

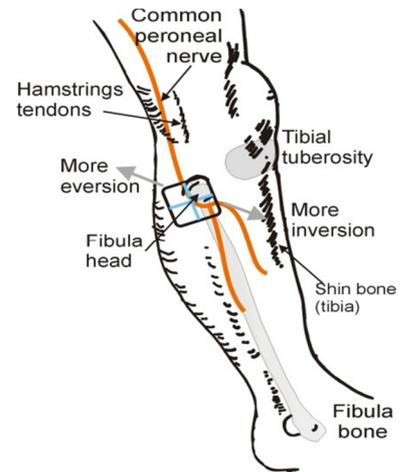
ELECTRODE POSITION REVISION

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Finding the right electrode position for your patient is an important part of using FES in the clinic. We aim to produce dorsiflexion with a little eversion. Eversion is important as it enables safer weight bearing at heel contact. Here is a reminder of the positions commonly used in our clinic.

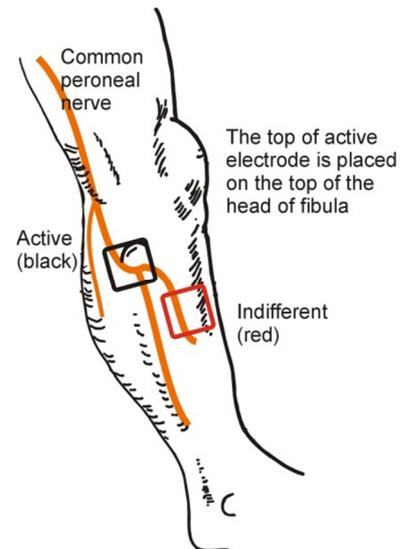
Finding the Head of Fibula

The head of fibula is the most important anatomical landmark for identifying electrode positions. It is important that the patient learns how to identify it for themselves. It can sometimes be confused with the tibial tuberosity so patients should remember that the fibula head is further round the side of the leg and is the lowest bony prominence. A good way to teach it is by asking the patient to find the ankle bone and run their fingers up the outside of the leg until the first bony prominence is found.



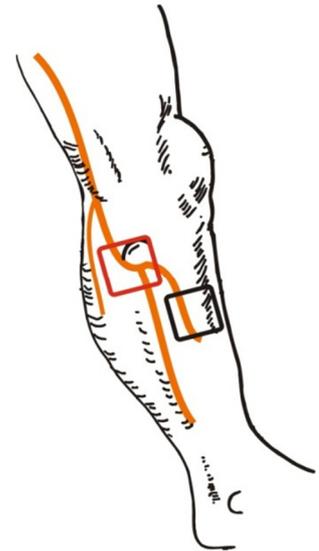
Standard Electrode Position

To place an electrode on the fibula head, imagine the electrode divided into 4 quarters. Place the top, front corner over the fibula head. This will result in the common peroneal nerve passing diagonally underneath the electrode. If you press with your finger on the 4 quarters, the top front quarter will feel hard while the other quarters will feel soft. This is a good exercise for the patient to do. Place the second electrode over the belly of the anterior tibialis muscle. This is generally one fingers breadth to the side of the tibia bone and about one fingers breadth below the fibula head electrode. Often the corners of the electrodes will be in line with each other as shown. If the electrode goes over the tibia bone the stimulation can sting a little. Connect the black electrode lead plug to the top electrode and the red electrode plug to the other electrode: this is called the standard electrode position and is the most commonly used position. Moving the top electrode further forward and downwards will generally recruit proportionally more of the deep branch of common peroneal nerve and cause increased inversion. Moving the same electrode back and upwards will cause more eversion as a greater proportion of the superficial branch is stimulated. Moving the lower electrode further away from the tibia and more over the peroneii muscles may also increase the amount of eversion.



Reversing the Polarity

Sometimes the standard position produces too much eversion even after adjustment. Swapping over the electrode leads will make the electrode over the tibialis anterior the negative electrode and as there is always a stronger stimulation effect under the negative, a greater proportion of this muscle will be stimulated. This will produce greater inversion. This will often be suitable for patients with low calf tone. Patients with high calf tone will often require more eversion because excessive calf activity causes plantarflexion with inversion.



Symmetrical Biphasic.

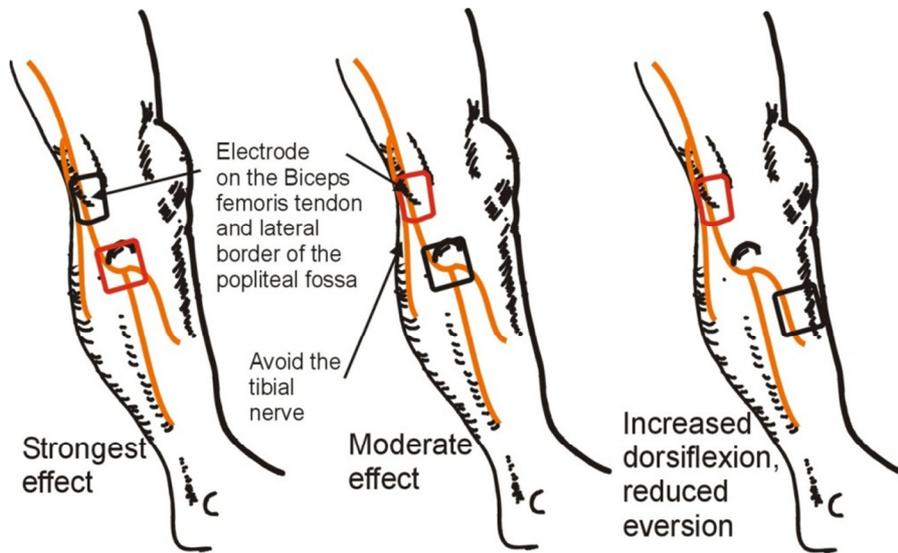
Sometimes it is the case that the standard position causes too much eversion but reversed polarity causes too much inversion. A compromise can be achieved by changing the waveform from asymmetrical biphasic to symmetrical biphasic (second to last parameter on the FINETUNE menu of the ODFS® Pace). This will cause both electrodes to have equal stimulation effect, producing a balance of eversion and inversion.

