

# Flexistim

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## Application Guidance

**TensCare™**



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# 1 .TENS

## 1.1 HOW “TENS” WORKS

TENS stands for Transcutaneous Electrical Nerve Stimulation.

TENS stimulates your body's own natural defences against pain.

TENS is totally safe, has been used successfully by thousands of pain sufferers.

TENS sends a gentle stimulation through the skin which works in TWO ways:-

### **Pain Gate**

Stimulating the sensory nerves, which carry touch and temperature signals. These nerves go to the same connections in the spine as the nerves carrying pain. A strong sensory signal will block the pain signal travelling up the spine to the brain. This is known as closing the “Pain Gate” and takes effect quite quickly after the unit is switched on. You can use TENS several times a day, for as long as you like.

### **Endorphin Release**

At low frequency settings, and slightly stronger output, TENS drives the motor nerves to produce a small repetitive muscle contraction. This is seen by the brain as exercise, and this promotes release of Endorphins – your body's own natural pain killer. The relief builds up and normally takes about 40 minutes to reach a maximum level which can last for hours after the machine is switched off.

By using TENS you can expect to achieve a significant reduction in pain if not complete pain relief.

There is no one setting appropriate for a particular condition, and the most appropriate varies from one person to another, even if they have the same type of pain. Therefore, the selection of both the settings and the positioning of the pads should be performed on an individual basis. You may need to try a few positions/programmes before finding the one that suits you the best.

If you are using TENS for the first time, it is recommended that you start with programme A. TENS can be used for as long as is necessary. Continuous treatment is fine, but electrode pads should be repositioned regularly (at least every 12 hours) to allow the skin to be exposed to the air.

The Endorphin Release modes work better when the strength is high enough to cause small muscle contractions. Best results are achieved at between 20 and 40 minutes.

## 1.2 T.E.N.S. SETTINGS

- **Frequency (measured in Hz – pulses per second)**

The **Flexistim** units offer a range of frequencies from 1 to 150Hz

Frequencies from 80 to 150Hz are good at blocking pain signals.

A low frequency of 4 or 10 Hz allows for the release of endorphins, the body's natural morphine-like substances.

- **Pulse Width (measured in  $\mu\text{S}$  – millionths of a second)**

The **Flexistim** units offer a range of pulse widths from 50 to 300  $\mu\text{S}$ .

A low pulse width is more likely to stimulate sensory nerves (pain gate), a high pulse width is more likely to stimulate motor nerves (Endorphin release). The feeling through the pads will strengthen with increasing the pulse width.

- **Constant and Burst Modes**

Constant mode is when the sensation is continuous as against Burst mode when the sensation, is as its name implies, is one of on and off.

- **Modulation Modes**

Modulation is when either the frequency or pulse width sweep across range of settings. This enables the body to receive many different signals and can be very beneficial and lessen any effect of accommodation. The Flexistim has two Modulation Modes

## 1.3 POSITIONING THE ELECTRODES FOR TENS

Electrodes are usually first placed where the greatest pain is felt.

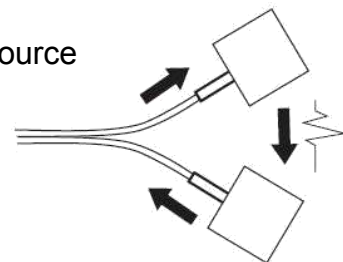
Try different positions until you find the best for you.

Try moving the electrodes short distances to establish the positions that are most effective for you.

The following body maps in this instruction booklet will show you where to place the electrode pads for a range of common complaints, dependent on your symptoms.

For symptoms not illustrated, apply the pads around/near to the source of the pain or seek advice from your doctor or physiotherapist.

The electrode pads must always be used in pairs, so that the signal can flow in a circuit.



**NOTE: Always check unit is OFF before attaching or removing pads.**

## TENS ELECTRODE PAD POSITIONS

**Low Back Pain**



**Neck and Shoulder Tension**



**Sciatica**



**Shoulder Pain**



**Knee Pain**



**Elbow Pain**



**Ankle Pain**



**Wrist Pain**



**Leg Pain**



**Where only two pads are shown on the arm, shoulder, and leg, use the other two pads either on the opposite limb or place all four pads on the same limb in a square pattern with each pad being about 4 inches apart.**

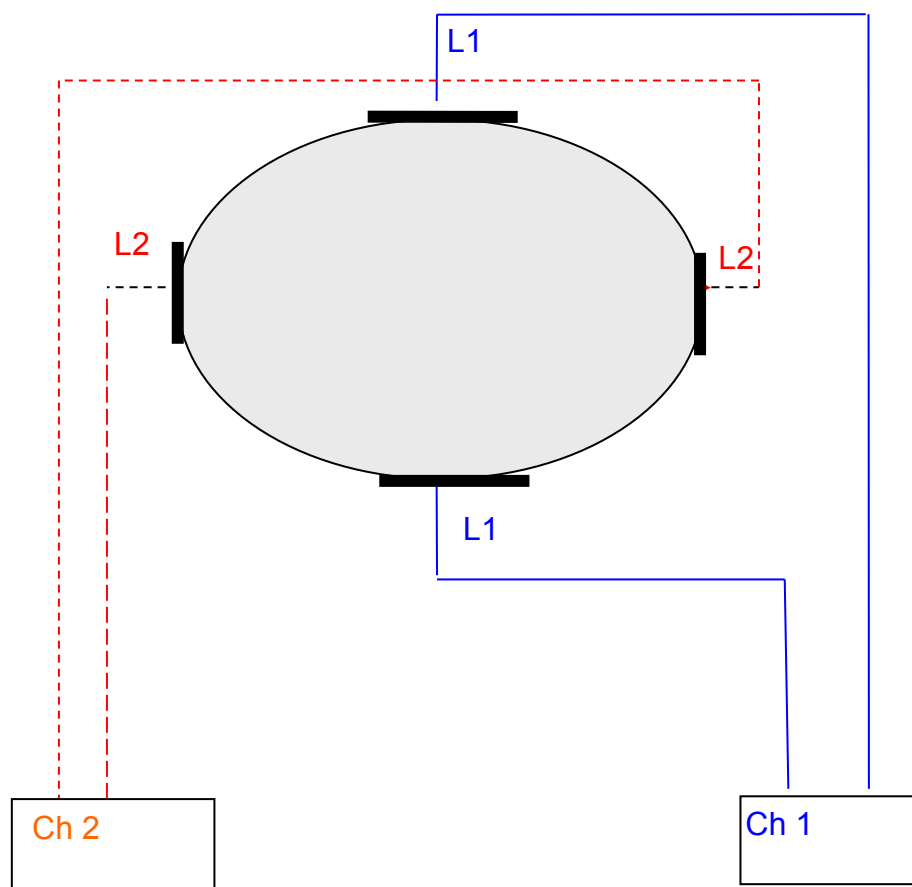
## 2 INTERFERENTIAL THERAPY

### 2.1 HOW INTERFERENTIAL THERAPY WORKS

Flexistim produces a low frequency current treatment that uses two medium frequency currents, which “interfere” with each other to produce a beat frequency that the body recognizes as a low frequency energy source.

