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Treatment with Interferential Current

Foreword by Jeanne-Marie Ganne

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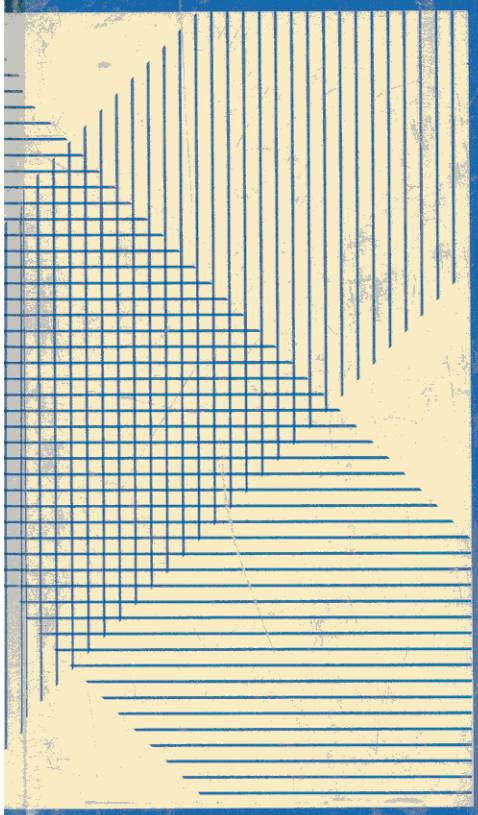

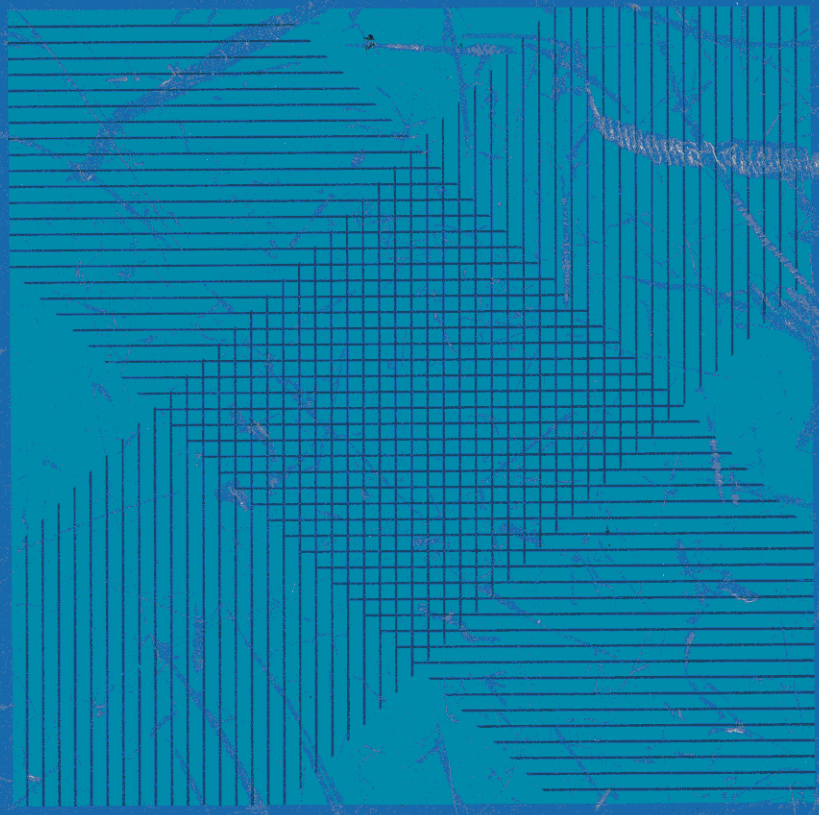

TREATMENT WITH INTERFERENTIAL CURRENT

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Foreword by

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Diseases of joints

INFLAMMATORY DISEASES

Rheumatoid arthritis

Burghart (1952) and Mutschler (1952) first applied IT in treating chronic inflammatory diseases of the joints. Later Thailhades (1959) applied this method in treating chronic rheumatoid arthritis and achieved favourable results in 40% of the patients. Pärtan et al (1953) applied IT in 200 patients suffering from rheumatoid arthritis, using the current alone or in combination with drugs and other types of physiotherapy. Active and passive movements of the affected joints were found to improve, reflex muscular spasm disappeared and pains were relieved.

We have applied IT in the treatment of patients with subacute and chronic rheumatoid arthritis and osteo-arthritis. Pain was relieved and movements in the affected joints improved. Improvement in blood circulation confirmed by rheography and oscillography before and after treatment (Figs 6.6 and 6.7), is considered to be one of the factors favourably influencing the pathological process.

Ankylosing spondylitis (Bechterew's disease)

This disease was described by Bechterew in 1892, but its aetiology has not yet been completely elucidated. Most authors agree that it is an infectious-allergic, chronic inflammatory process. The main purpose of physiotherapy is to suppress the inflammatory process (in combination with

drug therapy), to stop the evolution of the disease and to treat deformities of the spine. Ultrasound and systematic remedial exercises are considered to be most useful in this respect.

Interferential therapy is recommended by Polster (1965) as having a beneficial effect mainly as an analgesic. It is given in the same manner as in spondylitic arthritis (Figs 6.9 and 6.10) and arthritis and it should always be combined with remedial exercises. The alternating application of IC and ultrasound gives better results.

