CLINICAL APPLICATION OF SHORT WAVE DIATHERMY

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Medical diathermy is the production of heat in the body tissues for therapeutic purposes by high frequency currents, insufficient in amount, however, to produce temperatures high enough to destroy the tissues or to impair their vitality.

With the development of radio, powerful oscillator tubes have been constructed for the production of high frequency oscillations of shorter wave lengths. The usual 300 to 400 meter wave length of conventional diathermy is now 30 to 6 meters in short wave diathermy. To distinguish between these two methods the Council on Physical Therapy of the American Medical Association has given the term "conventional diathermy" to the older method and "short wave diathermy" to the newer method. At the present time it probably is better not to make a division of ultra-short wave diathermy since evidence that this subdivision is necessary still is lacking.

Short wave diathermy is rapidly replacing conventional diathermy. No doubt exists that the application of the new method is more simple and the danger of burns is markedly reduced. In short wave diathermy, the plates are not in direct contact with the skin, as is necessary in conventional diathermy. Short wave diathermy can produce a burn, but the danger is minimal if the proper technic is used.

Short wave diathermy is divided into two types; namely, (a) the electromagnetic field, and (b) the electric field. When the electromagnetic field is utilized, the current is conducted to the patient by means of a heavy, very flexible, insulated cable which is used as the electrode, and is coiled about or around the part to be treated. The electric field is applied by means of condenser pad electrodes or cuff electrodes which encircle the part to be treated, and the so-called air space electrodes made of metal contained in glass, bakelite, or rubber.

The condenser pad electrode consists of a flexible metal plate between two layers of flexible rubber which prevent the current from arcing from the metal to the patient's skin. Various machines have different sized electrodes. The cuff electrodes are similar to the condenser pad electrodes except for their size, which ranges from three to nine inches in width and from two to forty-eight inches in length. When applied to the body, they are placed so that they entirely encircle the part to be treated. The air space electrode is made of a circular disk which is adjusted within a special glass container or encased within hard or soft rubber. They are made so that the electrodes can be placed within any desired distance of the skin.

The usual and accepted length of time for a treatment with short

wave diathermy is from twenty to forty minutes. In conventional diathermy the milliamperage indicates the amount of current flowing. However, in short wave diathermy the dose or intensity of current is determined mainly by the patient's tolerance.

In treating a pathological condition with heat, it is important to visualize the process in the tissues and not to use diathermy to the exclusion of other methods of treatment. In many instances short wave diathermy is a valuable adjunct to other forms of therapy.

In the various types of arthritis, adequate treatment is essential. The various physical agents are important adjuncts to treatment, and physical agents alone should not be relied upon in the treatment of this disease. Rest is of prime importance in most instances. Foci of infection should be eliminated, anemia and lowered metabolism should be corrected, and if the patient is obese, weight reduction is important.

The patient with arthritis usually requires treatment over a long period of time and simple physical methods of treatment should be employed. Short wave diathermy is not a necessity, but if it is available, it should be used especially for treating the larger joints such as the shoulder, back, hips, and knees. The local application of heat increases circulation and tissue metabolism in the involved part, and a sedative effect also is obtained. In an acute rheumatic joint, the first application of short wave diathermy should be at low intensity and for a period of time shorter than the usual treatment. When there is congestion in a joint, added excess heat may increase the congestion and intensify the symptoms. Treatments can be given every day if the patient is in the hospital and every other day if the patient is an out-patient. In addition to local heat, the systemic application of heat is of value in increasing circulation and metabolism. This is especially true when many joints are involved and they cannot all be treated locally. If at home, the patient can apply heat daily from an infra-red generator or the paraffin bath which is especially suitable for the hands.

Massage must be given at frequent intervals, and should follow the application of heat. This also can be done at home by some interested member of the family who has received instruction in the procedure. Heavy massage over an arthritic joint may cause a marked local reaction. Therefore, the prescription for this should be made specific by the physician.

During the acute phase, rest in proper supports is important. Passive manipulation should be avoided because it may increase swelling and interfere with the circulation which already is poor. Sunbaths from the natural source should be taken whenever possible, and the ultra-violet lamp should be used in the winter.

Short wave diathermy aids in relieving the pain and muscle spasm in bursitis, and in promoting the absorption of the calcareous deposits.