The rationale is to overcome the problems caused by low-frequency currents, while maintaining their claimed therapeutic effect. Unlike TENS, which delivers intermittent pulses to stimulate surface nerves and block the pain signal, Interferential Current Therapy delivers continuous stimulation deep into the affected tissue.

The actual stimulation is produced by crossing two alternating currents with medium frequencies simultaneously to a targeted body region. As a result, these two currents will superimpose to form a new low frequency current deep within the tissue.



## 2.2. THE PADS

### 2.2.1 Placement of pads:

**NB:** Always make sure that the skin is clean and dry before attaching the pads.

Due to the technology incorporated within the **FLEXISTIM** the positioning of the pads is important. Place the four pads around the painful or stiff area. Please refer to the photographs, which show positioning in respect of knees, elbows, backs and legs. The two lead wires are described as coming from outlets Ch1 (channel 1) and Ch2 (channel 2). To attach the pads to the body simply peel the pads off the plastic liner by lifting from any corner. The pads are self-adhesive and therefore will stick automatically. Do **NOT** switch on the **FLEXISTIM** until all the pads are on the body.

### 2.2.2 Removal of pads:

Always switch **OFF** the **FLEXISTIM** before removing the pads.

Remove the pads individually and replace onto the liner. The pads are multi use and therefore can be used repeatedly, normally about 20 times.

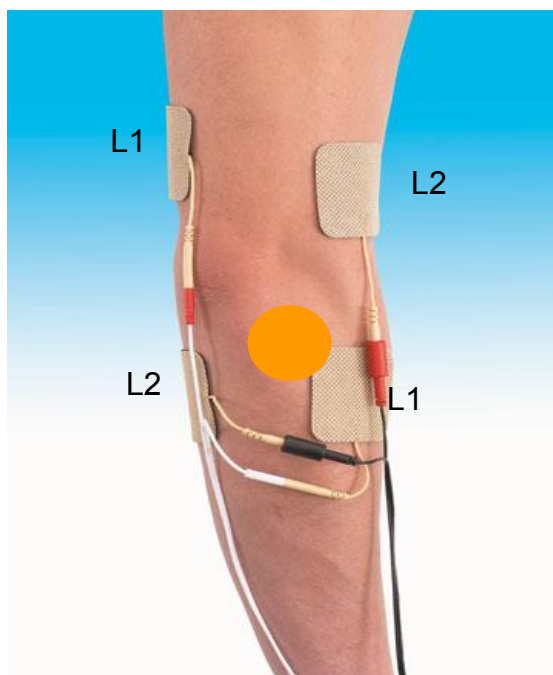


## 2. 3. PAD POSITIONING

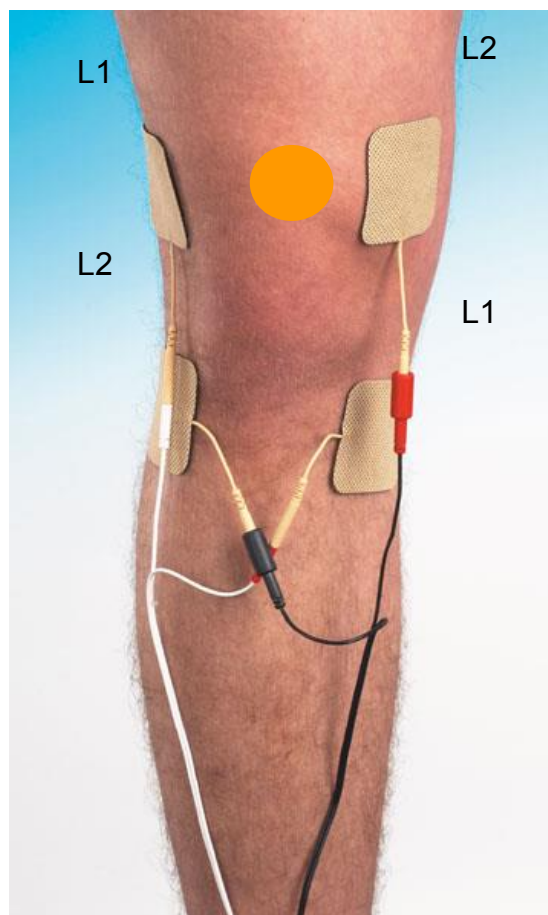
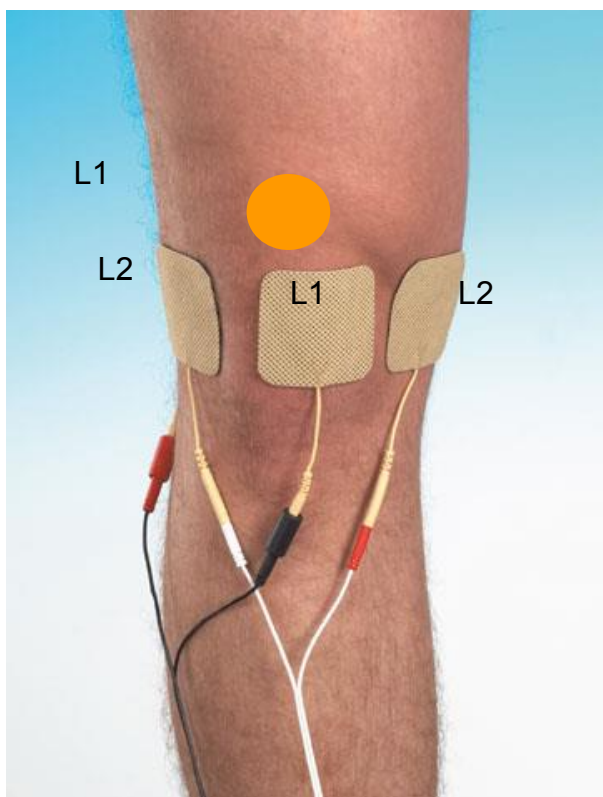


