

FOLLOW UP OF PATIENTS WITH A PERONEAL STIMULATOR: INDICATIONS FOR PRESCRIPTION.

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I Abstract

40 Patients remitted to the department of rehabilitation of the Free University Hospital Amsterdam and the Roessingh Rehabilitation Center at Enschede in the Netherlands were evaluated during a period of 1 to 7 years to find out how to optimise the use of the stimulator.

Early start of the treatment leads to a better therapeutic result and can cause the leg to be less disregulated than the arm. Severe disregulation of the agonist/antagonist ratio can be influenced in a positive way by phenolising motor points.

In all our patients the distance of walking was improved significantly. In testing the functionality of the lower leg musculature by means of a standard check list we see a better score in most patients caused by a better ratio between the active contraction possibilities of agonists and antagonists. This is confirmed by analysis of the EMG. Temperature of the legs becomes mostly symmetrical as could be stated by thermography. Stimulation produces satisfactory results in 15 - 30% of the total ambulatory hemiparetic population. No such percentages can be given for other diagnoses in which the stimulator could be prescribed.

Adding the possibilities of phenolisation we use the selection criteria of Merletti to prescribe a stimulation. The diagnoses in which this is possible are given.

II Introduction

After Liberson's publication concerning stimulation of the peroneal nerve other articles on this subject appeared. The last ten years publications were based on the use of objective parameters to evaluate the stimulator. (Gračanin 1972; National Academy of Sciences and the National Institute of Health, 1972; Zilvold, 1976; Ship and Mayer, 1977; Van Griethuysen, 1978; Dillner, 1978; Merletti, 1979.)

In the Netherlands this method is only used in two places, namely Amsterdam and Enschede, because we have the impression that the technical problems around the apparatus have not yet been solved. If the apparatus were to circulate in the country at this stage the effect might be that the apparatus should disappear into the cupboard as useless. For this reason the Philips apparatus were no success and it gave the FES (by Philips) a bad name. This study was undertaken to evaluate by means of a critical follow up of patients in the course of the years which points are of importance in the prescription of stimulators.

III Methodology

The group consisted of patients who were sent to the department of rehabilitation of the Free University Hospital Amsterdam and the Roessingh Rehabilitation Center at Enschede. All patients were remitted due to problems in gait caused by upper motor neuron dysfunction.

We are concerned with about 40 patients, who were given stimulators from 1974. The patients are looked at 3 or 4 times a year, and with the help of a check list their experiences with the stimulator are recorded. Of most patients electromyographic research have been done frequently to be able to trace the influence of the stimulator of the dysfunction.

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Thermography was done to be able to measure the influence of the circulation in the affected leg and a standardised leg function test was done to be able to see the influence on the function of the leg. It was not the intention to prove by means of these parameters that stimulation is better than other methods like orthoses and such. This was already established by other researcher and us in the past.

Our aim was to reduce the remaining complaints around the apparatus to a minimum, so that the apparatus can circulate better in the Netherlands.

IV Results

Time of onset of the treatment: Gračanin says in his final report of June 1972 in the conclusions that FES should be used in the early stage of rehabilitation. This was confirmed by Merletti, who stated that FES should be applied within a few months after the lesion, when high spasticity has not yet developed. Intensive FES treatment in such a situation would lead to therapeutic effect of more than 70% whereas a longer time after the lesion the likelihood to succeed drops to 30%. This is confirmed by our observations. In some patients who's treatment was started early, a discrepancy arose between the degree of disregulation of the arm and the leg. The arm is much more spastic than the leg. When there is a serious spasticity of the foot/ankle region there is the possibility to brake this pattern by means of phenolisation of the plantar flexors. This is done by putting some drops of phenol in the motor-point of the dominating gastrocnemius muscle. (Fig.1) We will report on this in another paper on this congress.