Diathermy usually aggravates the symptoms in the very acute stage. The severe pain in acute subacromial bursitis makes bed rest almost essential. Abduction of the arm and a few pounds of traction will give immediate relief in most cases. The application of moist heat during the first few days is most beneficial. It may be followed by infra-red irradiation and later by low intensity short wave diathermy. If the symptoms are aggravated after the first treatment of from five to ten minutes at low intensity, infra-red baking should be used for a day or two. When treatment with short wave diathermy is tolerated, the daily treatment time may be increased until treatments can be given for twenty to twenty-five minutes.

In acute bursitis there often is considerable distention of the bursa, which causes very severe pain. Kendrick[1] suggests needling or needle irrigation of the bursa, especially if relief is not obtained by traction and moist heat. Massage should follow the use of heat in all cases and as full a range of motion as possible should be executed each day. This usually is not difficult, especially if the muscle spasm has been overcome by a short period of traction.

It is well known that calcareous deposits in chronic bursitis will disappear without treatment. If the deposits persist, however, diathermy should be tried before surgical intervention is undertaken. Massage and exercise are essential for restoring the joint to normal function. In the painful bursa with calcific deposits and marked limitation of motion, treatment with diathermy, massage, and exercise should be given daily until the symptoms are relieved. Then treatments can be given at longer intervals. In these patients the general treatment is as important as the local treatment. Eradication of foci of infection, regulation of diet, systemic heliotherapy or any measure to generally improve the physical condition should be utilized.

The use of short wave currents in the treatment of fractures has been justified by its effect upon the injured soft tissues. It has not been proved, however, that diathermy has any specific action beyond that of centrally producing heat in the tissues and bone. Massage and exercise should be used in conjunction with heat.

Although diathermy has been suggested for delayed or nonunion of fractures, few reports have appeared in the literature to support this suggestion. Voshell[2], who reported thirty-eight cases of delayed union of fractures, still considered his investigation to be in the preliminary stages. Some of his earlier patients had been treated with conventional diathermy, the more recent ones with short wave diathermy. In this group, thirty fractures showed clinical union, three improved, and nonunion occurred in seven. He states, "Definite thickening of the soft callous surrounding the fracture occurs after eight or more treatments and this steadily hardens and thickens until union occurs; in conjunction

with this the hinge-like abnormal mobility slowly diminishes." The beneficial effect probably is due to the hyperemia produced by the heating effect.

Osborne and Coulter[3] have demonstrated that the bone marrow temperature of dogs can be elevated with short wave diathermy in the living animal, and that the temperature of the muscular tissue can be elevated to a greater degree than that of the bone marrow. The thermal gradient from the surface to the interior of the limb eliminates the danger of any damage to the bony structure. More clinical and experimental data must be available before any definite conclusions can be drawn as to the value of short wave diathermy in the treatment of fractures and the nonunion of fractures.

Whenever a sprain or dislocation occurs, muscles, blood vessels, ligaments, tendons, and the synovial membrane are injured. Hemorrhage and swelling is produced with muscle spasm. There is an inflammatory reaction with heightened local metabolism and elevation of the temperature. For the physiologic effect, local application of cold with rest, proper compression bandaging, and elevation are indicated for immediate treatment. After the first day or two, local edema, lessened circulation, and decreased local metabolism necessitate applications of local heat. If the affected joint is immobilized with a removable plaster cast or splint, the cast may be removed so that heat may be applied locally. It is well to begin with daily infra-red baking for fifteen to twenty minutes, followed by massage. After the danger of hemorrhage has passed, diathermy should be applied to increase local circulation and to reduce pain and swelling.

In acute myositis, the application of the infra-red lamp or hot fomentations, in addition to rest and light massage, have been more effective than has diathermy. However, short wave diathermy is indicated when the condition becomes chronic and presents the picture of a fibrositis with the formation of nodes or areas of induration. In addition, heavy massage and exercise should be utilized.

In a review of fibrositis, Krusen[4] states that almost every writer on this subject considers the judicious application of heat followed by a special type of deep local massage to be almost specific.

In the last few years, with the introduction of specific serums and sulfanilamide and its derivatives, the treatment of pneumonia has undergone a change. Diathermy is not considered a specific cure for pneumonia, nor is there sufficient critical evidence that it lowers mortality or changes the course of the disease. However, it is a helpful adjunct because it is the best method for the application of deep heat for reducing the severity of thoracic pain. This symptomatic relief is often important.

Schmitt[5] states, "Adequate dosage is determined by the intensity of current, duration of each treatment, and frequency of treatments, which

will safely establish and maintain an effective active hyperemia. In all patients treated, the relief from dyspnea, cyanosis, and pain was marked; it takes place during and after the first treatment, and is usually quite complete after a second treatment. The fact that these patients are without distress in any position in the prone posture is the best evidence of such relief."