Rheumatic fever

Interferential current is used in the treatment of rheumatic fever in combination with other therapeutic measures. It can be applied only as the rheumatic attack subsides to improve tissue trophicity and muscle function (treatment of disuse atrophy). When it is aimed at acting on joints, IT is given in the same manner as in deforming arthritis. First, it is necessary to relieve pain and to improve the blood circulation. A total of 15 to 25 daily treatments are needed for 15 to 20 minutes, the constant frequency of the current being 100 Hz. Treatment in the relevant segmental area is also recommended.

A current of a rhythmical frequency of 0–10 Hz is used for muscular exercise.

DEGENERATIVE-DYSTROPHIC DISEASES

Osteo-arthritis

Osteo-arthritis is one of the most complex and still not completely understood problems of arthrology. The pathological and anatomical changes affect all tissues including cartilage, bone and soft tissues. First, the joint cartilage is damaged, being particularly susceptible because it lacks its own blood supply. Its regenerative capacity is insignificant, and some authors are of the opinion that it does not exist at all. The changes are considered to be due to a disturbed cartilaginous metabolism, especially that of the mucopolysaccharides (Balaba et al, 1974). For that reason intra-articular introduction of drugs containing mucopolysaccharides is recommended.

Osteo-arthritis (especially at the knee and hip joints) is one of the most common causes of joint function disorder. Some authors claim that 90% of individuals over 40 years of age are affected by it, and others (Emminger, 1964; Nikolova, 1971a) that a degenerative process can also be observed in young people, for example ballet dancers.

Two basic forms are distinguished: primary and secondary arthritis. The main aetiologic features in primary arthritis are: (a) disturbance of the local blood circulation — vascular spasm due to various causes; (b) endocrine or metabolic disorders; (c) repeated injuries — not major, but beyond the bounds of physiological compensation; (d) outside factors such as working under conditions of high humidity, sudden and sharp changes in temperature and barometric pressure or a long-standing, strained body or joint posture.

Secondary arthritis is the final structural result of different acute and chronic processes in the joints, such as congenital anomalies, intra- and periarticular fractures, aseptic necrosis, osteochondropathy and infectious processes.

The high incidence of osteo-arthritis in all countries of the world makes it of great socio-economic importance, and the problem of its treatment is therefore of major concern.

Pain and disturbed movements of the joints prevail upon the patient to see the doctor. Nowadays it is not a diagnostic but a therapeutic problem. The clinical signs, especially the pain, can be alleviated, but the anatomical lesions continue to progress. Herein lies the problem which is still unsolved, i.e. to find out a reliable way to stop this process.

The main therapeutic task related to the pathogenesis of the disease is to relieve or reduce the pain, to improve the blood supply in the area of the damaged joint and to control the progressing restriction of movements and the concomitant muscle atrophy. The numerous therapeutic approaches are divided into three basic groups: medication, physiotherapy and surgical treatment. Conservative methods are aimed at relieving pain and improving or restoring the function of the joints. The prescribed and recommended drugs are so numerous that it is impossible to enumerate or assess them. Most of the drugs have a symptomatic and time-restricted effect.

Various methods of physiotherapy have found recognition in the treatment of osteo-arthritis not only because of their beneficial effect, but also because of the absence of the side effects which are produced by some drugs. However, there is still no agreement concerning the extent of the therapeutic effectiveness of these methods.

Interferential therapy in treating osteo-arthritis was applied for the first time by Burghart (1951), and later on by a number of workers. Burghart observed relief of pain after 2 to 14 treatments in 34 patients with typical osteo-arthritis without accelerated sedimentation rate who had not benefited from any other therapy. Pärtan et al (1953), on the basis of their observations of 200 patients, reported great improvement in 49%, definite improvement in 28.5%, slight improvement in 19% and no improvement in only 3.5%.

We have applied IT in osteo-arthritis since 1963, and up to now more than 500 patients have been observed[1] between the ages of 25 and 77. The clinical diagnosis was also confirmed by X-ray examination. There were 140 patients with 1st stage arthritis, 205 with 2nd stage arthritis and 155 with 3rd stage arthritis.[2] Interferential therapy was given in the following manner: 4-plate electrodes of an area of 50 cm^2, 100 cm^2 or 200 cm^2 (depending on the extent of the affected joint) are placed in such a manner that the two currents cross in the area of the joint to be treated (Figs 3.1, 6.1 and 6.2). A current of a constant frequency of 100 Hz is used in the first 3 treatments, and of a rhythmical frequency of 0–100 Hz in the others. The 20 treatments required are given daily for 15 to 20 minutes.

On the basis of comparative studies in 1300 patients with arthritis of the knee, ankle and shoulder joints treated with IC only or with IC combined with vacuum massage,[3] microwaves, US or diadynamic current (Nikolova, 1965, 1969, 1971a), the following facts of practical importance were found:

- IT influences the lesions more markedly compared to other routine methods
- the percentage of relapses from 6 months to 1 year is lower with IT
- the results from the combined application of IT and vacuum massage are better
- IT is ineffective only in arthritis with concomitant disease requiring surgical treatment (e.g. loose body meniscus lesion)
- in the knee and hip joint arthritis (initial stage, without dysplasia) IT has a more pronounced effect if the local treatment is combined with a paravertebral action in the lumbosacral area using current of a constant frequency of 100 Hz (see spondylitic arthritis) for a total of 15 procedures administered daily for 15 minutes.[4,5]

A basic principle in modern medicine is multiple or complex treatment, i.e. the simultaneous use of a variety of therapeutic measures which mutually enhance their effect or complement one another. This principle is applied in physiother-

[1] Interferential therapy was combined with remedial exercises in 100 patients because it helps to improve blood supply and maintain tissue elasticity although these exercises are contra-indicated in marked local inflammatory phenomena. In principle, general strengthening exercises are applied as well as special ones for the damaged joint. They are planned individually according to the age, training and general condition of the patient, and the condition of the affected joints. The exercises are carried out without physical effort, so as not to traumatise the affected tissues.