This symbol indicates the site of injury to be treated

### 2.3.1 ELBOW

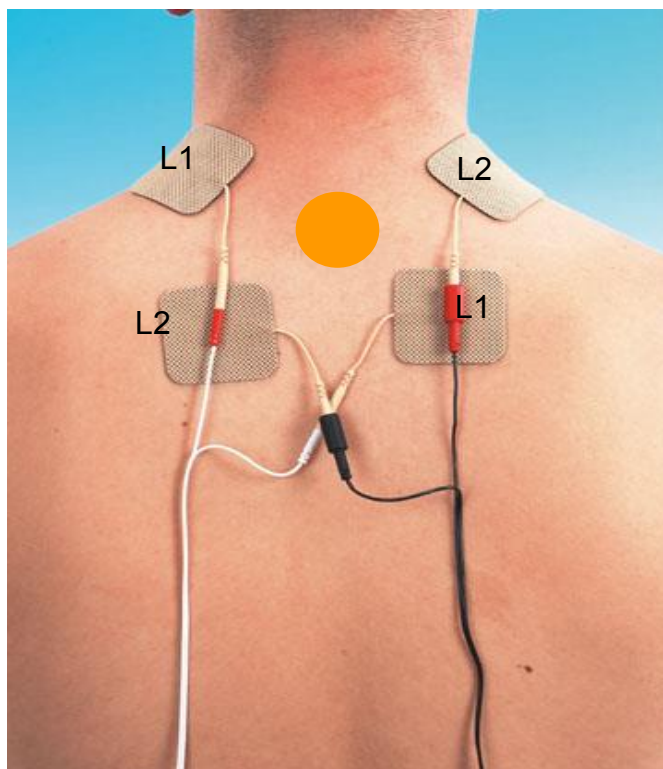


### 2.3.2 KNEE

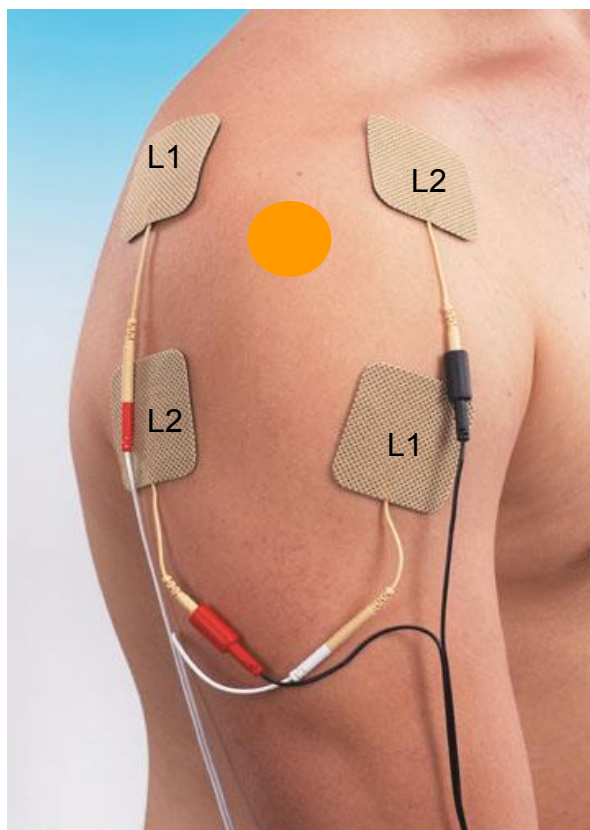


Alternative setting,

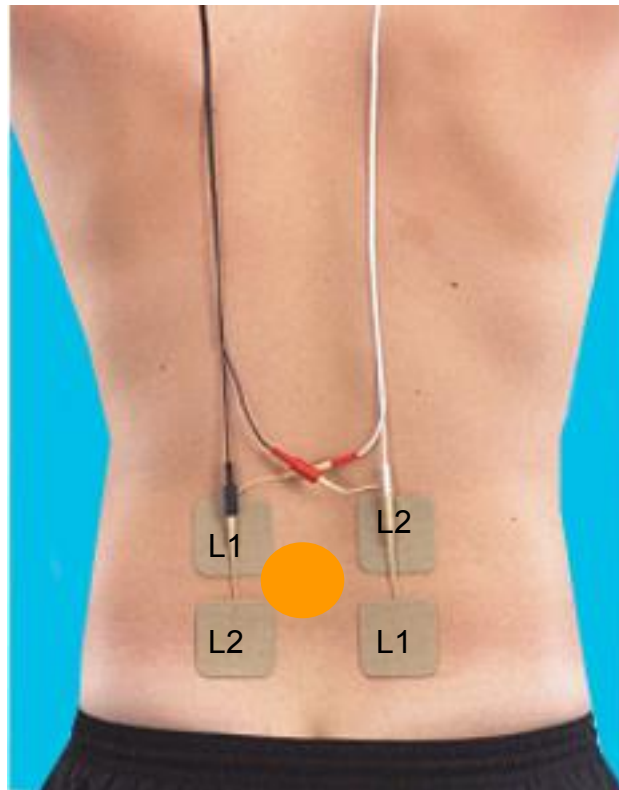
### 2. 3. 3 NECK



### 2.3.4 SHOULDER



## 2.3.5 LOWER BACK



## 2.4. INTERFERENTIAL THERAPY AS PART OF A WHOLE TREATMENT

- The use of IFT should be considered a part of the whole treatment of the condition.
- The whole treatment may include:
  - exercises to stretch injured muscles
  - exercises to move stiff joints
  - exercises to strengthen muscle groups to support the joints  
and your physiotherapist will advise you accordingly.  
Stiff joints are invariably painful so it is important to appreciate that gentle movement is generally better than resting.
- A TENS unit, which also treats pain using electrotherapy but in a different way, can be used *simultaneously* if you need extra pain control to enable you to keep the joints or muscles moving.



- If you are interested in knowing more, please speak to your physiotherapist.

## 2.5. TREATMENT PROTOCOLS

The following protocols are derived from previously published literature and from clinical advice derived from practical experience.

Unless otherwise indicated, they are not the results of controlled, peer reviewed, research, and should be treated as general guidance only.

Interferential Therapy should not be commenced before the cause of the problem has been properly diagnosed by a medical practitioner

### 2.5.1 Ankylosing Spondylitis

(Reference : B Savage, Interferential therapy)

#### Application

Relieving the persistent aching of Ankylosing Spondylitis.

Interferential therapy must be combined with exercises which encourage extension, performed either before or some hours after the treatment.

Pain is reduced and range of movement improved.

#### Settings

	First half of treatment	Second half of treatment
<b>Program</b>	<b>P3</b>	<b>P2</b>
<b>Frequency</b>	<b>80-150 Hz</b>	<b>1-150 Hz</b>
<b>Timer</b>	<b>15 min</b>	<b>15 min</b>
<b>Level</b>	<b>Maximum comfort level</b>	<b>Just below contraction</b>

#### Treatment Duration:

Treatment is given three times week for a month, followed by a rest of two or three weeks.