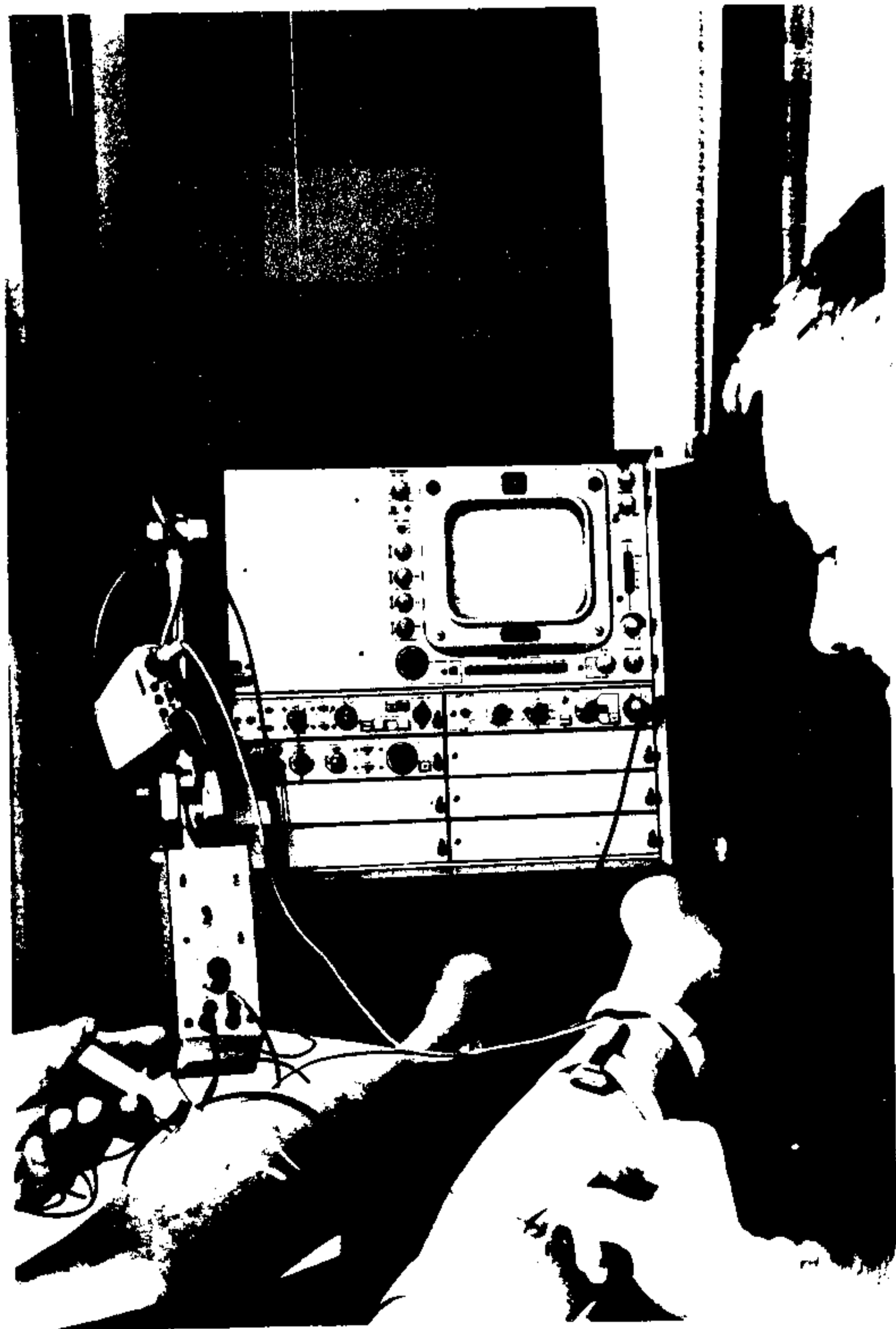


Fig.1: putting some drops of phenol in the motor-point of the dominating gastrocnemius muscle.

After the phenolisation these patients can also be provided with a stimulator. Normally the phenolisation should be repeated after a few months or a year, but when a stimulator is used this is often not necessary because the stimulator maintains the spasm lowering effect.

V Complaints about cables

In practice we work with 2 apparatus namely the FEPA 10 from Yugoslavia and the STIPEL and BISTIPEL developed by our friend Dominique Thomas. (Fig.2)

