

INTERFERENTIAL THERAPY

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One hundred patients with a wide range of musculoskeletal conditions were treated by interferential therapy, using the Nemecrodyn '8' machine. No control group was used, but marked or complete improvement was achieved in a large percentage of the patients, especially those whose conditions had been of short duration. The use of the 'Vector system' enabled a wide area of treatment to be achieved. It was possible for certain patients to exercise while undergoing interferential therapy. Interferential therapy appears to be a most useful form of physiotherapy for many types of conditions, from immediate sports injuries to intransigent chronic conditions.

During the nine months from November 1977 to August 1978 100 patients with many types of conditions were treated in the Physiotherapy Department of Sydney Hospital with interferential therapy. The machine used was the Nemecrodyn '8', which incorporates a 'Vector system'*.

Although, for this study, other forms of physiotherapy were not used, the effectiveness of the treatment in conjunction with microwave diathermy in musculoskeletal problems has been reported (Nikolous-Troeva 1967); other physiotherapists have described its effectiveness when used before manual therapy to help to decrease muscle spasm, and post-manual therapy to help to decrease treatment 'soreness' (personal communication, Sydney Hospital). Other articles discussed the effectiveness of interferential therapy on treatment of fracture complications (Nikolous-Troeva 1969) and arthrosis deformans, (Nikolous-Troeva 1967).

Theoretical background

Cells and tissues of the body give off electrical impulses in the range of 0-100 Hz, as evidenced in the use of electrocardiography and electromyography. When electrical impulses of low frequency, eg 50 Hz, are applied to the body, one is operating within a pain sensation zone, because of the high resistance of the outer skin to these low-frequency currents. As the frequency of the current increases, skin resistance decreases, but at high frequencies, where skin resistance (and pain) are low, the frequencies are too high to stimulate muscle.

Interferential therapy is a means of healing injured or abnormal tissue by generating a stimulating current of a frequency in the bioelectric range (0-100 Hz) *within* the patient's tissues, but without the disadvantage of high skin resistance because

the currents actually applied to the body are of medium frequency.

Interferential therapy is based on the beat-frequency phenomenon—when two medium-frequency currents of slightly different frequency intersect, the lower frequency is cancelled out leaving a frequency response equal to the difference of the two frequencies (Willie 1972). With the Nemecrodyn '8' machine, circuit 1 has a constant frequency of 4000 Hz and circuit 2 has variable frequencies between 4000 and 4100 Hz. (Frequency is adjusted by the operator using a press button mechanism.) The resultant internal frequency varies between 0 and 100 Hz, with no discomfort to the patient. Effective treatment will only occur at the intersection of the two currents, and if this is not directly over the area to be treated, no therapeutic benefits will be experienced. Anatomically it is not always possible to locate the electrodes as accurately as necessary and referred pain can make accurate treatment difficult. With interferential there are random areas where small secondary signals cross to produce beat frequency.

Advantages of interferential therapy

- 1 It is safe, as healing originates in the body.
- 2 Deep-seated lesions are easily treated.
- 3 It is not necessary for patients to have intact sensation.
- 4 Patients can move while having treatment, and in some cases exercise, with the interferential therapy acting as a pain block.
- 5 The use of suction electrodes decreases the treatment time by allowing perfect contact.
- 6 With the Vector system, a large area can be treated and there is less need for 'perfect' electrode placement.

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* The Vector system allows the entire area between the four electrodes to be treated, with a much improved uniformity. The whole area can be scanned by altering the path of the current 45° to one side and 45° to the other side, allowing a link-up of all the points of beat frequency and covering the area between electrodes with low-frequency current (Hansjurgens 1974)

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Contraindications

- 1 Acute danger of haemorrhage
- 2 Infective conditions (because of the stimulation of blood vessels)
- 3 Arterial disease
- 4 Malignancy

Method

One hundred patients, with a variety of musculo-skeletal conditions, were treated with interferential therapy using a range of frequencies, intensities, treatment times, as described below.

Subjects

The subjects were divided into three major groups, depending on the duration of their condition (greater than 6 months, 2 weeks to 6 months, less than 2 weeks) and these groups were further divided according to the type of condition. All of the patients included in the trial were treated only with interferential therapy and relevant strengthening exercises. No patient had any other form of mobilization or electrical treatment.

Settings

With the Nemecrodyn '8' machine, automatic rhythmic frequencies of 0-10 Hz, 90-100 Hz, 0-100 Hz, or a constant frequency can be used. In this study, the machine settings utilized were:

- 1 90-100 Hz, or 100 Hz constant, for analgesia, due to the depression in the action of the sympathetic nervous system, or by virtue of the pain-gate theory (Melzack and Wall 1965). This treatment is very helpful in recent injuries as there is relief of pain without heat.
- 2 0-100 Hz for swelling, due to the stimulation of general tonus and increase of deep and lymphatic circulation due to the fine vibration of ions. Also contraction of deep muscle fibres, and resulting alteration in vessel calibre are important for oedema control. It is said to repolarize depolarized cell membranes.
- 3 0-10 Hz for the stimulation of innervated muscle, thereby increasing venous return, rate of healing etc. (This setting was also used in an attempt to break down adhesions, for example quadriceps adhesions, post-fracture, or post-frozen shoulder when the last 20 degrees were difficult to regain.)