In reviewing the results obtained with short wave diathermy, Brugsch and Pratt[6] found a high percentage of cures in lung abscess. They treated two acute cases and six chronic cases in which they were unable to obtain similar results. Whether or not short wave diathermy will cure acute lung abscesses is still not definitely established clinically.

For acute enteritis and severe irritable colon, heat in its various forms has been found to be very effective. Short wave diathermy, used as an adjunct to medical treatment, is very valuable for the rapid relief of spasm and for its sedative effect also.

Occasionally a case of severe vesical spasm is seen following electroresection of the prostate. Although we have too small a number of patients to report, we have used short wave diathermy in ten and have observed the disappearance of spasm in all the patients. In vesical spasm and irritable colon, treatments are given twice daily.

Ruedemann and I[7] have studied sixty patients who were treated with short wave diathermy for ocular conditions.

The chief factor in all acute diseases of the eye is to administer immediate treatment to the affected part. The eye does not tolerate infection or inflammation very well. Recovery is usually very poor and the visual loss may be great. We believe that deep diathermy offers a medium for immediate treatment. Short wave diathermy, both as heat therapy and for lessening the amount of deep orbital pain, is of definite benefit in those patients who have acute inflammatory glaucoma. It has a definite beneficial effect in cases of orbital and ocular inflammation, especially the acute cases, in deep corneal ulcers, and in the early stages of central venous thrombosis.

Short wave diathermy is an excellent adjunct to treatment and should be tried in many more cases until the proper field for this form of therapy is found. It surpasses superficial heat in all lesions of the orbit. Very few patients complain of any discomfort and the vast majority are improved by the therapy.

Since it is possible to heat the bony structures with short wave diathermy, various reports have appeared as to its value in the management of nasal sinusitis. Short wave diathermy was evaluated by Hollender[8] in two series of patients in both the acute and chronic form, with controls. Local deep heating in the region of the sinuses produces analgesia through hyperemia and hyperlymphia, improves tissue metabolism, increases resorption and consequently brings about a more rapid defensive

response to infection. In acute sinusitis, short wave diathermy in itself is not sufficiently effective as a therapeutic agent and may occasionally lead to serious consequences unless it is used as a therapeutic aid to other procedures. This agent was valueless in the large majority of cases of chronic disease of the maxillary sinus. Our experience has been that expressed by Hollender, in that short wave diathermy is used as an adjunct to accepted therapeutic measures.

In neuritis and neuralgia, an accurate diagnosis should be made and, if possible, the etiological factors should be eliminated. General medical measures should be employed and short wave diathermy advocated. The response varies and in some instances the patient is made worse rather than relieved. In other instances, complete and sudden relief may be obtained. Therefore, short wave diathermy should be given a therapeutic test to determine its effectiveness. In the acute stage, treatments at low intensity should be used first to determine the effect and to gauge subsequent treatments.

Short wave diathermy has been especially valuable in the treatment of Bell's palsy. More recently it has been substituted for infra-red baking in the early stages of this disease. Here again it is used at low intensity and for short duration. When applying it by the electromagnetic induction method, a soothing, deep heat is obtained which increases the circulation and reduces inflammation in the involved area. As soon as the pain has disappeared, stimulation with the galvanic current should be used on the affected muscles. The patient should be given instructions for exercises, and support with adhesive tape should be applied to prevent sagging of the face and stretching of the muscles.

Contraindications to this form of therapy are as follows:[9]

"It is important to keep the contraindications for diathermy in mind. The local application of high frequency currents is contraindicated in the case of certain acute inflammatory processes such as acute nondraining cellulitis and acute infectious arthritis, or any condition in which there is a tendency to hemorrhage, such as a gastric ulcer; over areas in which the appreciation of heat has been impaired or lost, as in the case of certain peripheral nerve injuries; through the abdomen, pelvis or lower part of the back during pregnancy; during menstruation or thirty-six hours before or after menstruation, and over areas where a malignant growth is suspected."

Summary

It is believed that the indications for the use of short wave diathermy are essentially the same as those for the use of conventional diathermy.

The ease of application and the lessened danger of burns are the chief advantages.

Short wave diathermy should be used as an adjunct in the treatment of

disease when it is so indicated. It has a very definite place in the treatment of disease and with its effective heating, it may be of greater use than conventional diathermy, or its use may produce successful clinical results where conventional diathermy has failed.

Further research and careful evaluation of clinical results are necessary.

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