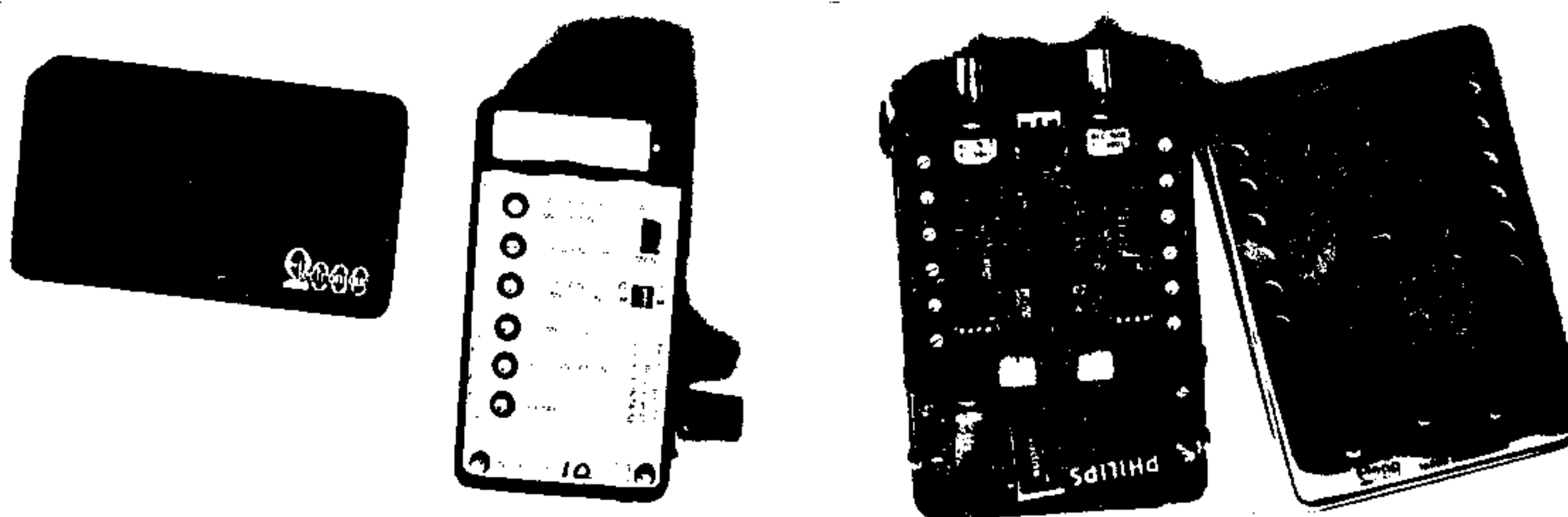


Fig.2: STIPEL and BISTIPEL

The BISTIPEL is very useful when the patients have to be stimulated from both sides. Some patients prefer the FEPA 10 for one side stimulation, because of the big switch on the front to regulate the current. Others prefer the STIPEL because the parameters can be adjusted minutely. The last few years there are fewer complaints about the cables than formerly. The most frequent errors were broken connector plugs or broken cables in the transition to the plug. Another place where the cables often break is at the transition to the electrodes. All our patients have spare cables and electrodes, so that they can replace themselves, since they are mostly totally dependent of the equipment.

The last few years we have fewer complaints with the cables except for a few patients. One of these patients has developed a much firmer cable himself, which can be repaired by the patient himself when it breaks which is an advantage. The patients who often have broken cables are given the firmer kind and then the problems are over. (Fig.3)

VI The place where the apparatus is kept

Most patients wear the apparatus around the neck. Men often have it in their pockets; one patient has fastened the apparatus to his calf in a leather bag by means of elastic strips. In this way he has hardly any broken cables or none at all.

VII The time needed to put on the apparatus

Almost all patients with 2 exceptions are able to put on their apparatus themselves. Most of them need 2 to 5 minutes, some need 15 minutes.

If the right place for stimulation is hard to find, the patients are tattooed on the stimulation spot.

VIII The gait pattern

The gait pattern is completely dependent on the measure of spasticity and the diagnosis. In hemiparesis with a serious stretch spasm we see just as in pareses which are the result of a spinal cord injury or brain contusion equino varus of the foot and extension of hip and knee. This causes circumduction during the swing phase of the affected leg. In a flaccid pareses, as seen in multiple sclerosis and hemiparesis, we see that the toes stick to the ground. The MS-patient lacks the power to raise his leg and therefore he has a strongly limited walking distance. The hemiparesis patient solves this problem by an increased flexion of the hip and knee. These gait patterns were evaluated by Ship and Van Briethuysen. When walking with the stimulator we find that these patterns disappear and the walking distance increases considerably from 10 yards to hundreds of yards or from hundreds of yards to unlimited. If the patient used one crutch before he can often do without it or in case of extension spasm the patient can walk with one crutch now, because the circumduction disappears and now he can go shopping again for instance.

IX The carry over phenomenon and own muscle activity (assessed by EMG analysis)

Liberson stressed this point in his publication. The disharmony between agonists (foot raisers) and antagonists (foot stretchers) decreases. Sometimes a spontaneous active dorsal flexion occurs, which remains for a few hours and sometimes days after the stimulation. And in some cases it is even permanent. In the later case the patient has no more need for the apparatus. In many patients we see the own activity of the dorsal flexors increase in the course of time. This appears from the leg-function test and from the EMG-registrations of isometric contractions of the agonist and antagonist of the lower leg in dorsal and planter flexion. We reported on this previously. (Visser, 1978)

In a spastic equino varus the relation between agonist and antagonist becomes more normal concerning the power and electrical activity in the analysis of the EMG.

Then agonist and antagonist are about equal in power and electrical activity (this is a spastic paresis) the relations are also favourably influenced because the power and electrical activity in the agonist decreases and own muscle activity becomes possible again.

X The temperature of the leg

Through the working of the muscle pump the temperature in the leg becomes often symmetrical again. Left is equal to right.

This is the case in most patients and we could ascertain this by making thermograms of the lower legs.

