

# **Functional Electrical Stimulation (FES) for correction of dropped foot and associated mobility problems.**

## **Protocol**

### **Referral criteria**

#### Cause and functional deficit

- Neurological deficit due to an upper motor neurone lesion. An upper motor neurone lesion is defined as one that occurs in the brain or spinal cord at or above the level of T12. This is normally but not exclusively associated with spasticity.
- Upper motor neurone lesion resulting in dropped foot occur in conditions such as stroke, multiple sclerosis, incomplete spinal cord injury at T12 or above, cerebral palsy, familial / hereditary spastic paraparesis and Parkinson's disease.
- Nature of functional deficit:
  - Dropped foot defined as a deficit of dorsiflexion and / or eversion of the ankle. While this will be frequently associated with lack of heel strike, FES can be successfully used to correct inversion at first contact to significantly improve the stability of the ankle in the stance phase, improving the safety of gait.
  - A dropped foot can be unilateral or bilateral
  - In addition to dropped foot, deficits in knee flexion or extension, hip extension and abduction and push off at terminal stance can be addressed. FES can be used to strengthen and / or control other muscles used in gait such as hamstrings, quadriceps, gluteal and calf muscles.

#### Functional ability

- Able to passively achieve a neutral angle of the ankle. A resistance due spasticity of the calf muscles is permissible but fixed contracture preventing plantigrade is not acceptable
- Able to obtain standing from sitting unaided. Use of aids such as sticks, frame or crutches is acceptable.
- Able to walk a minimum distance of about 10m. Use of aids such as ankle foot orthosis (AFO), sticks, frame or crutches is acceptable.
- A reasonable exercise tolerance is required for treatment sessions. However, FES often reduces the effort of walking therefore poor exercise tolerance is only an exclusion criteria in extreme cases.
- There is no maximum walking distance limit. FES devices have been successfully used in cases where a dropped foot only becomes a significant problem when the device user is tired or when the deficit is relatively mild.

#### Motivation, understanding and independence

- Able to understand the aims of the treatment and be motivated to comply with treatment protocols. Where appropriate, carer support can assist in using the equipment.
- Where patients live alone and do not have carer assistance, they must be able to place electrodes and operate the equipment independently. If family or carer support is present, less independence is required.

#### Precautions

- Poor skin condition is a contraindication as sores or irritation prevents the use of self adhesive electrodes
- Poorly controlled epilepsy. Where epilepsy is controlled by drugs or there has been no fits experienced for a reasonable period, FES can be used
- A history of significant autonomic dysreflexia in incomplete spinal cord injury above T6
- The effect of FES on the unborn child is not known in pregnancy
- Active medical implants such as cardiac pacemakers or other devices must be treated with caution and information sought from the device supplier about the use of electrical

stimulation in their presence. Additional clinical test may be required to determine the safety of FES. For some devices this can be arranged in Salisbury.

- Patients with a cancerous tumour in the area of the electrical stimulation should be excluded as increased local blood flow may increase tumour growth
- Patients with exposed orthopaedic metal work in the area of electrical stimulation should be avoided.
- While the majority of our patients fit the above criteria, patients outside these criteria can be considered in special circumstances.

## **Procedure**

Referrals are accepted from GP or Medical consultant and are generally made to the Head of Department, Prof. Ian Swain. The referral letter is reviewed by Prof. Swain or in his absence by experienced clinical staff at the National FES Centre. If it is judged that FES might be a suitable treatment an appointment is made for an assessment. Some times further details are requested from the referring clinician.

At the assessment clinic, the above referral criteria are checked. An additional acceptance criteria is the ability to tolerate the sensation of electrical stimulation. A FES device is tried and in most cases an improvement in gait is immediately apparent. With discussion with the patient a decision whether to proceed with treatment is made. In some cases the clinician may judge that a period of electrical stimulation training is required in order to strengthen muscles, reduce spasticity or to accustom the patient to the sensation of electrical stimulation. Stimulation exercises may be started at this appointment if time permits. Otherwise exercises will be set up at another appointment.

The ODFS is fitted over two clinic sessions on consecutive days. On the first day the user is taught how to apply the device while on the second day their ability to do so is assessed and further training given if necessary. Use of the stimulator is increased gradually over 2 to 3 weeks until it can be used all day. Follow up is made at 6 weeks, 18 weeks, 45 weeks and 72 weeks from first use and then every 6 months or yearly depending on the patient's condition, for as long as the device is used. If users experience problems they are encouraged to contact the clinic so advice can be given, equipment repaired or extra clinic sessions arranged if necessary.

In the case of more complex movement problems where more than one muscle group are stimulated, treatment is often started with a single channel ODFS and the second channel introduced at the 6 or 18 week follow up assessment once the user has become accustomed to FES.

For more information please contact Prof. Ian Swain, Dr Paul Taylor or Geraldine Mann, The National Clinical FES Centre, Department of Medical Physics and Biomedical Engineering, Salisbury District Hospital, Salisbury, Wiltshire, SP2 8BJ, UK Tel: +44 (0) 1722 429065, Fax: +44 (0) 1722 425263, E-mail: [enquiries@salisburyfes.com](mailto:enquiries@salisburyfes.com) Web [www.salisburyfes.com](http://www.salisburyfes.com)