Most spondylitic patients require treatment two or three times a year.

## 2.5.2 Rheumatic conditions

(Reference: B Savage, Interferential therapy)

### Application

Interferential therapy can be used effectively in the acute and chronic stages of rheumatoid arthritis, osteoarthritis and spondylitis.

*Acute phase* (joints are red, shiny and swollen.)

#### Aims of Treatment:

Relief of pain

Decrease of inflammation

Increase of range of movement

### Settings

#### Treatment Duration:

The relief may be short lived at first, but treatment is repeated daily and freedom from pain should increase with each treatment.

*Chronic phase*

#### Aims of Treatment:

Relief of pain

Decrease of inflammation

Increase of range of movement

### Settings

	First half of treatment	Second half of treatment
<b>Program</b>	<b>P3</b>	<b>P4</b>
<b>Frequency</b>	<b>80-150 Hz</b>	<b>30-69 Hz (set at 43 Hz)</b>
<b>Timer</b>	<b>15 min</b>	<b>15 min</b>
<b>Level</b>	A comfortable tingling intensity but short of producing any contraction	Level: The intensity of current is such that during the sweep it produces a contraction only around 50Hz, followed by relaxation for the rest of the cycle.

The relief may be short lived at first, but treatment is repeated daily and freedom from pain increases with each treatment.

## 2.5.3 Osteoarthritis of the hip joint

(Reference: B Savage, Interferential therapy)

### Aims of Treatment

Reduce pain

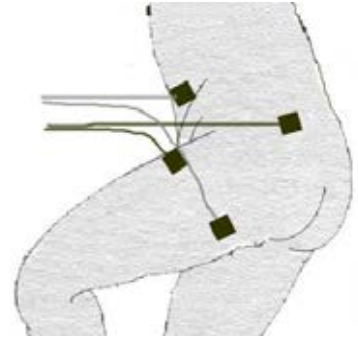
Increase blood flow

### Electrode Position:

Four Pole mode illustrated

Current should cross so that most of the stimulation is felt in the area of pain.

Placement adjustments may be made to allow for surgical site, density of tissues, underlying nerve position, etc.



### Settings:

	First half of treatment	Second half of treatment
<b>Program</b>	<b>P3</b>	<b>P2</b>
<b>Frequency</b>	<b>80-150 Hz</b>	<b>2-100 Hz</b>
<b>Timer</b>	<b>15 min</b>	<b>15 min</b>
<b>Level</b>	Set at maximum comfort level	Set at maximum comfort level

### Treatment Duration:

Treatment is given two or three times a week for 12 treatments. Daily treatment is not necessary, but once a week is ineffective. After 12 treatments the patient should cease treatment for a month to prevent over-tiredness.

After treatment the patient should rest for at least 15 minutes, preferably longer, and undertake no severe exercises for at least an hour. The longer the rest period, the longer the relief of pain will last. If an exercise class is to be undertaken this must *precede*, not follow, treatment. Immediately after treatment the patient has less pain and the range of movement is increased. This may last only a short time at first but is more prolonged after each treatment.

## 2.5.4 Osteoarthritis of the knee joint

### Application

Non-surgical approach in conjunction with other therapies  
Post-op procedures

### Aims of Treatment

Reduce pain  
Increase blood flow

### Electrode Position:

With the knee joint, some patients find that 2 Pole treatment is more effective than 4 Pole. Here, one pad is placed over the most painful area and the other directly opposite directing the current straight through the joint. The patient usually reports that the current is 'picking out the painful spot' if he does not, the electrode is moved until he does. The increased pain dies away after a few minutes and relief continues after treatment.

### Settings:

	First half of treatment	Second half of treatment
<b>Program</b>	<b>P3</b>	<b>P2</b>
<b>Frequency</b>	<b>80-150 Hz</b>	<b>2-100 Hz</b>
<b>Timer</b>	<b>15 min</b>	<b>15 min</b>
<b>Level</b>	Set at maximum comfort level	Set at maximum comfort level

### Treatment Duration:

Treatment is given two or three times a week for 12 treatments. Daily treatment is not necessary, but once a week is ineffective. After 12 treatments the patient should cease treatment for a month to prevent over-tiredness.



## 2.5.5 Treatment of recent injuries - Relief of pain

### Application

Relief of pain is of first importance not only as an end in itself but because pain produces spasm, unnatural movement and production of further strains. However, it must not be forgotten that spasm may be protective and its removal may leave the injured structure open to repetition of the original injury.

Therefore when spasm has been relieved, support must be given with bandage or strapping to prevent uncontrolled or excessive range of movement.

### Aims of Treatment

Reduce pain

### Electrode Position:

Four-electrode method:; Two electrodes are placed immediately above and two below so that the currents cross at the site of injury .

### Settings:

	First half of treatment	Second half of treatment
<b>Program</b>	<b>P3</b>	<b>P4</b>
<b>Frequency</b>	<b>80-150 Hz</b>	<b>60-137 Hz (set at 86 Hz)</b>
<b>Timer</b>	<b>15 min</b>	<b>15 min</b>
<b>Level</b>	Definite prickling sensation well within patients tolerance. If a single point of acute tenderness can be located, a strong dose may be given to anaesthetise the part but this may well not be indicated at the first treatment. Use the maximum current the patient can tolerate for three minutes.	Same as first half

### Treatment Duration:

To produce the most rapid and satisfactory result, start treatment as soon as possible. Daily treatment is given until the pain does not return significantly between treatments, then dropped to alternate days.

After treatment avoid prolonged exercise for at least an hour. The longer the period of rest between treatment and exercise, the longer the freedom from pain will last.

## **2.5.6 Treatment of recent injuries**

### **- Reduction of bruising and swelling**

#### **Application**

Reduction and/or removal of bruising and swelling, with minimum delay, is important because if left too long they lead to the formation of adhesions and impairment of function.

Since no passive congestion is produced by interferential therapy it is possible to institute treatment immediately after injury without risk of increased bleeding. If the skin is broken care must be taken to avoid introducing any infection.

#### **Settings**

	<b>First half of treatment</b>	<b>Second half of treatment</b>
<b>Program</b>	<b>P3</b>	<b>P2</b>
<b>Frequency</b>	<b>80-150 Hz</b>	<b>2-100 Hz</b>
<b>Timer</b>	<b>15 min</b>	<b>15 min</b>
<b>Level</b>	Set at maximum comfort level	Just sufficient to produce contraction at lower frequencies

#### **Treatment duration**

The colour of the bruise will be seen to change from the first treatment, though deep and extensive bruising, or a haematoma, may take several weeks to disperse.

