seizure frequency dramatically reduced even though medication remained unchanged. For the last 2 weeks of the second month he had noted only one short lasting complex partial seizure; at the same time the family had noted a change in the patient's behaviour. Psychiatric evaluation disclosed a schizophrenia-like syndrome with auditory hallucinations, delusions of persecution, thought broadcasting, psychomotor agitation, and complete lack of insight.