

Rehabilitation of bone fracture complications by means of interferential current

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The most serious complications in bone fractures are delayed callus formation, pseudarthrosis, development of Sudeck's atrophy, joint rigidities and contractures.

Over the last 10 years we have observed a total of 875 patients with various fractures of the extremities who had developed the above-mentioned complications.

Investigations revealed that these complications had the following causes:

1. Incorrect repositioning or protracted immobilization in 38 % of the patients with delayed callus formation.
2. Incorrect repositioning in 24 % of the patients; use of a vigorous thermotherapy (paraffin packs, warm baths, etc.) after removal of the cast in 76 % of the patients with Sudeck's atrophy.
3. Incorrect repositioning in 16 % and use of vigorous thermotherapy or massage and passive movements in the area of elbow joint in 84 % of the patients with elbow joint contractures.
4. Non of the patients with painful rigidity of the joints and contractures were provided with any physical prophylaxis (physical therapy, etc.) during the period of immobilization;
5. nor was any prophylaxis (prevention) with physical measures given to all of the 875 patients during immobilization.

Rehabilitation of the above-described complications was performed primarily by applying the following methods: interferential current, ultrasonics, diadynamic current, syncardial massage – always combined with physical exercises – and if necessary appropriate medications.

In patients with delayed callus formation, pseudarthrosis, and Sudeck's atrophy we applied interferential current therapy at a constant frequency of 100 Hz. The four electrodes were arranged so that the damaged area was located within the zone of interference. The sessions were conducted daily for 15-20 minutes and numbered 15-20 or more. If the patient had a cast, openings were made in the cast or two plate electrodes were placed in the segmental area and the other two in the distal-most part of the affected extremity which usually had no cast.

The curative effect of interferential current at a constant frequency of 100 Hz is due to its dampening the sympathetic part of the vegetative nervous system and its pronounced analgesic effect. Elimination of angiospasm is followed by active hyperemia, an opening of anastomoses, an increase in the lymph flow, a rapid removal of toxic metabolic products, and improved oxygen supply to the tissues, i. e., the

venous stasis and anoxemia of the tissues present in Sudeck's atrophy are eliminated.

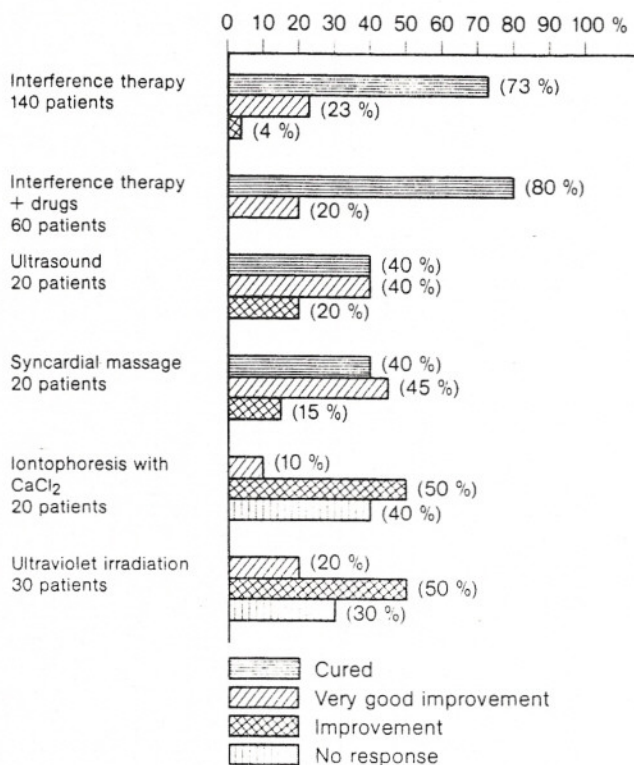


Fig. 1 Results of treatment of delayed callus formation with different physiotherapeutic methods

To treat joint contractures and rigidities we use interferential current in the following way: In a simple course of contracture the rhythmical frequency of 0-10 Hz is used (stimulation of the motor nerves, muscle exercise). In patients with pronounced pain or a delayed callus formation as an accompanying symptom we apply a constant frequency of 100 Hz until the pain disappears and a satisfactory callus formation is achieved. In patients with ossifying myositis, a hematoma, and incorrect repositioning we use the rhythmical frequency of 0-100 Hz (pain relief, active hyperemia, removal of trophic disturbances). The sessions took place for 15 minutes; the number of sessions amounted to 12-15.

We evaluated the therapeutic effect in all patients according to the following parameters: disappearance or relief of pain, removal or reduction of trophic disturbances, circumference of the joints, measurement of the joint function (ROM, range of motion), X-ray pictures, oscillation values, and erythrocyte sedimentation rate.