[2] *1st stage arthritis* Clinical data (symptoms) are present but usually there are no visible X-ray changes.

2nd stage arthritis Function of the joint is considerably disturbed, changes in the surrounding soft tissues are observable on X-ray and osteoporosis and subchondral sclerosis have begun.

3rd stage arthritis Function of the joint is greatly disturbed and there are advanced changes in the X-ray picture: osteophytes, degenerative cysts and other sclerotic changes in the epiphysis.

[3] Treatment with tetra-polar vacuum electrodes (Fig. 6.3) is mandatory in knee arthritis.

[4] Surgical treatment, and especially arthroplasty, has won recognition in treating arthritis of the hip. The application of pre- and postoperative kinesitherapy is of fundamental importance in such patients. As a rule, IT can be applied locally, but we prefer to act upon the segmental area. Interferential therapy is also recommended in treating all patients with hip arthritis in whom surgical treatment cannot be applied for one reason or another.

[5] In order to assess immediately the effect of IC and that of other physical methods in 60 patients with arthritis of the two knee joints, treatment was carried out with US, microwaves or diadynamic current on the left-hand side and with IC only on the right-hand side. As a rule IT was prescribed for the more affected joint. The effect in 14 of the patients was the same, but in 46 patients the effect was greater in the knee which received IC.

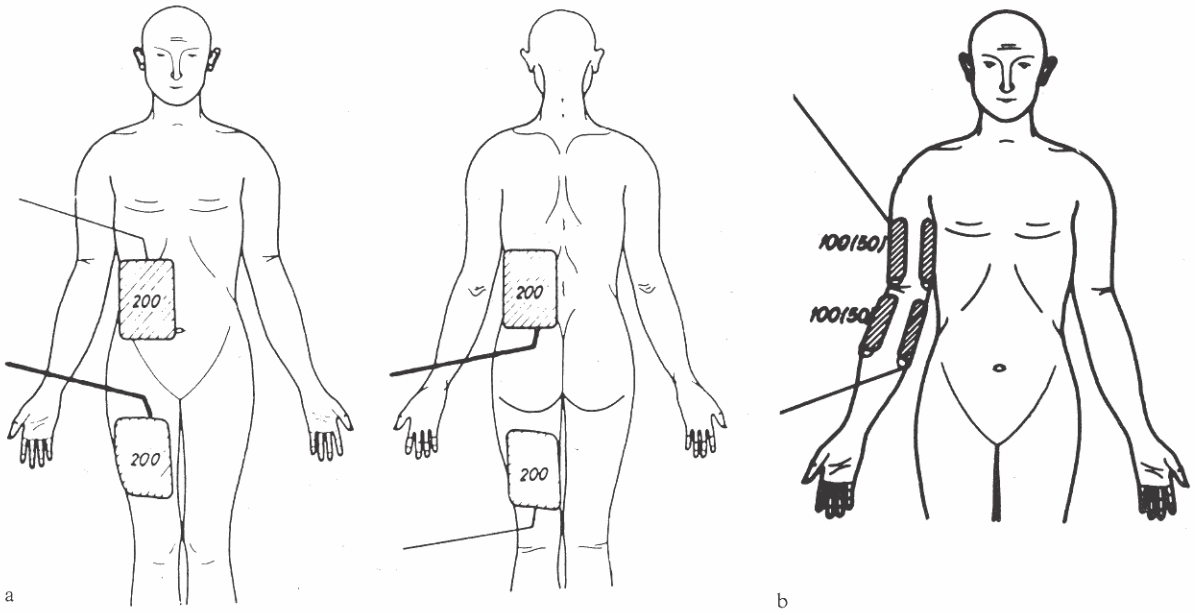


Fig. 6.1 Position of electrodes. a. Arthritis of the hip. b. Arthritis of the elbow joint.

