StrokEngine

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FUNCTIONAL ELECTRICAL STIMULATION
FOR THE UPPER EXTREMITY
Information for Patients and Families

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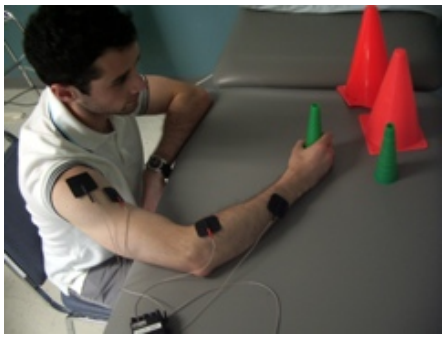
What is Functional Electrical Stimulation (FES)?

Functional electrical stimulation (FES) is a technique that causes a muscle to contract through the use of an electrical current. This might sound strange, but in fact, the body naturally uses electrical currents to make muscles move. Normally, when a part of the body needs to move, the brain sends electrical signals through the nervous system. The nerves, acting like electrical wires, relay these signals to the muscles, directing them to contract. This contraction causes the body part - for example, the elbow, wrist or finger joints - to move in a controlled, deliberate way.

After a stroke, some of these electrical signals do not function as well as they should. FES allows muscles that have been paralyzed or partially paralyzed by stroke to move again. When using FES as an intervention after a stroke, the therapist applies an electrical current to the skin over a nerve, or over the bulk of a muscle, causing muscle contraction.

This module will look at the use of FES for loss of function, pain or spasticity (stiffness) of the arm, wrist and hand. Two other modules in StrokEngine focus on FES for the leg and the hemiplegic shoulder.



Are there different kinds of FES?

Yes. You might see different names including functional electrical stimulation, functional neuromuscular stimulation and electrical stimulation. But they all have the same goal: to stimulate muscle contraction which in turn may lead to increased function, strength and movement, and decreased pain and spasticity. Also, FES may provide benefits such as increased reaction time and improved hand function (dexterity).

Why use FES for the arm and hand after stroke?

Loss of arm and hand function, movement, and strength are common after a stroke. Pain and spasticity are also common after a stroke. FES may be useful for increasing arm and hand function and for preventing pain and dysfunction after a stroke.

Does it work for stroke?

Researchers have studied how FES can help patients with stroke who experience a weak or painful hand.

Hand function and dexterity
Researchers have found that FES is helpful in re-training hand function and dexterity in individuals with acute and chronic stroke.

Hand strength
The research in this area is still inconclusive – that is, we do not know if FES is better than other treatments for strengthening the hand after a stroke.

Functional independence
Research has shown that FES for the arm and hand were not effective in improving overall functional independence. In other words, patients who were treated with FES did not necessarily improve in their ability to take care of themselves.

Spasticity (stiffness)
There is limited evidence that FES reduces spasticity for patients in the chronic phase of stroke.

Range of motion (movement of joints)
Research has not found FES to be effective for increasing movements of the hand and arm soon after a stroke (acute patients).

But for clients who are in rehabilitation (in the sub-acute or chronic phases), FES applied to specific muscles has been shown to be more effective than regular therapy for increasing movement.

Motor function (general functioning of muscles and nerves)
There is conflicting evidence as to whether FES treatment, in combination with conventional physical therapy, can improve motor function in patients with acute stroke.

However, for patients with sub-acute stroke, FES treatment combined with task specific exercises has been shown to improve motor function.

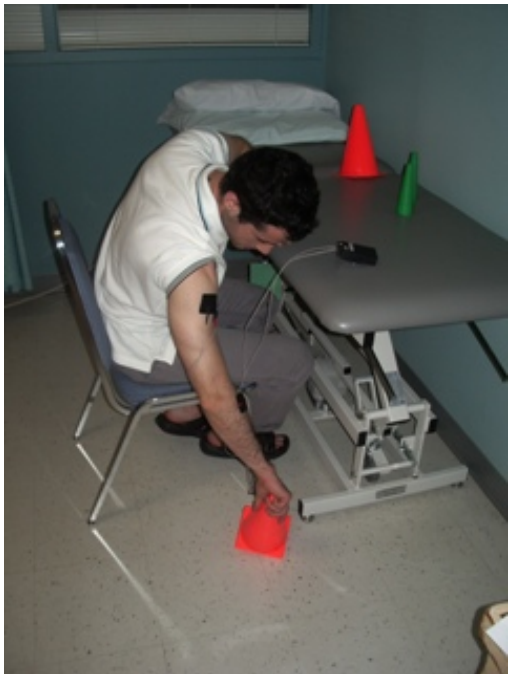
For patients with chronic stroke, it has been shown that FES treatment in combination with conventional therapy does not improve motor function.

Reaction time (how fast you move your hand in response to instructions)
Researchers found that FES does help to improve reaction time in those with an acute stroke. But, for more chronic stroke patients, FES does not seem to be more beneficial than regular therapy.

What can I expect?

Small square stickers (electrodes) are placed on the skin over the centre of a muscle. 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 and 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 the treatment uncomfortable, it is usually well tolerated. FES may give some discomfort, but it is virtually painless. Treatment times may vary. However, the time is usually divided into a number of daily sessions. FES treatments are usually done for 30 - 45 minutes, but once you are set up, you can typically perform the treatments on your own or with a family member.



Are there any side effects or risks?

Some people may find that certain types of electrical stimulations are irritating, but this can be easily fixed by changing the level of the current. The electrodes can irritate the skin, but this is not common. Using non-latex hypoallergenic electrodes can often solve this problem. After the treatment, there may be pink marks left on the skin where the electrodes were placed, but these usually fade within an hour. Although it is very rare, this type of therapy can increase spasticity (muscle tightness).

NOTE: People with epilepsy, poor skin condition, hypersensitivity to the electrical stimulation, cancer, and cardiac pacemakers should not receive FES treatment.

How many treatments do I need?

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

Who provides the treatment?

Physical therapists or occupational therapists 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 machine at home. If you are provided with a home stimulator, family members or friends will be given instructions on how to assist with treatments. Usually, once the electrodes are placed, the rest of the procedure is very simple. To operate a FES machine, you simply switching it on and increase (slowly and gradually) the intensity of the current on a knob - just like switching on a radio and increasing the volume.

NOTE: Consult with your therapist or medical professional on the exact use of specific models of FES equipment.

How much does it cost? Does insurance pay for it?

Although the cost of a FES machine varies, some systems are relatively inexpensive. Rental or lease options bring the cost down to the equivalent of 1 or 2 clinic visits per month. Some insurance plans cover the purchase or rental of such equipment. Check with your insurance company.

Is FES for me?

While there have not been many high quality studies on FES for treating the arm and hand, those studies available generally report good overall results. FES has been shown to help recovery after stroke, although the differences between regular therapy and FES therapy alone were not large. While some studies have found FES to be "ineffective" for independence in function, strength, spasticity or range of motion, there is clear evidence that there are benefits to using FES in comparison to regular therapy, such as improved motor hand functioning and dexterity, and increased reaction times.