Letter

Recurrence of hemifacial spasm after hypoglossal facial anastomosis

SIR,—The aetiology of hemifacial spasm is unproven in most cases, though clinical evidence points to a lesion in the proximal part of the facial nerve. Relief from the distressing involuntary movements can be obtained by a partial section or alcohol block of the facial nerve distal to the stylomastoid foramen, but with this procedure relapse is not uncommon. Gardner¹ has argued that the commonest cause of hemifacial spasm is damage to the nerve from contact with an aberrant artery in the cerebello-pontine angle. Janetta² has reported a high frequency of full relief of spasm after intracranial exploration of the nerve and the interposition of foreign material between it and any crossing vessel. The procedure has a significant morbidity however.³ An alternative surgical technique is to combine total section of the seventh nerve peripherally, with a hypoglossal facial anastomosis. This relieves the spasm and at the same time treats the resulting facial paralysis. A recent case was unexpectedly followed by recurrence of spasm despite a functionally successful anastomosis.

Mrs KM a 51-year-old housewife developed typical left-sided hemifacial spasm at the age of 45 years. In 1976 she underwent division of the facial nerve at the stylomastoid foramen. The hypoglossal nerve was divided and anastomosed with the distal end of the seventh nerve. The spasm disappeared to be replaced by a complete left-sided facial palsy. A temporary tarsorrhaphy was required. After 6 to 8 weeks facial movement began to return. She subsequently showed mass movement of the left side of the face during tongue movements. Her tongue showed hemiatrophy. After 2 years some small involuntary movements occurred around the left eye. The patient was reinvestigated. EMG studies showed a good interference pattern in the orbicularis oculi muscle during tongue movement, but also demonstrated a return of tonic and clonic spasm. No orbicularis oculi reflexes could be recorded on the left during stimulation of either supra-

orbital nerve. A vertebral arteriogram showed no intracranial abnormality. Over the following 2 years the hemifacial spasm became increasingly more severe and widespread.

When re-examined in January 1981, severe movements were occurring persistently in all parts of the left side of the face together with some tonic closure of the left eye. Formal testing revealed mild residual weakness of voluntary eye closure and at the angle of the mouth, but there was no evidence that any change in power had occurred over the previous 2 years. EMG studies demonstrated typical hemifacial spasm (figure (a)). Tongue movements caused a full interference pattern in orbicularis oculi and orbicularis oris. Supra-orbital nerve stimulation caused both early ipsilateral and delayed bilateral orbicularis oculi reflexes (figure (b)).

It was concluded that despite the functional hypoglossal facial anastomosis facial nerve regeneration had occurred. The facial nerve was re-explored through a cortical mastoidectomy (Mr R Williams). The facial nerve was divided and separated. Stimulation of the distal end of the nerve produced a brisk contraction of the whole of the left side of the face. Post-operatively her hemifacial spasm had ceased but eye closure and movements of the mouth were weak. A repeat EMG study revealed no spasm. Tongue movements still produced what appeared to be a full interference pattern around the eye. No orbicularis oculi reflexes could now be recorded on the left side from stimulation of either supra-orbital nerve.

Despite a functionally successful hypoglossal-facial anastomosis this patient showed clear evidence of regeneration

Figure (a) EMG record of spontaneous activity in orbicularis oculi showing intermittent bursts of muscle action potentials typical of hemifacial spasm. (b) EMG record of response in left orbicularis oculi to stimulation of left supraorbital nerve. Early (monosynaptic) and late (polysynaptic) responses are seen.

Letter

of the sectioned facial nerve. This was responsible for return of hemifacial spasm and was also responsible for some of the return of voluntary movement after the original section, and permitted a return of the orbicularis oculi reflexes.