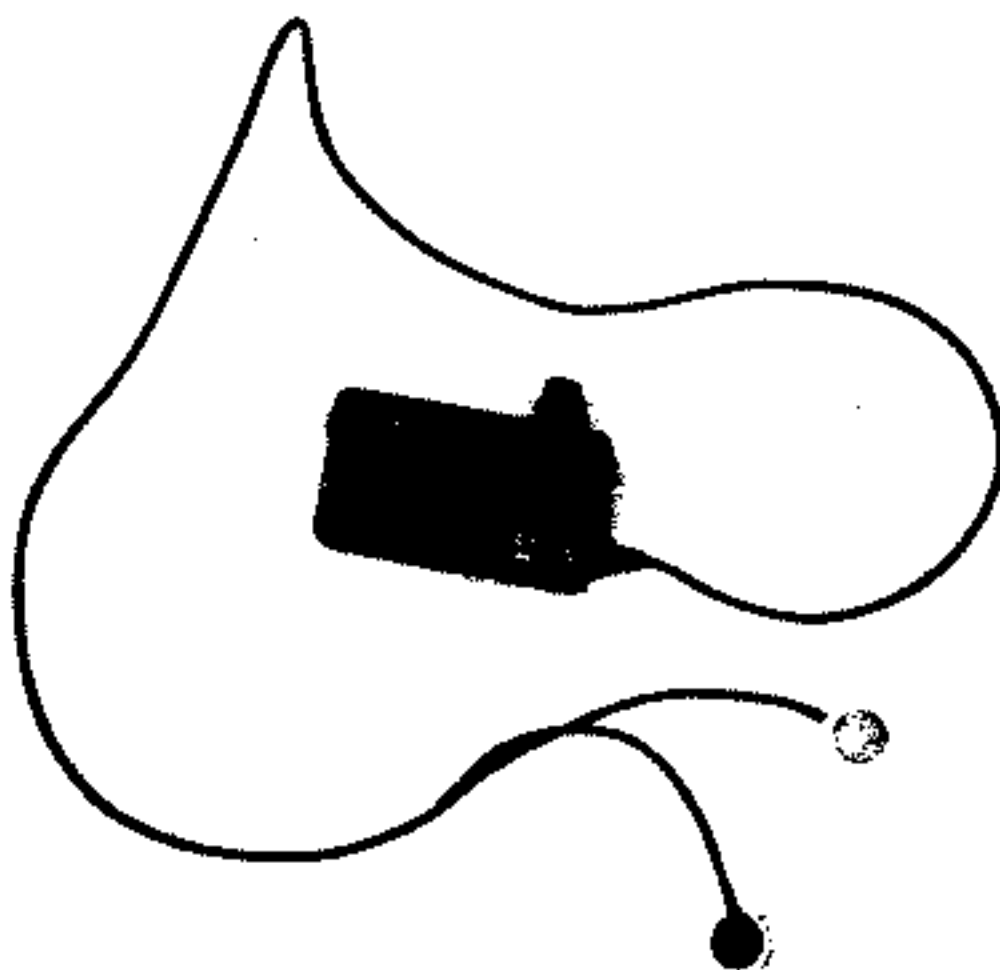


Fig.3: firmer cable

XI The influence of the stimulation on the arm in hemipareses

Only 2 patients from our series show this.

One housewife can use her hand again when she is stimulated which without stimulation of her leg she cannot.

Another patient walks with a flexion spasm in his elbow without stimulation and with a stretched arm if his leg is stimulated.

Gračanin already said in his final report: 'The effect of FES on the organization of motor activity including participation of mechanisms at higher levels of the central nervous system is probably involved.'

This longer continuing inhibition can not be explained with monosynaptical or oligosynaptical reflexmechanisms. Presynaptical mechanisms must be the reason for these longer inhibitory effects.

XII Which percentage of patients with a hemiparesis is suitable for the FES?

Gračanin said in his final report that FES produces satisfactory results in approximately 30% of hemiplegic patients. We found a percentage of 25% and Van Griethuysen found the same percentage. Merletti has good results in 15% of the total ambulatory hemiparetic group. For the other diagnoses like MS and paraparesis the number of patients is too small to be able to say something about percentages. Very important for the percentage is the reliability of the equipment, service facilities and a skilled technical staff. Since January this year the stimulators are paid for by the insurance in the Netherlands, when they are prescribed by a physiatrist. The selection criteria to give a patient a stimulator are stated by Merletti and they are excellent as he could show in his study. We make one exception: In the case of severe spasticity we try to diminish this by the use of phenolisation. When phenolisation is successful these patients can be treated with the stimulator too.

Taking these criteria into account we can prescribe the stimulator to patients with upper motor neuron dysfunction caused by:

- cerebrovascular disease resulting in hemiparesis
- spinal cord injuries resulting in paraparesis
- brain contusion resulting in paraparesis
- multiple sclerosis resulting in flaccid paresis.

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