## 2.5.7 Post-Operative Pain, Edema, and Range of Motion of the Knee

(G. J. JARIT ET AL. 18 Clin J Sport Med, Vol. 13, No. 1, 2003)

**Application** Chondroplasty /Menisectomy

**Aims of Treatment** Reduce pain / Reduce edema /Increase range of motion

**Electrode Position:** Across the joint

**Settings:**

	First half of treatment	Second half of treatment
<b>Program</b>	P1	P4
<b>Frequency</b>	2-10 Hz	60-137 Hz (set at 85)
<b>Timer</b>	15 min	15 min
<b>Level</b>	Set at maximum comfort level	Set at maximum comfort level

**Treatment Duration:**

3 times daily for 7-9 weeks.

## 2.5.8 Back Pain

**Application:** Non-surgical approach in conjunction with other therapies.  
Post-op procedures

**Aims of Treatment:** Reduce pain and increase blood flow

**Electrode Position:**

Current should cross so that most of the stimulation is felt in the area of pain.

**Settings:**

	First half of treatment	Second half of treatment
<b>Program</b>	P4	P4
<b>Frequency</b>	60-137 Hz (set at 85) Hz	10-23 Hz (set at 14) Hz
<b>Timer</b>	15 min	15 min
<b>Level</b>	Set at maximum comfort level	Set at maximum comfort level

**Treatment Duration:**

- Combined (40) minute treatment three times daily
- Suggested treatment period: one to three months

## 2.5.9 Epicondylitis (Tennis & Golfer's Elbow)

**Application:** Post-op procedures

Non-surgical approach in conjunction with other therapies

**Aims of Treatment:** Reduce pain and increase blood flow

**Electrode position:**

Current should cross so that most of the stimulation is felt in the area of pain.

Placement adjustments may be made to allow for surgical site, density of tissues, underlying nerve position, etc.

**Settings:**

	First half of treatment	Second half of treatment
<b>Program</b>	<b>P4</b>	<b>P4</b>
<b>Frequency</b>	<b>60-137 Hz (set at 85) Hz</b>	<b>10-23 Hz (set at 14)</b>
<b>Timer</b>	<b>15 min</b>	<b>15 min</b>
<b>Level</b>	Set at maximum comfort level	Set at maximum comfort level

**Treatment Duration:**

- Combined (30) minute treatment three times daily
- Suggested treatment period: one to three months

## 2.5.10 Ankle Injuries

**Application:** Non-surgical approach in conjunction with other therapies

Inversion, eversion and lateral rotation injuries

Sprains/strains and contusions / Tenosynovitis

**Aims of Treatment:** Reduce pain and increase blood flow

**Electrode Position:**

Current should cross so that most of the stimulation is felt in the area of pain.

**Settings:**

	First half of treatment	Second half of treatment
<b>Program</b>	<b>P4</b>	<b>P4</b>
<b>Frequency</b>	<b>60-137 Hz (set at 85) Hz</b>	<b>10-23 Hz (set at 14)</b>
<b>Timer</b>	<b>15 min</b>	<b>15 min</b>
<b>Level</b>	Set at maximum comfort level	Set at maximum comfort level

**Treatment Duration:**

- Combined (30) minute treatment three times daily
- Suggested treatment period: one to three months

## 2.5.11 Ankle surgery (Post Op)

**Application:** Post-op procedures

**Aims of Treatment:** Reduce pain and increase blood flow

**Electrode Position:**

Current should cross so that most of the stimulation is felt in the area of pain.

Placement adjustments may be made to allow for surgical site, density of tissues, underlying nerve position, etc.

**Settings:**

	First half of treatment	Second half of treatment
<b>Program</b>	P4	P4
<b>Frequency</b>	60-137 Hz (set at 85) Hz	10-23 Hz (set at 14)
<b>Timer</b>	15 min	15 min
<b>Level</b>	Set at maximum comfort level	Set at maximum comfort level

**Treatment Duration:**

- Combined (30) minute treatment three times daily
- Suggested treatment period: one to three months

## 2.5.12 Carpal Tunnel

**Application:** Post-op procedures

Non-surgical approach in conjunction with other therapies

**Aims of Treatment:** • Reduce pain and increase blood flow

**Electrode Position:**

- Current should cross so that most of the stimulation is felt in the area of pain.

**Settings:**

	First half of treatment	Second half of treatment
<b>Program</b>	P4	P4
<b>Frequency</b>	60-137 Hz (set at 85) Hz	10-23 Hz (set at 14)
<b>Timer</b>	15 min	15 min
<b>Level</b>	Set at maximum comfort level	Set at maximum comfort level

**Treatment Duration:**

- Combined (30) minute treatment three times daily
- Suggested treatment period: one to three months

## 2.5.13 Plantar Faciitis

**Application:** Non-surgical approach in conjunction with other therapies

**Aims of Treatment:** Reduce pain and increase blood flow

**Electrode Position:**

Current should cross so that most of the stimulation is felt in the area of pain. Placement adjustments may be made to allow for surgical site, density of tissues, underlying nerve position, etc.

**Settings:**

	First half of treatment	Second half of treatment
<b>Program</b>	<b>P4</b>	<b>P4</b>
<b>Frequency</b>	<b>60-137 Hz (set at 85) Hz</b>	<b>10-23 Hz (set at 14)</b>
<b>Timer</b>	<b>15 min</b>	<b>15 min</b>
<b>Level</b>	Set at maximum comfort level	Set at maximum comfort level

**Treatment Duration:**

- Combined (30) minute treatment three times daily
- Suggested treatment period: one to three months

## **3.1 MICROCURRENT ELECTRICAL THERAPY**

The following information is derived from previously published literature and from clinical advice derived from practical experience. Unless otherwise indicated they are not the results of controlled, peer reviewed, research, and should be treated as general guidance only. TensCare can accept no responsibility for their clinical effectiveness.

Microcurrent Therapy should not be commenced before the cause of the problem has been properly diagnosed by a medical practitioner.

## **3.2 HOW IT WORKS**

Microcurrent stimulation is a type of therapy in which very low current is sent into the cells of the body.

Microcurrent is a very faint current that is so small it is measured in millionths of an amp (Microamps). Human cells generate a current that is in the microamp range which is why you can't feel it - the current is so low it doesn't stimulate the sensory nerves. Microcurrent is a physiological electric modality that increases ATP (energy) production in the cells of your body. This dramatically increases the tissue's healing rate. The immediate response to the correct microcurrent frequency suggests that other mechanisms are involved as well. The exact effects or changes in the tissue are unmistakable; scars will often suddenly soften; trigger points often become less painful within minutes when the "correct" frequency is applied. In many situations the changes seen seem to be long lasting and in many cases permanent.