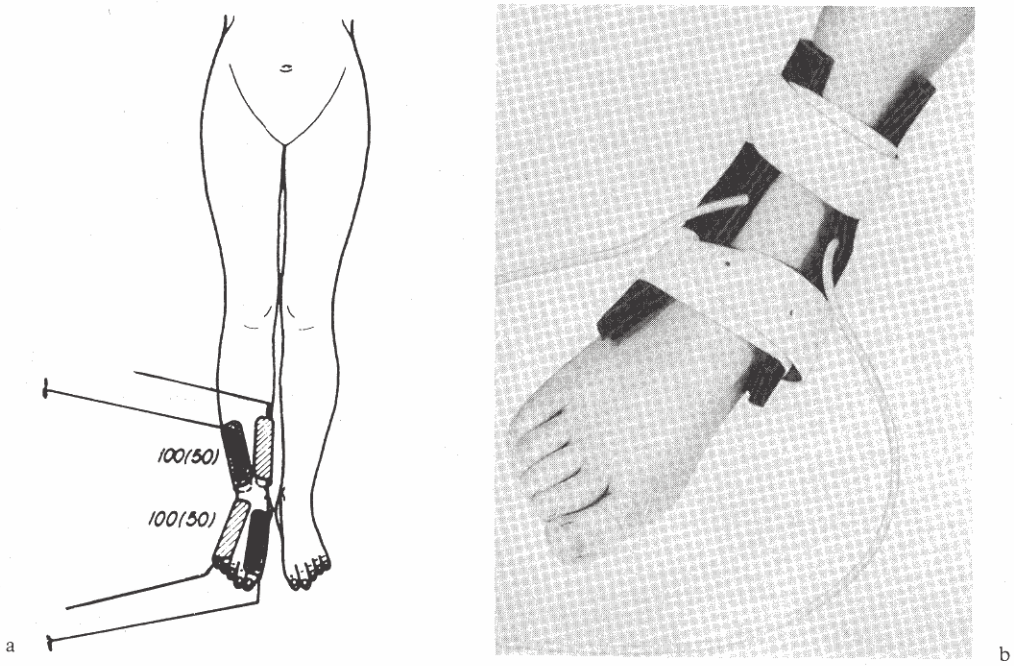


Fig. 6.2 Position of electrodes in treating knee joint arthritis. a. With 4-plate electrode. b. With 4-field electrode.

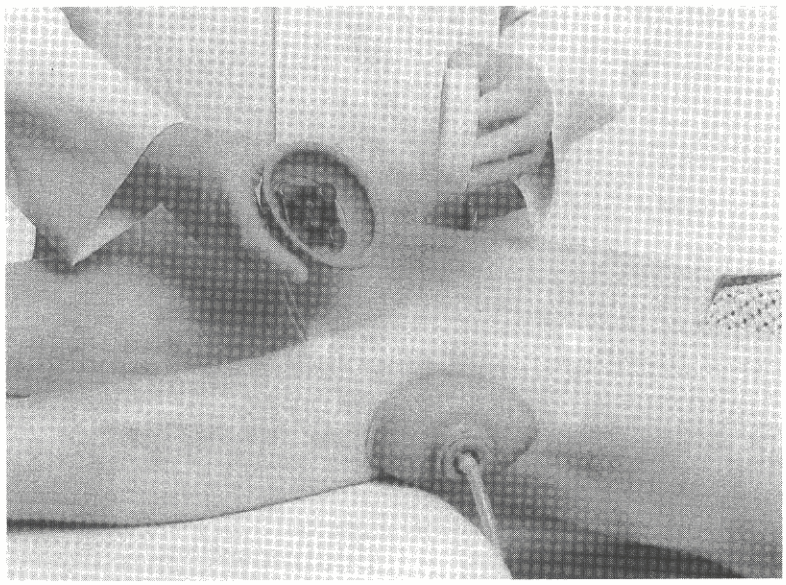


Fig. 6.3 Treatment of knee joint arthritis with tetrapolar vacuum electrodes.

apy too, the parallel or consecutive application of different methods being recommended. Jung & Gierlich (1968), for example, developed a method of combined application of diadynamic current and ultrasound (Sonodynator apparatus), and reported better results in various diseases of the locomotor system.

Since it was first introduced therapeutically, IC has been successfully combined with vacuum massage (e.g. Nemectrodyn apparatus) or infrared (Endogenos apparatus), but no studies have been carried out so far on its simultaneous application with other physical methods.

The lack of technical facilities at this stage for a simultaneous application of some physical agents (for example, ultrasound in an interferential current field) and the efforts to develop new, more effective methods, naturally led to the study of results with the application of two physical forms of treatment given consecutively. This is actually close to a simultaneous action, as both agents are applied without interval *immediately one after the other*.

In order to ensure more effective therapeutic combinations in knee joint arthritis, the effect of interferential current was studied by us first when applied simultaneously with ultrasound, then before ultrasound, and these two methods were compared with magnetotherapy, which has been recommended in the last few years.

Table 6.1 Sex and age distribution of patients with knee joint arthritis

Men	Women	21–40 years	41–60 years	61–75 years	Over 75 years
32(27%)	88(73%)	8	69	38	5

Our observations included 120 patients with knee joint arthritis; their sex and age distribution are given in Table 6.1. The extent of the degenerative-dystrophic process is given in Table 6.2.

In the first group of patients (group I), IC and US were applied simultaneously,[6] while in the second (group II), US therapy was given immediately after interferential current. Ultrasound was applied using the labile technique at a dosage of 0.2–0.6 W/cm^2 over 8 to 12 minutes in 12 applications. Magnetotherapy (applied to group III patients) was conducted with an apparatus designed on the basis of technical data of the

[6] Ultrasound was applied in the area between the electrodes.

Table 6.2 Distribution of patients with knee joint arthritis by treatment groups and by extent of degenerative-dystrophic process

Extent of degenerative-dystrophic process	Number of patients		
	First therapeutic combination (Group I)	Second therapeutic combination (Group II)	Magnetotherapy (Group III)
0–I and 1st stage	18	17	17
I–II and 2nd stage	17	20	19
3rd stage	5	3	4

Soviet 'Polyus-1' apparatus. The knee joint was placed between the two inductors of the apparatus, the latter being closely applied to the skin. A continuous regime was used at a dosage of 25–40 mT for 15 minutes daily in 12, 15 or 20 applications. All the patients received out-patient treatment, without any drugs.