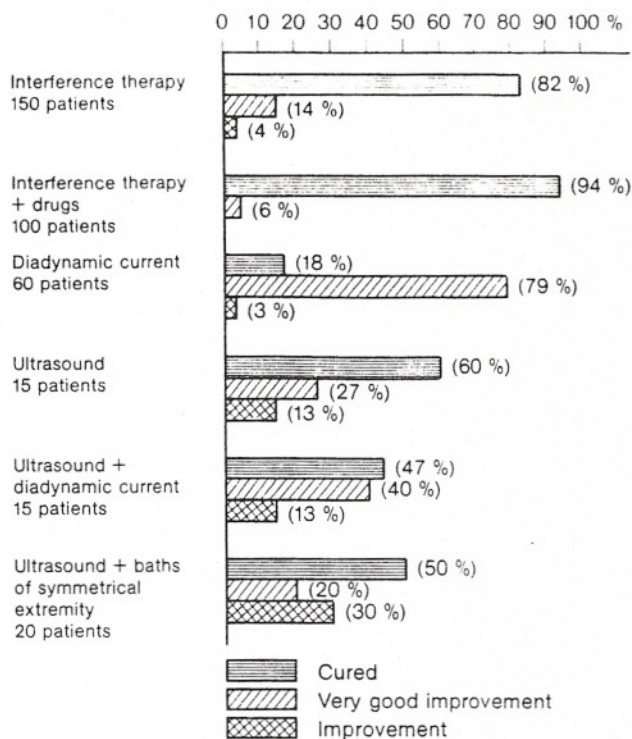


Fig. 2
Results of treatment in cases of Sudeck's atrophy with different physiotherapeutic methods

On the basis of our experience we have established the following important factors for treatment in the practice:

1. Interferential current promotes formation of both endosteal and periosteal callus. Compared with other physiotherapeutic methods of treatment, interferential current therapy yields the best results (Fig. 1). A considerable advantage of interference therapy is that it can be applied even in patients with metal osteosynthesis without any danger. The favorable effect is more pronounced when interferential current therapy is combined with the appropriate medication (*Emdabol*[®], *Primobolan*[®], *Dianabol*[®], or *Stronticol*[®] plus *Trikal-kol*[®] D tablets).
2. Sudeck's atrophy is most influenced with interferential current therapy (Fig. 2). We have observed a clinically and roentgenologically confirmed cure in 82 % of the patients and a considerable improvement in the others. Moreover, the effect is especially pronounced (100 % cure!) when interference therapy is combined with the appropriate drugs such as *Radecol*[®]-comp. (a preparation from GDR) or *Vasculat*[®].
3. Interferential current therapy quickly eliminates painful rigidity after long immobilization, i.e., it is an excellent prophylaxis against joint contractures.

4. Interferential current has been successfully used in patients of all ages with traumatic contractures and it gives better results than diadynamic current (Fig. 3) – especially in contractures of the shoulder and elbow joints. Interferential current therapy leads to a functional rehabilitation even in patients with fractures of the head of the radius when surgery would have been indicated but had not been performed for various reasons.

Treatment results of therapy with diadynamic current at joint contractures

Treatment results of interference current therapy at joint contractures

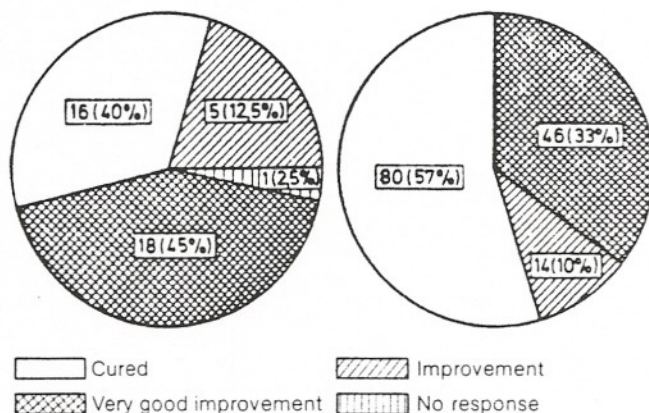


Fig. 3
Results of therapy with diadynamic and interference current in joint contractures

5. Achieving favorable effects in pseudarthroses with the physiotherapeutic means known to us is the most difficult question. Here too our application of interferential current therapy in cases of risk of pseudoarthrosis and pseudoarthrosis following osteosynthesis yielded encouraging results (see Table 1).

On the basis of our experience with interferential current therapy we are of the opinion that this therapy should be the therapy of choice in cases of rehabilitation of postfracture complications.

Table 1

Diagnosis	Number of patients	Results of treatment			
		Cured	Very good Improvem.	Improvem.	No response
Risk of pseudarthrosis	15	15	-	-	-
Pseudarthrosis after osteosynthesis	30	13	14	3	-

Summary

Rehabilitation by means of interferential current, diadynamic current, ultrasonics or syncardiac massage in connection with physiotherapy (and, if necessary, also with the corresponding drugs) was used with 875 patients suffering from various bone fracture complications. It was found that with delayed callus formation, Sudeck atrophy, rigidity in the joints, and contractures, the best results were obtained by treatment with interference current. This treatment has the additional advantage that it may be applied even in presence of osteosynthesis.

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Brief notes on the pharmaceutical preparations mentioned in the paper:

Dianabol[®] (Ciba) = methandrostenolone
= metandienone

Emdabol[®] = tiomesterone (INN, international non-proprietary name)

Note: Emdabol[®] was a preparation of the firm Merck, Darmstadt. At the time of the reprint of this publication (1983) the preparation was no longer on the market under this name. The Swedish firm Draco distributes this product under the name Protabol[®].

Primobolan[®] (Schering) = metenolone (INN)

Radecol[®] (a product from Radebeul near Dresden) and

Ronicol[®] (Boehringer, Ingelheim) contain β -pyridylcarbinol = 3-pyridine methanol

Stronticol[®] (Laves, Ronnenberg, Hann.)
1 tablet contains 47 mg strontium chloride and 18.7 mg protein-bound phosphoric acid.

Trikalkol[®] D (Laves)
1 tablet contains 125 mg tricalcium diphosphate and 500 IU ergocalciferol (vitamin D₂).

Vasculat[®] (Boehringer, Ingelheim) = bamethane (INN)