Microcurrent has been shown to give very effective pain relief. In patient surveys over 90% of patients reported significant improvement.

The results of MET can be seen after only a minute or so of treatment in most people

## **3.3 CHOOSING THE SETTINGS**

For most conditions, use a low frequency from 1 to 10 Hz, starting at 1 Hz in programme P1.

A higher frequency up to 100 Hz may give faster results when treating inflammatory problems (e.g. arthritis, tendonitis, etc.).

However, you should always follow this up with a short treatment at low frequency.

Set the current intensity level at the highest comfortable position. This is usually 500 to 600  $\mu$ A, which most people can barely feel.

If you have a very sensitive condition like neuralgia, you can start with a very low current – unlike TENS there is no lower threshold.

## **3.4 PREPARING FOR TREATMENT**

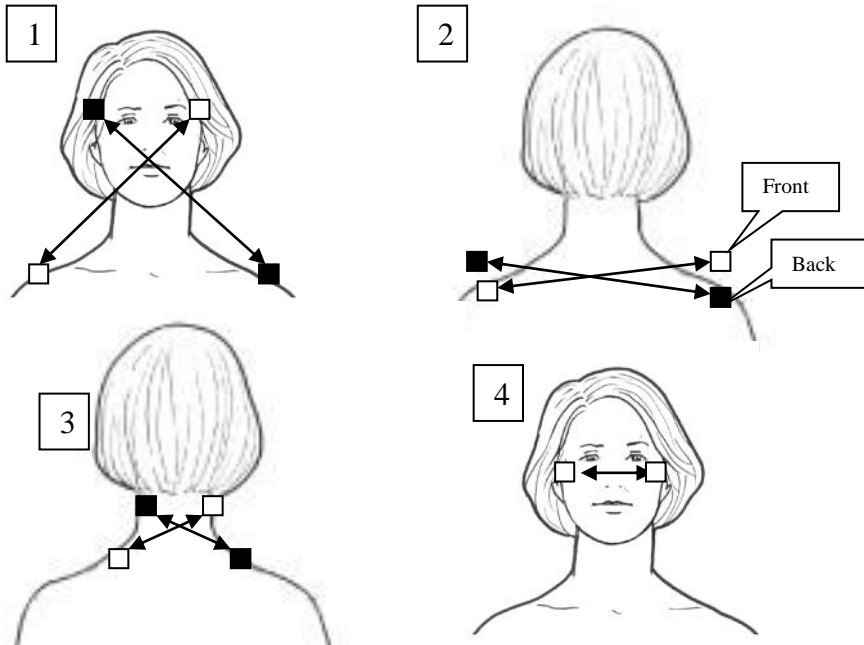
To gain the best results make sure that you are in a relaxed position for the treatment. Make sure you do not have tense muscles.

### 3.5 ELECTRODE PAD POSITIONING

Pad positioning is NOT like TENS, and is closer to Interferential.

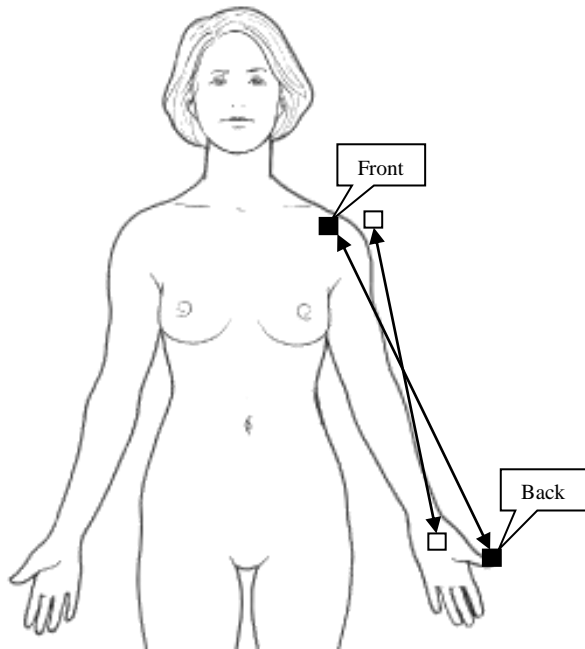
The pads should be placed so that a straight line between them passes through the problem area. This is different to TENS, where the aim is to stimulate the correct sensory and motor nerves.

Since the body is three dimensional, this often means going from front to back, and side to side. The four alternatives for headache below show how many possibilities there are :-



There is no single correct placement, and the best position may vary from day to day.

*One position for treatment of arm pain.*



Microcurrent seems to work better if you also treat the OPPOSITE side of the body to where the pain is felt (with the second pair of pads). Also try connecting both sides of the body by placing one pad at the site of the pain, and the other on the opposite side( ie left hand to right hand), for 10 mins.



## 3.6 HOW LONG SHOULD EACH SESSION LAST?

Start with 10 minutes, then pause to re-evaluate your pain. Stop treatment when the pain is completely gone or when there is no further improvement. This could take an hour or more. However, continuing to treat after the pain has gone may cause it to return :- More is not necessarily better when using microcurrent to relieve pain.

## 3.7 FOLLOW-UP

Although results will usually be seen immediately, in some people the effects will be delayed, continuing to improve from several hours to over a day or two after the treatment. In others, it may take several treatments before you start to see noticeable improvement. The effects of microcurrent therapy are cumulative.

Use daily for 1-2 weeks, then switch to every other day.

## 3.8 PROBLEMS

While microcurrent therapy can provide a noticeable improvement on more than 90% of users, it will not work for everyone. Where there appear to be no effects, try the following:-

- 1) Increase your fluid intake. If you are dehydrated you may not respond well.
- 2) Some people who have had a significant exposure to strong electrical current may be poor candidates for microcurrent therapy. If you have had a severe electric shock in the past, or have used TENS for a long time, microcurrent may not work as quickly for you. You may need prolonged treatment to gain results.
- 3) Microcurrent electrical therapy works through very small electrical flows in the body. These can be affected by earlier surgical scars and traumatic injuries some distance from the present pain. It is possible to clear the body of these “blocks”. By covering the scar with the electrodes or, on larger scars, putting one electrode at each end, and treating for 10 minutes four days in a row. As this treatment “unblocks” your body’s electrical flow, you may feel increased energy and the pain may also temporarily increase. After treating the scar, allow time to treat the painful area as well.
- 4) Try using a lower current setting of 100  $\mu$ A for longer – an hour or more.