The therapeutic effect was assessed using the following indices: pain and function of the joint, X-rays, oscillography and rheography.

All patients under treatment complained of severe pain in the affected joints, especially at night and when descending and ascending stairs. Functional disorders were found in 85 patients (27 from group I, 28 from group II and 30 from group III).

The following results were achieved in the three groups of patients: pain was favourably influenced (Fig. 6.4),[7] together with the muscular state and joint mobility (Fig. 6.5). The increased knee joint mobility is of great statistical significance ($p < 0.001$) for the three groups of patients.

Blood flow improvement in the area of the affected joint was demonstrated using oscillography and rheography in the three groups of

[7] Six of the patients (15%) treated with magnetotherapy were discharged without relief of pain.

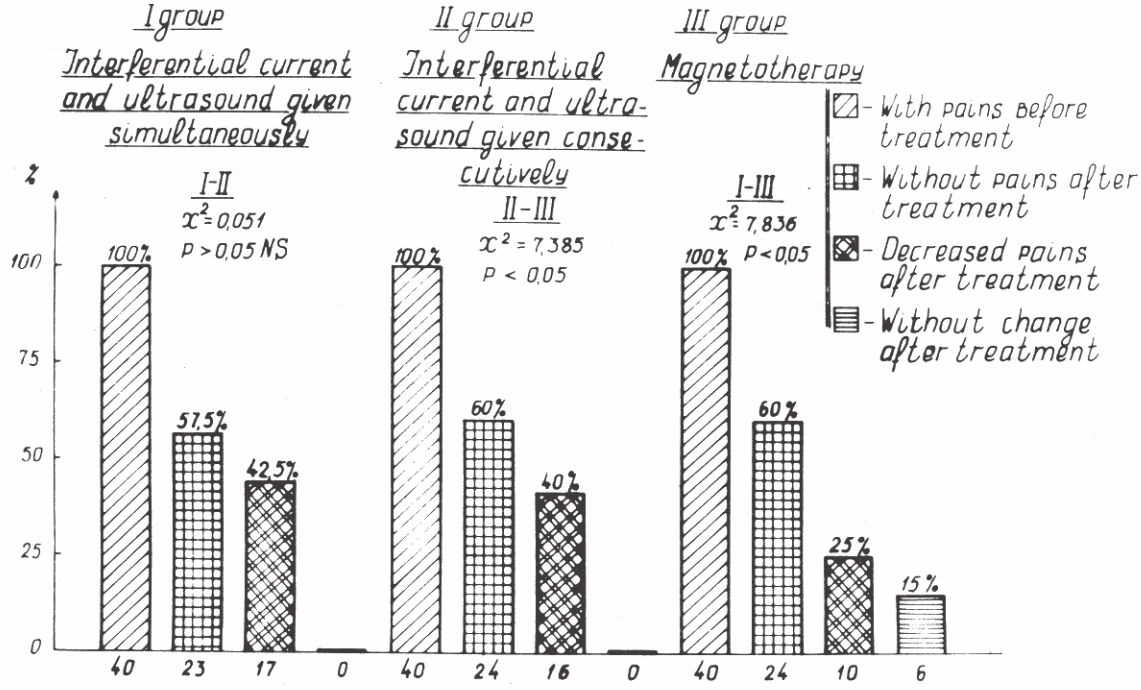


Fig. 6.4 Comparative therapeutic results on treating knee joint arthritis.

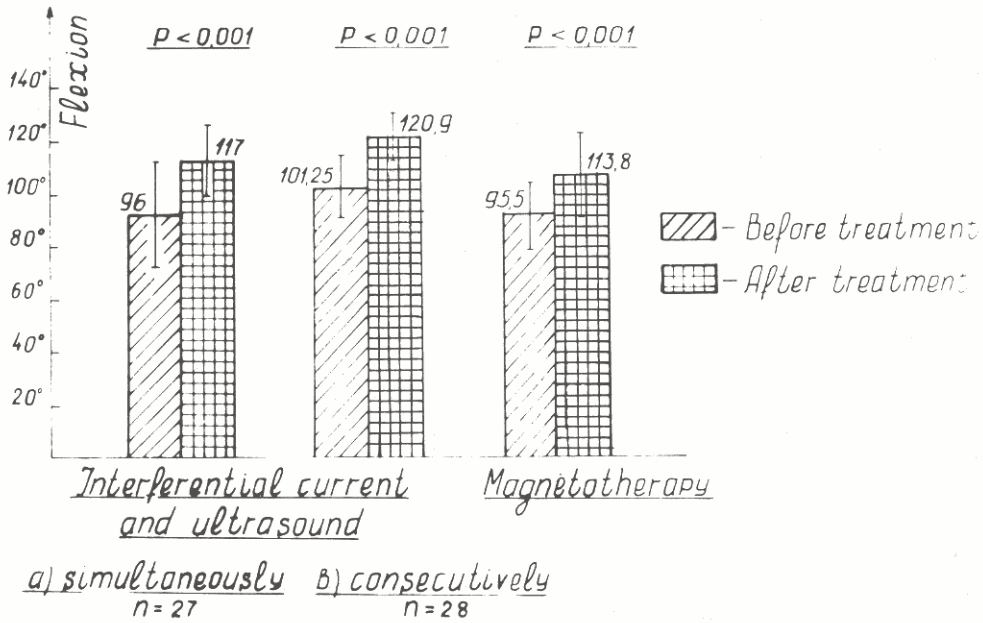


Fig. 6.5 Goniometric data on the function of the knee joint in patients treated for knee joint arthritis.

patients (Figs 6.6, 6.7 and 6.8). The control X-rays did not show any change in the X-ray appearance except in one woman from group I (periosteal reaction decrease in the metaphyseal area).

