

**What is functional electrical stimulation (FES)?**

The term FES is used to describe a technique used to make a muscle move using electrical current. While this may seem bizarre or unnatural to some, we should point out that the body naturally uses electrical current to make muscles move! To do this, the brain sends these currents through our nerves. The nerves relay the message to the muscle and then the muscle shortens.

FES works in a very similar way. Current is applied to either the skin over the nerve or over the muscle belly to cause a muscle contraction (muscle shortening). So people paralyzed by injuries to their necks or backs may be able to move their muscles and maybe even do things such as walking thanks to FES.

However, this module will look at FES used for a different purpose. Strokes often result in loss of function, pain, spasticity (stiffness) and subluxation (joint out of socket) in the shoulder. This module of StrokEngine reviews the use of FES for reducing or reversing these effects of the stroke in the shoulder.

There are also types of electrical stimulation that do not cause muscle contraction. These are described elsewhere (see TENS).

**Are there different kinds?**

Despite the use of different terms (functional electrical stimulation, functional neuromuscular stimulation and electrical stimulation), these all have the same goal: to make the shoulder muscles contract in order to increase function and decrease pain, spasticity (stiffness) and subluxation (joint out of socket). Different terms are often used to describe the same technique.

**Why use FES applied to the shoulder after stroke?**

Loss of shoulder function, pain, spasticity, subluxation and shoulder pain after stroke are common and can profoundly affect quality of life. FES is used for increasing shoulder function and for preventing pain and dysfunction in hemiplegic stroke patients.

**Does it work for stroke?**

Research has studied how FES can help stroke patients with a hemiplegic shoulder:

## FUNCTIONAL ELECTRICAL STIMULATION – HEMIPLEGIC SHOULDER

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- **Muscle function:** There is limited evidence that FES in combination with regular physical therapy can improve muscle function. There is moderate evidence that FES treatment does not prevent the loss of shoulder function after a stroke.
- **Shoulder Subluxation:** There is limited evidence that FES improves and prevents shoulder subluxation after stroke. There is conflicting evidence as to whether there is a lasting effect after the treatment is stopped.
- **Shoulder Pain:** There is moderate evidence that FES does reduce shoulder pain post-stroke when there is shoulder subluxation.
- **Shoulder Muscle Tone:** There is limited evidence that FES treatment, in combination with conventional physical therapy, can improve tone in the shoulder of post-stroke patients.
- **Shoulder EMG Activity:** There is limited evidence that FES treatment, in combination with conventional physical therapy, can improve EMG activity in the shoulder of post-stroke patients.

### What can I expect?

Small square stickers (electrodes) are placed over the centre of the muscle belly. Wires connect the electrodes to a stimulator, a small machine that produces the current. The stimulation is usually started at a very low level causing a tingling “pins & needles” feeling on the skin. The current will then slowly be increased after each stimulation until it is strong enough to make the muscle contract. This level (the smallest current necessary to make the muscle contract) will be used for the treatment. Although some people find it uncomfortable, it is usually well tolerated. Treatment times may vary. However, the time is usually divided into 3 to 5 sessions per day ranging in duration from 45 minutes to 2 hours, 5 to 7 days per week.

### Side effects/risks?

The electrodes can irritate the skin, but this is not common. Using hypoallergenic electrodes or changing the type of stimulation used can often solve this problem. After the treatment, there may be pink marks on the skin under the electrodes. Usually the pink marks fade out within an hour. Although very rare, this type of therapy can increase spasticity (muscle tightness).

Some people should not use FES. These include people with: epilepsy, poor skin condition, hypersensitivity to the electrical stimulation, cancer, cardiac pacemakers.

**Who provides the treatment?**

Physical therapists will usually provide the FES treatment. However, due to the long duration of the stimulation it is possible for the treatment to be done at home after discharge from the hospital. This will require having a stimulator at home.

**How many treatments?**

Some patients continue to use FES for many years. To maximize the benefits after stroke, it should be used for at least 6 weeks.

**How much does it cost? Does Insurance Pay For It?**

Although the cost of an FES machine varies, some systems are relatively inexpensive. Rental or lease options bring the cost down to the equivalent of 1 or 2 clinical visits per month.

**Is FES for me?**

While there haven't been many high quality studies of FES for treating the hemiplegic shoulder, most of the studies have reported good results from its use. More specifically, FES has been reported to improve function, reduce subluxation, reduce pain, reduce tone and increase EMG activity.

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