As seizures are usually associated with pronounced increases in cerebral blood flow, ictal SPECT has been effectively used for the diagnosis of seizures in general. Although it may be argued that ictal EEG recording should differentiate hypotonic seizures from transient ischaemic attacks in the present patient, it is not certain that the localising value of ictal EEG would have the same precision as the '99mTc-HMPAO SPECT method. '99mTc-HMPAO is rapidly absorbed after intravenous injection and reaches a maximum concentration within two minutes of injection. Once it has crossed the blood-brain barrier it forms a hydrophilic compound and 86% of activity is still present at 24 hours after administration. With these features, ictal SPECT with '99mTc-HMPAO has been reported to provide unique information for the treatment of patients with refractory epilepsy and to give insights into the pathophysiology of seizures. In the present study, we applied ictal SPECT with '99mTc-HMPAO to a patient with a brain tumour with repeated hemiparetic attacks and confirmed the diagnosis of unilateral hypotonic seizure. To our knowledge, the present case is the first example showing that unilateral hypotonic seizure could be differentiated from transient ischaemic attacks by ictal SPECT with '99mTc-HMPAO. We stress the efficacy of ictal SPECT in making this differentiation since treatment options for seizure and transient ischaemic attacks are very different.

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Cervical extradural abscess complicating discitis and associated disc prolapse, secondary to a long line infection

Spinal epidural abscess is rare, accounting for only one or two cases per 10 000 hospital admissions. Trauma and surgery (20% each) are the two commonest causes. Dental, skin and soft tissue infections, and endocarditis account for a further 20%. In most of the remaining cases no source is found. *Staphylococcus aureus* is the commonest organism isolated (60%).

Although discitis or osteomyelitis are reported in 16-80% of cases,1 disc prolapse has not been mentioned as a comorbid condition.

We report a patient (a 53 year old woman) who underwent total thyroidectomy for carcinoma on 20 October 1993. A right antecubital long line was inserted in theatre. Postoperatively she became hypocalcaemic and calcium was given via the long line. Ten days later she developed a clinical thrombophlebitis affecting the right arm although ultrasound showed no axillary vein thrombosis. The long line was removed and venous blood cultures were made on 1 and 2 November 1993. Cultures and the long line tip grew *Staphylococcus aureus* that was resistant to penicillin but sensitive to gentamicin, erythromycin, and flucloxacillin. After a single dose of erythromycin she was changed to regular intravenous flucloxacillin on the advice of the microbiologists.

On 4 November 1993 she complained of "electic shocks" in the shoulders followed by weakness of the right arm, which progressed over the next five days to involve the left arm and both legs. There were no other sensory symptoms, no sphincter disturbance, and no respiratory difficulties. She was apyreal, with no meningism, cranial nerve, or fundal abnormality. The neck wound was well healed, and neither it nor the long line site was clinically infected. There was flaccid weakness of her right arm, grade 3/5 proximally and 4/5 distally, and a milder degree of weakness of her left arm. Both legs showed very mild spastic weakness. There were no sensory abnormalities. Biceps and triceps jerks were absent, knee and ankle jerks brisk, and plantars equivocal.

Contrast enhanced cervical MRI showed high signal in the C4-5 disc and in both the anterior and posterior longitudinal ligaments. There was thickening and elevation of the posterior ligament over the adjacent two vertebral levels, and a low intensity mass at the level of the disc space compressing the theca of the cord and C5 nerve root. This was thought to be either pus or a sequestered disc prolapse (figs 1 and 2).

She was started on intravenous cefuroxime and metronidazole and operated on immediately for anterior cervical decompression and fusion.

At operation through the right half of the thyroidectomy scar the tissues were found to be extremely stuck down. No overt
infection was encountered until the longus colli was dissected from the vertebral bodies when a substantial amount of pus emerged. This extended through the disc space, but there was little free pus in the extradural compartment. There was a large right lateral free disc fragment densely adherent to the theca, which had to be removed to decompress the nerve root cord. The pus was at least partly contained by a membrane which was opened to achieve full decompression. A 14 mm autologous bone dowel from the iliac crest was inserted.

Pus swabs cultured Staphylococcus aureus sensitive to gentamicin, erythromycin, fusidic acid, and fluocoxacinil, but resistant to penicillin; exactly the same as the cultures grown from the long line tip. This was treated with intravenous fluocoxacinil and fusidic acid.

Postoperatively she was well but the power in her right arm failed to return. Repeat MRI on 17 November 1993 showed further enhancing material centrolaterally again impinging on the nerve root. On 18 November 1993 she was re-explored and an extension of the corpectomy to the right of the dowel performed and further granulation tissue removed. Postoperatively her right biceps and deltoid gradually started to recover, her other limbs having returned to normal. She remained on oral antibiotics for one month.