Popliteal Fossa Positions

The common peroneal nerve can be stimulated more proximally than at the head of fibula by placing an electrode behind the knee. The nerve runs up the lateral side of the popliteal fossa, just to the inside of the biceps femoris tendon. Place an electrode with one edge along the tendon with the rest of the electrode within the fossa. If you place the electrode too far into the popliteal fossa, it is likely that the tibial nerve will be stimulated, causing plantarflexion from calf activation. Placing the electrode a little more proximal can sometimes be more comfortable but may also have less effect as the nerve will be deeper.

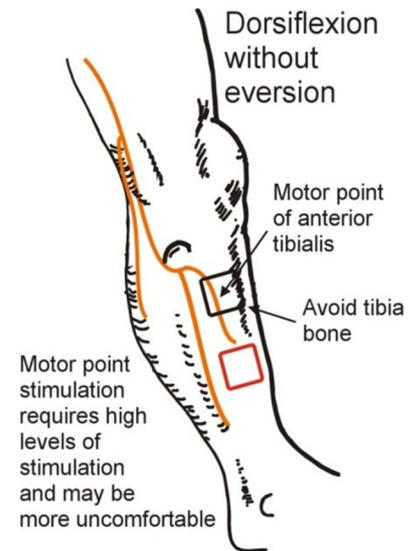
Stimulating the nerve in the popliteal fossa will generally produce a stronger effect, producing more dorsiflexion and more eversion. It is also the best electrode position for producing a withdrawal reflex, improving knee and hip flexion. Sometimes excessive hip external rotation can occur.

The strongest effect is produced by placing the active (black electrode plug) in the popliteal fossa with the indifferent on the head of fibula. A more moderate effect is achieved by reversing the polarity. If too much eversion is produced, move the electrode from the head of fibula to the motor point of anterior tibialis. If more eversion is required, the lower electrode can be moved towards the peronei group. These positions can be used with either polarity electrode. Further variation can be found by changing the waveform to symmetrically biphasic.



Motor Point Stimulation

If all the other electrode positions produce too much eversion, place the active electrode over the motor point of tibialis anterior with the indifferent electrode below it. If a little eversion is needed, either or both electrodes can be moved towards the peroneii group. It is common for a higher level of stimulation to be required for this electrode position because the nerve is less superficial. This may make the stimulation more uncomfortable



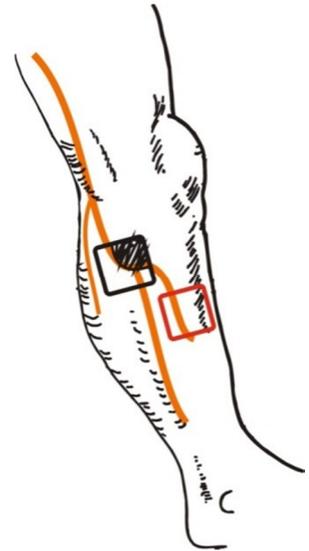
Toe clawing while walking

Sometimes a dropped foot stimulator user can experience toe clawing. This is generally a spastic response to walking and not caused by the FES. Sometimes it is possible to increase toe extension by stimulating the long toe extensors. This

can be achieved by placing one electrode over the common peroneal nerve as before and the other over the toe extensors, mid way down the lower leg (lower than the Standard position). Choose polarity and waveform depending on the response you find.

Finding the electrode positions again

Many patients ask us to mark the position of the electrodes on their legs with an indelible marker. While in the short term this helps ensure correct duplication of the positions, after a few days the marks will fade. While re-marking can help, the lines can drift in time resulting in incorrect positions. The best plan is for the patient to learn their own anatomy and understand why the electrodes are placed where they are. In this way, if the incorrect response is found, they will have a better idea of what to do to improve the movement of the foot. An aid to learning the anatomy is to mark the position of the head of fibula on the back of the electrode. The patient then learns to line up the mark with their fibula head and in this way learns the anatomical land mark. Likewise the position of the biceps femoris tendon can also be marked.



Conclusion

Our knowledge of electrode positions continues to expand as we see more patients and try out new ideas. As with all things with FES, don't be afraid to use your knowledge of anatomy and basic principles to experiment and find variations of your own.

Please let us know your own experiences and ideas so we can share practice through the FES Newsletter.