Intensities

The degree of intensities used depended on the conditions being treated.

PAIN

The intensity was increased until the patient felt moderate 'pins and needles'. After allowing for accommodation, the intensity was again increased until the 'moderate' feeling was re-obtained.

SWELLING

The intensity was increased until the patient felt mild 'pins and needles'.

STIMULATION OF INNERVATED MUSCLE

The intensity was slowly increased until the desired muscle contraction was obtained. In some cases it was necessary to increase the intensity as accommodation took place.

Treatment time

The following periods of treatment were used:

- 12 minutes for each application with suction electrodes
- 20 minutes for each application with flat electrodes
- 15 minutes for each application with two suction and two flat electrodes.

Treatment was initially performed daily, if possible. (Therapy could be carried out twice-daily with a 6-hour break.) Interferential therapy was discontinued if there was no change after three treatments.

Use of the Vector system

The Vector system was used most of the time, unless the area treated was a precise area, easily located by the intersection of the four electrodes. The suction electrodes were used whenever possible because treatment time was shorter. They were not used if there was danger of haemorrhage or bruising in the area. Pulsating suction was used mostly, although steady suction was used for acute pain.

Use with exercise

It is possible for some patients to exercise during interferential therapy. This has been found useful for patients for whom maintenance of range is essential, and where there is pain present which hinders this, for example after manipulation of a knee or shoulder under anaesthetic, or after a total knee replacement. Using the setting of 90-100 Hz and suction electrodes, the patient can exercise with the interferential current acting as a pain block. Quadriceps exercises that are painful can also be performed in this way. Obviously the machine must not be used where pain is required as a warning signal.

Results

Results ranging from worse to complete improvement were defined by subjective and objective means, by measuring swelling and joint range.

Results for the three major groups of patients are shown in Tables 1-3, using an 'improvement' rating from A to F:

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- A: complete improvement
- B: marked improvement
- C: moderate improvement
- D: slight improvement
- E: no change
- F: worse

Group I

All patients in Group I were those with conditions present for more than 6 months (some up to 7 years) and had experienced a number of forms of treatment, such as short-wave diathermy, ultrasound, microwave diathermy and manual therapy. Most had been to chiropractors, or/and had

acupuncture, or/and hypnotherapy.

Group II

This group included patients with conditions present for 2 weeks to 6 months, some of whom had tried other forms of treatment, some for whom this was the initial therapy. Results from this group are given in Table 2.

Group III

Patients in this group were those with acute conditions present for less than 2 weeks, for whom interferential therapy was the first form of physiotherapy.

Table 1: Improvement rating for Group I patients*

<i>Conditions</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>Total</i>
Pain, considered to be of spinal origin, not responding to other physiotherapy	3	8	6	1	5		23
Chronic joint pain and/or swelling not responding to other physiotherapy eg osteoarthritis, chondromalacia	1	4	1		3		9
Bursitis, tendonitis (all other forms of treatment had been tried)	1	2	3		1		7
Chronic soft tissue injuries and persistent pain and/or adhesions		2		1			3
Chronic neuralgia-type pain, eg post-herpes zoster			2		1		3

* Average number of treatments: 11 (4-27)

Table 2: Improvement rating for Group II patients*

<i>Condition</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>Total</i>
Spinal pain not responding to other forms of physiotherapy	4	2	1		1		8
Joint pain and/or swelling post-trauma	5	12			3		20
Atraumatic joint pain and/or swelling, eg osteoarthritis	1	1			2		4
Bursitis, tendonitis		2					2
Tendon or muscle sprain or partial tear		2	1				3
Persistent pain post-fracture around fracture site		1	1				2

* Average number of treatments: 10 (3-27)

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Table 3: Improvement rating for Group III patients*

<i>Condition</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>Total</i>
Pain of spinal origin, eg whiplash	4	1					5
Muscle or tendon sprain or partial tear	2	1					3
Acute joint contusion, eg sports injury	1	4					5
Severe pain after manipulation under general anaesthetic	1	2					3

* Average number of treatments: 7 (2-15)

Summary of results

The improvement in patients in all three groups is summarized in Table 4. No patient reported any deterioration.

Table 4: Distribution of improvement rating among all patients

	<i>Marked to complete improvement (%)</i>	<i>Slight to moderate improvement (%)</i>	<i>No change (%)</i>
Group I	47.0	31.0	22.0
Group II	76.9	7.7	15.4
Group III	100		

Discussion

The effectiveness of interferential therapy in conjunction with other forms of therapy, as described by other workers, has already been discussed. Results from the present study were obtained from patients whose only form of treatment was interferential therapy. Results achieved with these 100 patients were encouraging, especially for patients whose conditions had been present for only a short period. However, no conclusive statement may be drawn from the results owing to the absence of a control group. Although the patients were asked to report back if symptoms recurred (some did), this does not constitute an accurate follow-up. Nevertheless, interferential

therapy does appear to be a most useful form of physiotherapy for many types of conditions, from immediate sports injury to intransigent chronic conditions.

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