There are two unusual features about this case. Firstly, although spinal epidural abscess is commonly associated with a discitis, there are no reports of disc prolapse also being an associated occurrence and the size of the fragment found at operation make it unlikely to have been a pre-existing prolated disc. Secondly, the organisms were the same as those from the long line, making this a relevant complication of long line insertion.

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Successful treatment of intractable tardive dyskinesia with botulinum toxin

Tardive dyskinesia, consisting of involuntary repetitive movements of orofacial muscles, and sometimes of the extremities and trunk, is a devastating side effect of neuroleptic drugs, and there is no established treatment.1 Recently, intramuscular injection of botulinum toxin type A (BTX) has been shown to benefit a growing number of conditions characterised by muscle hyperactivity.2 Because BTX is thought to diminish involuntary movements by paralysing the injected muscles, applications have been limited to conditions in which few muscles are involved. We present a case of tardive dyskinesia in which widespread involuntary movements affected the neck, trunk, and the limbs. Repeated BTX injections to the neck and trunk resulted in improvement of not only the injected sites, but also the limbs, far from the injected muscles, thereby dramatically improving the overall condition.

The patient was a 43 year old woman who presented with severe involuntary movements. Fifteen months earlier she had visited a psychiatrist for acute schizophrenic episodes (auditory hallucination, delusion, and violent behaviour). Neither her nor her family had a history of neurological or psychiatric disease. She was prescribed regular doses of haloperidol decanoate, fluphenazine, and biperiden. Her schizophrenic symptoms were eliminated but she gradually developed involuntary movements. The neuroleptic drugs were stopped after 11 months but this did not alleviate these movements.

When the patient first visited us, she exhibited twisting of the tongue, strong intermittent retroflexion (whip like movements) of the neck and trunk along with tonic retroflexion of these areas, and repetitive extension and flexion of the limbs. The most pronounced movement of the limbs was a sudden, strong kicking of the legs from a flexed position. All the dyskinetic movements occurred at three or four frequencies (figure, A). She had had multiple falls because of these uncontrollable movements. We diagnosed her condition as tardive dyskinesia, and gave standard medications including diphenylhydantoin, carbamazepine, and diazepam, all of which were of little benefit. Ten months later, she was admitted to hospital.

On admission, her general findings, mental status, and lab tests were normal. Neurologically, the involuntary movements seen on her first visit to us persisted, leaving her confined to bed, unable to walk, stand, or sit. She could not feed herself because of her unstable posture and uncontrollable movements of the head. All of the involuntary movements disappeared when she slept. Brain MRI (Magnetom, 1·5 T, Siemens) including the basal ganglia was normal.

Repetitive retroflexion of the neck was the most prominent and bothersome movement. We gave three pairs of BTX injections to her posterior cervical region (figure, C), hoping that diminished retroflexion would help maintain her posture, and enable her to feed herself. Each injection contained 50 IU of BTX (Chiba Serum Institute, Chiba, Japan; 40 IU/mg). The injection sites were chosen using EMG to detect muscle hyperactivity. After the treatment, the retroflexion of the neck became milder in frequency, amplitude, and strength. The effect peaked around seven to 10 days after the treatment. Her stability in sitting also improved, which allowed her to feed herself with her left hand supporting her posture.

Because the first BTX injections were effective, we performed the second injections two weeks later (figure, D), and the third injections six weeks later (figure, E). After these treatments, the whip like movements of the neck and trunk markedly diminished in frequency, amplitude, and strength, and tonic retroflexion in these sites decreased. Unexpectedly, the involuntary movements in the limbs were also much improved; the repetitive kicking movement in the legs decreased in frequency, amplitude, and strength (figure, B). Improvement in the legs was substantial after the second treatment when the trunk was injected with BTX for the first time.

Her upright posture became stable enough for her to walk and even go up and down stairs by herself. The injected muscles showed minimal weakness (less than 4 on the manual muscle test). No weakness was noted in the muscles of the limbs after the treatment. She was discharged and has maintained her performance level for more than 20 months with additional injections at intervals of three to six months. The time course of the effects of BTX in this patient correspond well with the typical time course of effects after BTX injection. Antibodies to BTX have not been detected in her serum.

There are two papers reporting a total of six cases of tardive dyskinesia or dystonia successfully treated with BTX injection. Our case is distinct in that involuntary movements in muscles far from the sites of BTX injections also improved considerably. There are three possible pathways by which locally injected BTX might affect distant muscles. The first two are diffusion via blood flow, and transportation via axons into the spinal cord: A single fibre EMG study showed that the BTX injected into neck muscles affected neuromuscular transmission in limb muscles that exhibited no weakness.3 Another study showed that after

Figure 1 Sagittal contrast enhanced cervical MRI showing high signal in the C4/5 disc with elevation of the posterior ligament.

Figure 2 Axial contrast enhanced cervical MRI showing a low intensity mass at C4/5 compressing the theca of the cord and the C5 nerve root. 11

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