## 4 E.M.S - Electrical Muscle Stimulation.

### 4.1 WHAT E.M.S. DOES

**EMS successfully rebuilds and tones muscles.** Different levels of muscle contraction are achieved by sending electrical impulses of various types, depending on the programme selected, into the body. These muscle contractions retrain the muscles, increase their effectiveness and improve their condition. This is beneficial where muscles - for whatever reason - have not been in regular use and have lost condition (muscle atrophy). For sports, the benefit is to increase the effect of training and enhance performance.

**Muscle wastage:** EMS is used in the treatment of:

Neuromuscular facilitation - Muscle reeducation - Muscle training - Prevention/slowing of atrophy/hypotrophy - Preventing postoperative muscle weakness - Reduction of spasticity  
Maintaining or increasing range of motion - Training of partial peripheral nerve damage with signs of reinnervation - Treatment of scoliosis - Incontinence treatment

**Sports:** EMS is used in:

sports training, covering - warm-up, strength, speed, power, resistance, endurance and recovery and also for rehabilitation in relation to sports injury.

EMS works as an excellent complement to regular training.

### 4.2 MODE OF OPERATION

EMS uses external electrical impulses that act through the skin to stimulate the nerves supplying a specific muscle group.

The muscle reacts in different ways depending on the strength of current and duration and frequency of the electrical impulse.

Muscles are made up of two different type of fibre:

- Red fibre is slower contracting and aerobic working.
- White fibre is faster acting and capable of anaerobic working.

The proportions of red and white fibres depend on the way the muscle is used.

Fibre can be converted from one type to the other, depending on the signals it receives.

This is known as the Trophic effect.

Different frequencies have different effects: Low (1-10 Hz) frequencies coupled with long impulse times have a purifying and relaxing effect through individual contractions, whereby the circulation in the treated muscle is simultaneously improved and removal of metabolic end products is supported (lymphatic drainage). The oxygen supply to the muscle is improved.

In contrast, medium (20-50 Hz) frequencies can put a high level of strain on the muscle, thus promoting the muscular structure.

Very high frequencies (60-90 Hz) can be used to promote muscle definition and bulk.

The body maps at the end of this section show pad positioning in order to stimulate specific muscle groups.

## 4.5 TREATMENT TIME AND INTERVALS

Treatment by EMS can vary between 15–60 minutes stimulation twice a week to treatment several times per day.

### **CAUTION**

EMS is closely comparable to normal exercise: over-work can cause pain during the exercise AND may cause aching the following day. Always use caution and build up exercise slowly. As the muscle gets stronger and blood supply improves, you will be able to work harder.

As with all exercise, results are not short term. It can take up to 12 weeks of regular use to rebuild the tissues in a muscle.

## 4.6 CHOOSING THE RIGHT STRENGTH

The object of EMS treatment is to produce powerful muscle contractions.

The strength of the current should be increased to **about three times the level at which you can first feel the tingling**, to as high as you can stand without causing pain.

You will probably feel that electrical contraction is being more powerful than a voluntary contraction, because the current also stimulates your sensory nerves. The signals have a pain-relieving effect.

You may find the sensation uncomfortable to start with, so that you may not get up to therapeutic strength at the start of treatment. The strength can be increased during the course of the treatment, as you become accustomed to the sensation.

Voluntary muscular activity is more effective than stimulation, and it may improve progress if you combine voluntary contraction with stimulation.

The powerful muscle contractions caused by electrical stimulation give rise to training aches, which usually disappear within a week.

After treatment tingling sensations may continue or your skin may feel numb, this is normal.

