

Correcting foot drop after stroke

Foot drop is a common physical problem following stroke. It affects people's balance, mobility and confidence. Physiotherapy together with a brace or splint has been the usual method of correcting this problem but another solution is available – Functional Electrical Stimulation (FES).



**About 20%
of all people
who have
had a stroke
suffer from
foot drop**

Foot drop is the dropping of the forefoot due to weakness or paralysis of the muscles down the front of the lower leg (the anterior tibial muscles). This becomes particularly apparent in walking when the foot is off the ground and the toes do not clear the floor.

Individuals compensate for this in one of two ways, either by bending the leg up at the hip excessively or hitching the hip, thus lifting the whole leg higher than usual and therefore the foot does not drag on the ground. Over time these compensation strategies for foot drop can cause secondary complications e.g. shortening of the calf muscles, hip or lower back pain, and further deterioration of balance leading to falls and reduced confidence.

There have been no statistics to show how many people have a foot drop following stroke,

but it is estimated at around 20% (Merletti 1979) with 80% of these people being suitable for FES treatment. This means there are potentially 12,800 stroke patients per year that could benefit from FES.

The most common treatment currently available to correct foot drop is physiotherapy alongside various orthotic devices. An orthotic is commonly known as a brace or splint that is applied externally to a limb (i.e. the foot). They are designed to provide support and help to maintain the limb in a position that will then allow a person to move more easily. These orthotic devices support the foot at a 90° angle which allows the foot to clear the floor when walking. However this type of orthotic does not strengthen or re-educate muscle function when walking, which is what FES does.

Functional Electrical Stimulation is a

relatively new approach in clinical practice in the United Kingdom. It dynamically helps the foot to lift during walking through muscle activation. FES is provided through a control box which is attached to the waistband, with wires leading to electrodes attached to the lower leg. It stimulates a person's leg muscles (dorsiflexors) that lift the foot at the right moment in their walking pattern (i.e. when the foot is off the floor) therefore allowing the foot to clear the ground. This produces a more normal walking pattern and reduces the need for compensatory strategies. As the muscle itself is being stimulated it can produce longer term benefits e.g. preventing muscle wastage and increasing muscle activity.

FES is not a new idea as it was developed by Liberson in 1961. However it wasn't until 1986 that Salisbury Hospital received a grant from the Department of Health to investigate the use of FES with spinal cord injured patients. This led to various developments and redesigning of equipment, expansion of clinical use, and valuable research proving its effectiveness.

Salisbury set up the first clinical service in 1995 and have gained enough evidence that it is now a recommended NHS treatment for stroke patients to help improve ankle dorsiflexion and gait performance as stated in the Royal College of Physicians National Clinical Guidelines for Stroke, Second Edition (June 2004).

FES is carried out using The Odstock Dropped Foot Stimulator (ODFS). The ODFS is the only type of muscle stimulator which is capable of correcting foot drop when walking.

The ODFS is activated by a pressure switch which is worn under the persons' heel. When weight is taken off the switch the stimulator is turned on and when weight is placed on the switch the stimulator is switched off. The heel switch is attached to two surface electrodes below the person's knee. One electrode activates the nerve that drives the dorsiflexors, and the second electrode stimulates the dorsiflexor muscle directly.

The benefits of activating the dorsiflexor muscles can be:

- Reduced effort of walking, therefore people are able to walk further and quicker
- Reduced need for compensatory strategies (i.e. using other parts of the body to

compensate for the foot not lifting)

- Prevention of muscle wastage through lack of use
- Improved muscle strength and re-education of muscle function therefore improving foot function even without FES. This has been shown in 14% of stroke patients (Taylor 2002)
- Allowing a wider choice of footwear. FES is less bulky and lighter weight than a typical orthotic device
- Reduced number of falls and ability to walk on uneven surfaces
- Increased confidence and independence



The Odstock Dropped Foot Stimulator

Salisbury Healthcare NHS Trust is currently researching an implantable device. This means that the electrodes will be implanted into the nerve and muscle surgically instead of being placed on the skin. It gives greater accuracy and reduces the time of the set up. This may be useful for upper limb rehabilitation as well as walking.

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For more information about FES please contact:

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National Clinical Guidelines for Stroke. Second edition June 2004 Royal College of Physicians