Results of treatment were followed up for 2 years, and all patients from group I and group II were reviewed. Recurrence (1–2 years after treatment) was found in 14 (35%) from group I and in 13 (32.5%) from group II, i.e. a lower percentage than in the isolated application of the two methods (Nikolova, 1973a). The ultimate results in 25 patients who benefited from magnetotherapy (group III) were reviewed within 20 days to 1 year after treatment. Relapse occurred in 4 (16%) after 1 month; in 6 patients (24%) after 2–6 months; in 6 (24%) after 9 months to 1 year—or a total relapse in 16 patients (64%).

These data show that:

1. Simultaneous or consecutive application of IT and US in knee joint arthritis helps give comparatively lasting relief of pain, with improvement or normalisation of the mobility of the joint. The clinical therapeutic result in both methods (i.e. simultaneous or consecutive) is equally effective. The immediate and later results are better than in the isolated application of the two agents. Preference should be given at present to consecutive application, as no adequate apparatus is available to enable safe application of US in the interferential current field.
2. Magnetotherapy has a beneficial clinical effect in the treatment of knee joint arthritis for a shorter length of time than does either IT on its own or IT used simultaneously or consecutively with ultrasound. Relapses are nearly twice as common and occur significantly earlier: in one study they occurred in the first 1–6 months in 10 patients (40%). Pain was also less influenced by magnetotherapy. Interferential therapy or its consecutive application with ultrasound are therefore preferable.

Spondylitic arthritis

Interferential therapy in the treatment of spondylitic arthritis has also given good results (Nikolova, 1971a, 1979). It is applied with 4-plate electrodes (or with 4 vacuum ones) positioned in such a way as to include the affected area of the

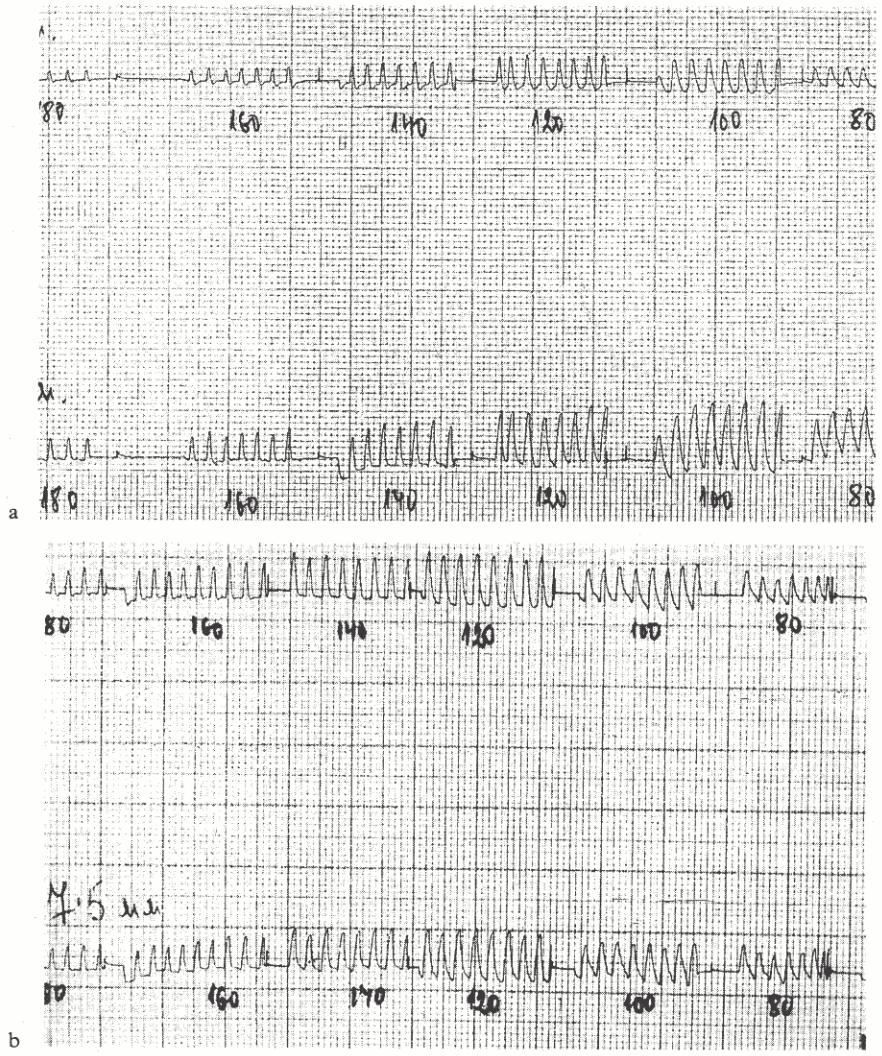


Fig. 6.6 Oscillography. a. Before treatment. b. After IT.