The practical significance of this experience is clear. The sectioned proximal end of the nerve should be reversed to prevent regeneration, and with it relapse of hemifacial spasm. The interest of the case is more general however. Regeneration of the nerve produced reinnervation of all parts of the face despite the prior reinnervation of those self same muscles by the regenerating hypoglossal nerve. Delay in regeneration of at least 10 months is established⁴ but in this patient clinical evidence suggested that perhaps 2 years elapsed before the facial nerve reinnervated the facial muscles. The anastomosis involved the full cross section of the distal seventh nerve and the whole circumference of its epineurium. While a partial breakdown of the suture line might allow access of regenerating seventh nerve fibres along side those of the twelfth nerve, it is not necessary to postulate such an event since regenerating nerve may reach the distal muscle bed without any such epineurial continuity.⁵

Experimental work on competition between two nerves reinnervating a de-
 vated muscle has shown, in lower animals, some selectivity in favour of the nerve originally responsible for innervation of that muscle. In a series of papers in the 1960s Mark⁶ demonstrated that though cross innervation by a foreign nerve established func-

tional contact with normal looking nerve terminals, subsequent reinnervation by the original nerve appeared to suppress function in the contacts made by the foreign nerve. Grimm⁷ in 1971 showed a similar phenomenon in the axolotl. Crossed nerves appeared to completely reinnervate antagonistic muscles, but stimulation showed that some fibres managed to return to their original muscles overcoming substantial geometric obstacles. This idea of competitive reinnervation has been challenged by Scott,⁸ and it seems unlikely that it applies in adult mammals. Thus Frank *et al*⁹ found no evidence of repression of functional connections in a muscle innervated by a foreign nerve when its embryologically appropriate nerve subsequently reinnervated the same muscle. Multiple innervation of muscle fibres has been identified in the mouse¹⁰ and in the cat,¹¹ but there is little evidence as to whether it can occur in the human. The evidence in the present case is certainly of double innervation of the face by both the twelfth and seventh cranial nerves, but of course there is no histological evidence as to whether individual muscle fibres had dual innervation. The findings in the present patient also argue against the phenomenon of repression of functional connections in dual innervation in man, and are in accord with those findings in lower mammals and in conflict with the studies on fishes as carried out by Mark.⁶

References

- 1 Gardner WJ, Sava GA. Hemifacial spasm—a reversible pathophysio-

- logic state. *J Neurosurg* 1962; **19**: 240–7.
- 2 Jannetta PJ, Abbasy M, Maroon JC, Ramos FM, Albin MS. Etiology and definitive microsurgical treatment of hemifacial spasm. *J Neurosurg* 1977; **47**:321–8.
- 3 Maroon JC. Hemifacial spasm. *Arch Neurol* 1978 **35**:481–3.
- 4 Guth L. Regeneration in the mammalian peripheral nervous system. *Phys Rev* 1956; **36**:441–78.
- 5 Sanes JR, Marshall LM, McMahan VJ. Reinnervation of skeletal muscle: restoration of the normal synaptic pattern. In: Jewett DL, McCarroll HR eds. *Nerve Repair and Regeneration*. St Louis: CV Mosby 1980; 130–40.
- 6 Mark RF. Selective innervation of muscle. *Brit Med Bull* 1974; **30**: 122–5.
- 7 Grimm LM. An evaluation of Myotypic respecification in Axolotls. *J Exp Zool* 1971; **178**:479–6.
- 8 Scott SA. Persistence of Foreign Innervation on Reinnervated goldfish extra ocular muscles. *Science* 1975; **189**:644–6.
- 9 Frank E, Jansen JKS, Lomo T, Westgaard RH. Effect of foreign innervation of muscle by its original nerve. *J Physiol (Lond)* 1974; **240**: 24–5P.
- 10 Tonge DA. Synaptic function in experimental dually innervated muscle in the mouse. *J Physiol (Lond)* 1974; **239**:96–7P.
- 11 Tate K, Westerman RA. Poly-neuronal self-reinnervation of a slow-twitch muscle (Soleus) in the cat. *Proc Aust Physiol Pharmacol Soc* 1973; **4**:174–5.

MJG HARRISON
J ANDREW