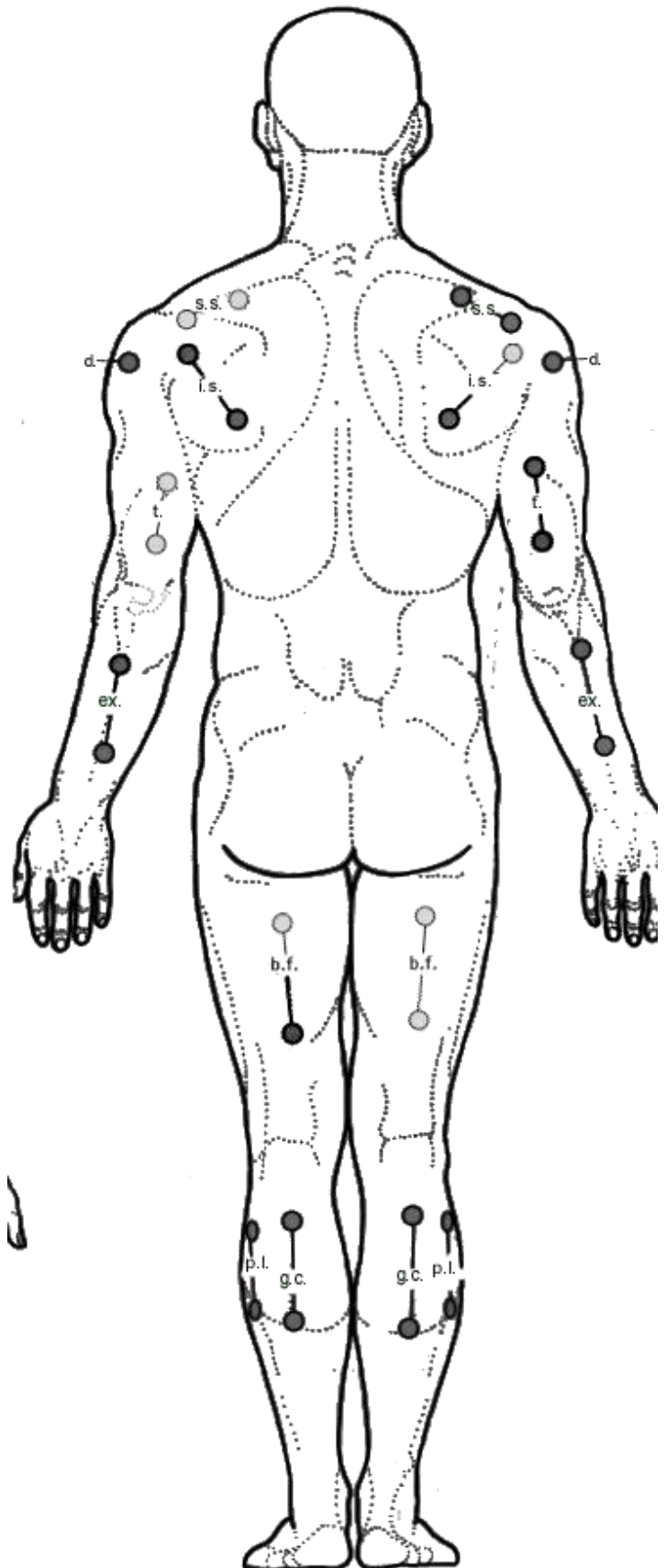
## 4.7. EMS SETTINGS

- **Frequency (measured in Hz – pulses per second)**  
See section 4.2 mode of operation. Think of this as the size of a weight you might lift: Lower weights for stamina, or higher weights for bulk and short term strength.
- **Pulse Width (measured in  $\mu\text{S}$  – millionths of a second)**  
A higher Pulse Width is more likely to activate muscles.  
Larger muscles need higher Pulse Width.
- **WORK** Is the time in seconds that muscle is stimulated (not including Ramp time)  
The “**Tone**” offers a range of work periods from 1-40 sec. Think of this as the length of time you might hold a weight.
- **REST** is the time in seconds at zero strength in between stimulation.  
At frequencies greater than 30Hz, REST time should always be more than twice WORK time. If you were lifting large weights, you would do a small number of repetitions, with a long rest in between. With small weights, you can do many, rapid, repetitions.  
  
In general, there is a limit on the number of times a minute you can comfortably fire the muscle fibres. With a low frequency stimulation, you do not need much, if any, rest time. With a high frequency stimulation, you need a lot of time at or near zero (rest) to reduce the average.
- **RAMP** is the time in seconds taken to move up and down between zero and the set stimulation strength . This makes the start of each WORK period more comfortable.
- **Synchronous / Alternating ( P1/P2 )** In Alternating mode output from Ch2 is active during the rest period of Ch1.
- **Delay (P3)** Start of WORK period in CH2 is later than start of WORK period in Ch1

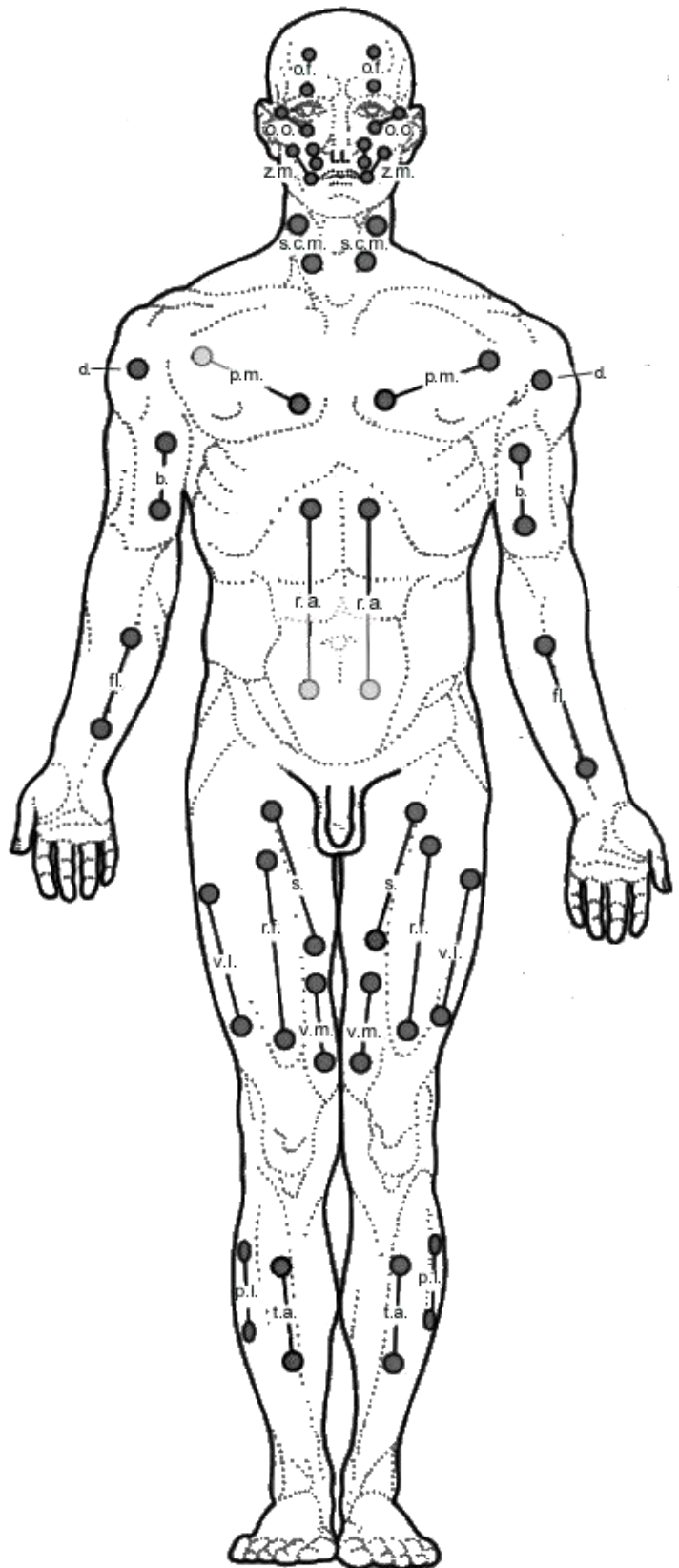
## 4.8 ELECTRODE PAD PLACEMENT FOR EMS

*Positive (red connector) pad should be placed in the centre of the muscle 1/3 of its length from the spine.*

<b>O.O</b>	M.orbicularis oculi
<b>z.m</b>	M. zygomaticus major
<b>o.f</b>	M.occipito frontalis, pars frontalis
<b>L.L</b>	M. levator latii
<b>s.c.m.</b>	M. sternocleido-mastoideus
<b>d.</b>	M. deltoideus
<b>b</b>	M. biceps brachii
<b>fl.</b>	Underarm flexors: M. flexor carpi radialis et ulnaris M. flexor digitorum superficialis M. palmaris longus
<b>p.m.</b>	M. pectoralis major
<b>r.a.</b>	M. rectus abdominis
<b>s.</b>	M. sartorius
<b>r.f.</b>	M. rectus femoris
<b>v.l.</b>	M. vastus lateralis
<b>v.m.</b>	M. vastus medialis
<b>p.l.</b>	M. peroneus (fibularis) longus
<b>t.a.</b>	M. tibialis anterior



- s.s.** M. supraspinatus
- i.s.** M. infraspinatus
- t.** M. triceps brachii
- ex.** Extensors on the underarm:  
M. extensor carpi radialis  
M. extensor carpi ulnaris  
M. extensor digitorum
- b.f.+st.** M. biceps femoris  
+ M. semitendinosus
- g.c.** M. gastrocnemius  
(+ M. soleus)





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