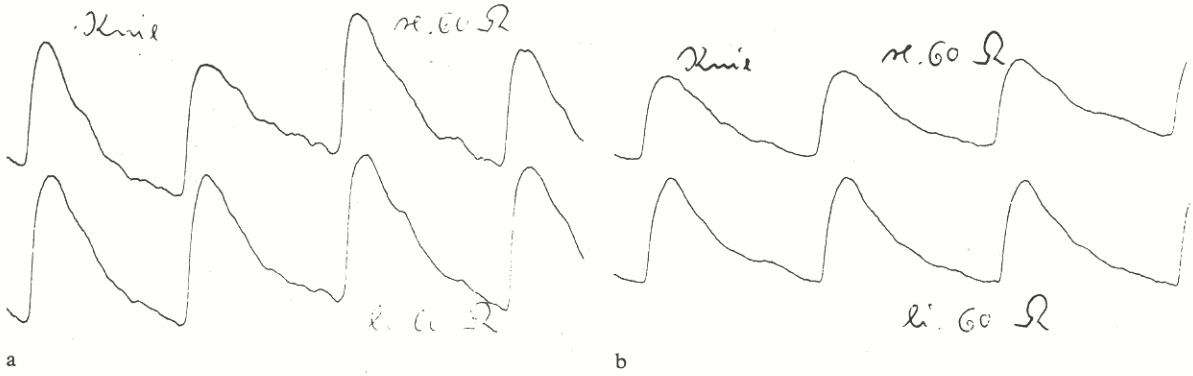


Fig. 6.7 Rheography of the left and right knee joints. a. Before treatment. b. After treatment with IC.

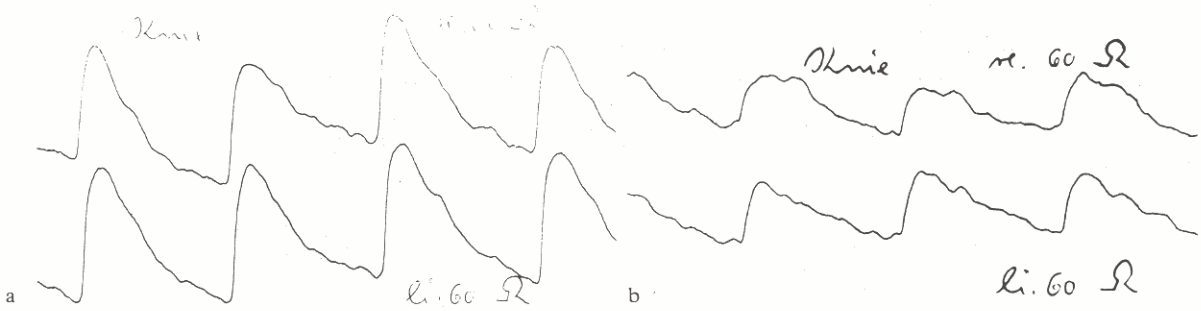


Fig. 6.8 Rheography of the left and right knee joints. a. Before treatment with IC and ultrasound consecutively — rheographic curve of angiodystonic type. b. After treatment — normal rheographic curve.

spine (Fig. 6.9). The bipolar electrodes are suitable (Fig. 6.10). A rhythmical frequency of 90–100 Hz is used in cervical arthritis, and in lesions of other areas a constant frequency of 100 Hz is applied in the first 3 treatments, and 0–100 Hz in the remaining ones. Treatment is given for 15 to 20 minutes, with a total of 20 per therapeutic course. Pain is usually relieved after the 5th treatment and disappears after the 15th to the 20th. Results are also beneficial in patients for whom other methods have failed. Repeated courses of treatment for persisting complaints are also effective. Very good results are obtained in combining IT with US and vacuum or manual massage.

Electro-acupuncture with IC gives very good results in treating cervical arthritis. Stimulation is given with a 4-point electrode (Nemectrodyn-8 apparatus) for 3 to 5 minutes on the following acupuncture points: GB 10, GB 12, GB 20, T 16, T 14, ST 15, BI 11, TH 15. A total of 10 treatments are carried out, and after a break of 8 to 10 days the treatment is repeated to strengthen the therapeutic effect.

Gouty arthritis was also favourably influenced by IT. The same method was applied as in osteoarthritis (p.60), and it was combined with adequate drug therapy to enhance the therapeutic effect.

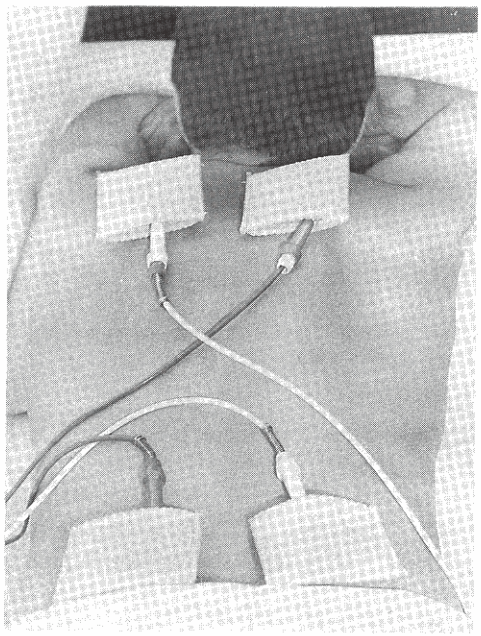
Calcaneal exostosis

The treatment of calcaneal exostosis is both medical and surgical. Nearly all physiotherapeutic methods are used in medical treatment. Scientific publications on the effect of IC are scarce (Nikolova, 1971a; 1979). We started applying it as early as 1963, taking into consideration its pronounced pain-relieving effect and its regulating influence on tissue trophicity. A total of 80 patients have been observed. Complaints disappeared or were more or less reduced in 77 patients, and only 3 did not respond to treatment. Comparative studies on the effect of IC, micro-

