

EPIDURAL STIMULATION IN 21 PATIENTS WITH MULTIPLE SCLEROSIS

Hawkes, C. H., Wyke, M., Desmond, A., Bultitude, M., Small, D., Jones, S. and Robinson, K.

From the Institute of Neurology, Queen Square and St. Thomas' Hospital, London.

Patient Material

Twenty-one patients with multiple sclerosis have been studied at the Institute of Neurology over the past two years. They were all selected according to the following criteria:

- a) Definite case of the disease according to the criteria of Schumacher<sup>1</sup>
- b) Under the age of 55 years
- c) No relapses within the previous six months
- d) No psychiatric history and reasonable observers of their own condition
- e) Able to walk 50 yards with or without support

Technique

All subjects had two electrodes inserted into the epidural space so that the tips lay between T2 and T4 approximately 3 cm. apart, using the procedure described by Cook<sup>2</sup>. Stimulation was adjusted to the sensory threshold so that paraesthesia was felt in the back or legs. Pulse width was 200 psec and stimulation frequency 33 HZ in all instances. All had a two week trial of continuous (day and night) stimulation and if a successful outcome was obtained the system was made internal<sup>2</sup> so that long term effects could be studied.

Assessment

1) Clinical. All patients were examined in detail twice before the trial and at least twice during stimulation, typically at weekly intervals. In addition to routine neurological assessment particular attention was paid to:

- a) Muscle power in the limbs using a spring balance

- b) Joint position sense at index, ring fingers and hallux. A series of ten trials per digit was given
- c) Two point discrimination - at four sites in the upper limbs and three in the lower
- d) Timed walking measured daily over a set distance, varied according to the ability of each patient
- e) Bladder voiding volumes and excretion times, measured daily
- f) Video-tape assessment:- films of gait, balance, co-ordination, reflexes etc. were obtained before and twice during the trial.

## 2) Psychomotor

- a) Postural movements (arm drift<sup>3</sup> and body balance<sup>4</sup>)
- b) Timed standing, sitting and walking<sup>4</sup> tasks
- c) Control and co-ordination of upper limbs (tapping,<sup>5</sup> reaction times,<sup>5</sup> card sorting, leafing<sup>4</sup> and cutting)
- d) Manual dexterity - finger dexterity, writing, image tracing,<sup>4</sup> finger movements
- e) Control and co-ordination of lower limbs (crossing legs, leg tapping<sup>4</sup> and leg flexing<sup>4</sup>)

Above measurements taken before and twice during stimulation.

## 3) Bladder

- a) Micturating cinecystometrograms
- b) Urethral pressure profiles, with and without phentolamine
- c) Sphincter EMG
- d) Urethral flow studies using the DISA mictiograph

Above determinations were made before and once during the trial.

## 4) Evoked Potential Studies

- a) Visual: using a pattern stimulus<sup>6</sup>
- b) Auditory; using a binaural click stimulus<sup>7</sup>

- c) Spinal; using stimuli applied to the median nerve and recorded over the clavicle, cervical cord and cerebral cortex<sup>8</sup>

These measurements were obtained once before and at least once during stimulation.

### Results

A detailed analysis will be available later. Preliminary observations are as follows:

- a) Improved walking speed in half the patients examined. This may have occurred because of a training factor or perhaps lessening of spasticity. Leg power did not improve. Two patients showed worsening of gait.
- b) Improved urinary volume/time ratios were seen in approximately 2/3 patients, and the same proportion reported symptomatic improvement in terms of hesitancy and urgency. Routine micturating cinecystometrograms have shown no changes so far. A few patients have shown reduced external sphincter pressures on urethral profile studies.
- c) Spontaneous erections were mentioned by three male patients who had been impotent for several years previously.
- d) A few patients showed mild improvement in body position and balance. Co-ordination was better in one patient only.
- e) Three patients with chronic central pain due to multiple sclerosis obtained significant relief.
- f) No significant change in any of the visual or auditory evoked potentials was seen, when allowance was made for the natural variability of these responses in patients with multiple sclerosis.
- g) Questionable improvement was obtained in spinal evoked potentials in a small number of subjects.

Provisional Conclusions

Overall any change seen has been minor and it was always very difficult to be sure these changes were genuine and not the effects of enormous efforts from highly motivated patients sometimes expecting miraculous results.

The most objective responses were in the bladder tests and perhaps it is in this sphere that most clinical benefit will be derived. On the other hand it is likely that identical improvement in function could be achieved more safely and cheaply in the case of walking by physiotherapy and antispastic drugs and in the case of bladder dysfunction agents such as Eneproniumbromide (Cetiprin), Distigmine (Ubretid) and Prostaglandins.

Whether more promising results will stem from long term stimulation ie. three or more months is presently under study.

References

1. Schumacher GA, Beebe G, Kibler RF et al. (1965) Problems of experimental trials of therapy in multiple sclerosis.  
Ann. N.Y. Acad. Sci. 122 552
2. Cook AW. (1976) Electrical stimulation in multiple sclerosis.  
Hospital Practice 11 51
3. Wyke MA. (1966) Postural arm drift associated with brain lesions in man.  
Arch. Neurol. 15 329
4. The Oseretsky tests of motor performance. Ed. Doll EA. (1946)  
American Guidance Inc. Minnesota
5. Wyke MA. (1967) Effects of brain lesions on the rapidity of arm movements.  
Neurology (Minneap.) 17 1113
6. Halliday AM., McDonald WI. and Mushin J. (1973) Visual evoked response in diagnosis of multiple sclerosis.  
British Medical Journal 4 661
7. Robinson K. and Rudge P. (1977) Abnormalities of the auditory evoked responses in patients with multiple sclerosis.  
Brain 100 19
8. Mathews WB., Beauchamp M. and Small DG. (1974) Cervical somato-sensory evoked responses in man.  
Nature 252 230