less difficult psychophysical task may also contribute to the result.

The point we wanted to draw attention to in our paper,⁴ illustrated by measurements of reaction times and supported by a review of the literature, was that the sensations of warming and cooling are not part of a continuum. These thermal sensations belong to separate systems and are conveyed by different classes of peripheral nerve fibres. Perhaps the neurological examination should be modified in the light of this knowledge.

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Individual motor unit analysis in the diagnosis of urethral sphincter innervation

Sir: Needle electromyography of sphincter and other perineal and pelvic floor muscles is a time honoured method for diagnosis of neurogenic lesions in the sacral nervous system, and we can still refer to the early reports on the method¹ regarding technique and interpretation. Analysis of motor unit action potentials (MUAPs) has been made easier by modern EMG machines having the option of triggering, delaying and storing of MUAPs; such an approach has also been proposed in analysis of sphincter EMG.² Single fibre EMG with fibre density measurements has already made important contributions to our understanding of the "microphysiology" of the motor unit,³ and has also been introduced into routine EMG diagnostics. It has (among other uses) been proposed as a sensitive diagnostic tool in diagnosing neurogenic changes of sphincter muscles,⁴ but already the early reports have claimed that it is not superior to concentric needle EMG in this particular use.⁵ In our

experience SFEMG recordings of sphincter muscles could not be depended upon for yielding information on abnormal spontaneous muscle activity and have (when used for diagnostic purposes) needed more needle adjustments in the muscle (meaning more pain and a longer examination procedure) as compared with concentric needle EMG. SFEMG recordings of sphincter muscles have, however, stayed en vogue in Britain.⁶ Furthermore the stability of MUAPs can be estimated rather accurately (and polyphasia interpreted more easily) by low frequency filtering of the conventional EMG signal. Trontelj (personal communication;⁷) has introduced this modification in the early seventies in our laboratory, but it has also been proposed by Payan.⁸ While the MUAP is triggered and its recording "optimised" the low frequency cut-off is adjusted to 500 Hz or even 2000 Hz ("extreme filtering").

Thereby the features of complex MUAPs are very nicely exposed, especially the number of phases and any instability of complex potentials (fig; cf fig 4 from ref 2).

In conclusion, a well conducted concentric needle EMG examination in my mind represents the method of choice (and not SFEMG) in determining (neurogenic) involvement of muscles innervated by lower sacral segments. Not only can it give information about abnormal spontaneous activity and the characteristics of MUAPs, but also a more wide insight into the patterns of voluntary and reflex activation of the muscle examined; also, last but not least, the concentric needle electrode can in the same diagnostic session be used for dependable and selective recordings of direct and reflex responses.⁹

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Fig Motor unit action potential from the urethral sphincter muscle in a young nulliparous female patient with micturition problems examined five months after traumatic fracture of the first lumbar vertebra. The "jitter" and blocking of the middle component is well seen in this series of 13 consecutive firings of the MUAP, indicating reinnervation (that is, immaturity of axons/end plates). Concentric needle electrode, frequency range 500-10000 Hz).

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Cyclosporin neurotoxicity in cardiac transplant recipient

Sir: We read with interest the report of Lane RJM *et al*¹ explaining the toxicity of cyclosporin on the central nervous system through changes of the blood-brain barrier. However, we feel that their explanation concerning the abnormal MRI seems hazardous. Indeed patient 1 and patient 3 described in the report experienced status epilepticus a few days before the MRI. The occurrence of CT scan hypodensities slightly enhanced by contrast injection following severe epileptic seizures is well described.^{2,4} These hypodensities spontaneously regres-

sive within months and are thought to be due to alterations of the blood brain-barrier produced by local hypoxia, lactic acidosis and loss of vascular autoregulation.

Furthermore, MRI T2-weighted abnormalities were described by Stone *et al*⁵ in one patient and Lesser *et al*⁶ in three patients with intractable focal seizure. These abnormalities were not correlated with the findings on subsequent pathologic examination.

Thus, it seems that the MRI features in Lane's report are probably due to the seizures. The sensitivity of MRI will probably lead to the description of more transient abnormalities secondary to severe epileptic seizures.

In consequence, the discovery of abnormal signal on MRI following severe epileptic seizures cannot be considered as an unequivocal proof of toxic effects of cyclosporin on the blood-brain barrier.

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Lane and Langes reply:

We thank Dr Mavroudakakis and Dr Zegers de Beyl for their interesting suggestion regarding the cause of the reversible MRI signals in our cases, but suspect their hypothesis may be equally hazardous.

First, the transient CT scan abnormalities in the papers cited were single hemispheric

lesions; Sethi *et al* provide further examples.¹ Our patients had multiple MRI abnormalities, including one cerebellar hemisphere lesion, and CT was normal in all cases. Secondly, MRI abnormalities have been reported in patients with cyclosporin neurotoxicity in the absence of seizures.^{2,3} The distribution of the MRI (and CT) abnormalities in these cases of liver transplantation was somewhat different from our cardiac transplant patients, being strikingly occipital and largely confined to the white matter, but this may be a reflection of differing aggravating factors in the two situations; low blood cholesterol in liver transplant patients^{2,4} and possibly hypomagnesaemia in the cardiac patients. Thus, while we cannot entirely discount a contribution from the seizures to the MRI appearances we still feel that they are more likely to be related to the neurotoxic effects of the drug.

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Frozen shoulder and other shoulder disturbances in Parkinson's disease

Sir: We read with interest the article by Riley *et al*¹ on the high incidence of shoulder pain in Parkinson's disease. We ourselves have made a similar observation.

As part of a survey to investigate a possible aetiological relationship between Parkinson's disease and essential tremor² we interviewed 100 consecutive Parkinson's disease patients attending the clinic. We were particularly concerned to establish the nature of the first symptom experienced and our interest was aroused when five consecutive patients gave shoulder pain as the initial symptom. On completion of the survey, we found a total of 15 patients (eight female) giving upper limb pain as the first symptom. Pain occurred in the shoulder (12 patients),