Table 6.3 Results of various methods of treatment of calcaneal exostosis

Applied therapeutic method	Number of patients	Therapeutic results*			
		Healthy	Greatly improved	Improved	No improvement
IC	50	24(48%)	24(48%)	2(4%)	–
IC combined with microwaves	20	15(75%)	5(25%)	–	–
Microwaves	70	30(43%)	25(36%)	14(20%)	1(1%)
Ultrashort waves	25	3(12%)	15(60%)	6(24%)	1(4%)
Ultrasound	45	6(13%)	25(56%)	12(27%)	2(4%)

* Healthy = no pains or complaints. Greatly improved = substantial decrease of pain. Improved = minor decrease of pain



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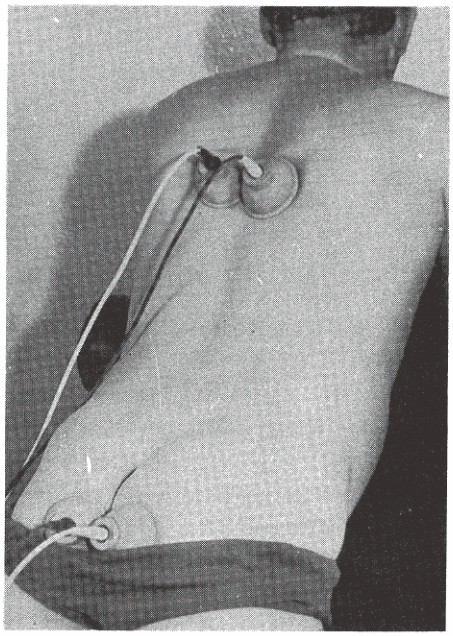

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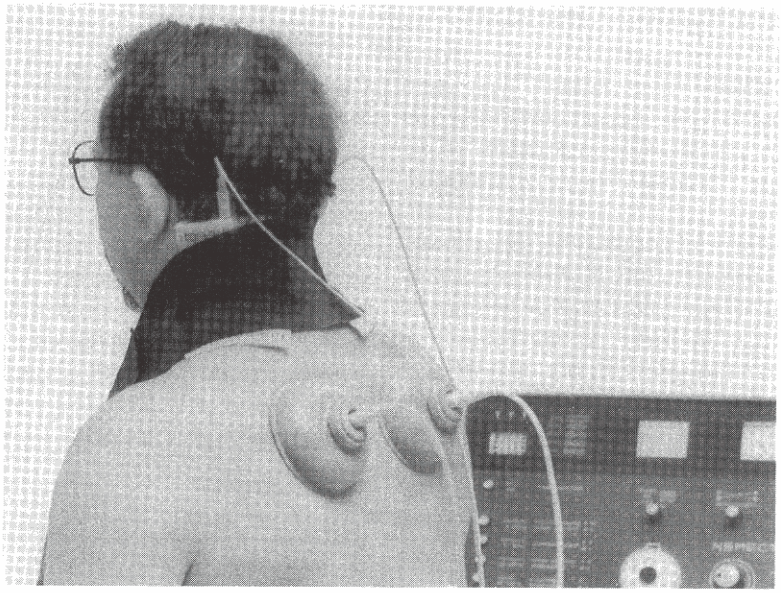

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Fig. 6.9 Position of electrodes in treating spondylitic arthritis. a. With plate electrodes. b. With vacuum electrodes. c. Position of electrodes in treating cervical arthritis.

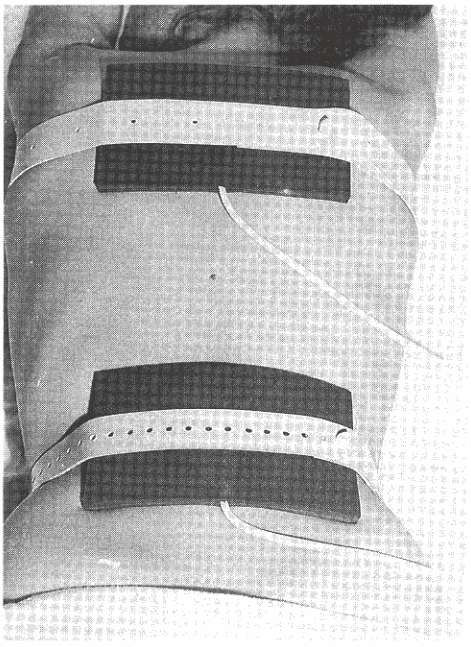

Fig. 6.10 Position of 2 × 2-field electrodes in treating spondylitic arthritis.

waves, ultrashort waves and US were carried out. The results are given in Table 6.3. They show that IT applied separately or in combination with microwaves gives the best results compared with the other physiotherapeutic methods.

Treatment is conducted with 4-plate or vacuum (in combination with vacuum massage) electrodes, or with the 4-field electrodes. The frequency of the current and the duration of the treatments are as in osteo-arthritis of the joints (pp.60–63).