Staff Meeting Bulletin
Hospitals of the » » »
University of Minnesota

Physical Medicine

Volume XII | Friday, May 16, 1941 | Number 26

STAFF MEETING BULLETIN
HOSPITALS OF THE . . .
UNIVERSITY OF MINNESOTA

Volume XII | Friday, May 16, 1941 | Number 26

INDEX

Published for the General Staff Meeting each week during the school year, October to May, inclusive.

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William A. O'Brien, M.D.

I. LAST WEEK

Date: May 9, 1941

Place: Recreation Room
Powell Hall

Time: 12:15 to 1:10 p.m.

Program: Movie: "Put-Put Trouble"

Gynecological Tuberculosis
Albert F. Hayes

Discussion
John L. McKelvey
K. W. Stenstrom

Present: 133

Gertrude Gunn
Record Librarian

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II. MOVIE

Title: "Birthplace of Icebergs"

Released by: Fox Pictures

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III. ANNOUNCEMENTS

1. CENTER FOR CONTINUATION STUDY

Obstetrics	April 3-5
Roentgen Diagnosis of Diseases of the Chest . . .	May 22-24
Nutrition in the Public Welfare	May 26-28
Diseases of Infancy and Childhood	June 2-7
Diseases of Rectum and Colon	June 9-14
Obstetric and Newborn Nursing	June 12-14
Diseases of Heart	June 16-21
Dermatology and Syphilology .	June 23-28
Health Problems in Industry .	August 4-6
Impairment of Hearing	August or October

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2. ALUMNI ATTENTION!

The Annual Banquet of the Minnesota Medical Alumni will be held in connection with the State Meeting in Saint Paul in May.

It will be a buffet supper held in the Casino Room of the Saint Paul Hotel on Monday evening, May 26th. The speaker will be Mr. Clifton M. Utley, Director of the Chicago Council on Foreign Relations and his subject will be "America in a World at War." Mr. Utley has appeared frequently on the University of Chicago Round Table Broadcasts and is internationally known as an authority on foreign affairs. We consider ourselves fortunate in obtaining him as guest speaker and are anticipating a large attendance at the banquet.

The price of admission will be $1.50 per person. Tickets are on sale in Saint Paul and Minneapolis, Rochester and Duluth and will also be on sale at the registration desk at the convention.

Gordon R. Kamman, M.D.

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3. REMAINING STAFF MEETINGS

May 23	Laboratory Service
May 30	Holiday
June 6	Out-patient Medicine
June 13	Anesthesiology

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IV. PHYSICAL MEDICINE AT THE UNIVERSITY OF MINNESOTA HOSPITALS

F. G. Rosendahl

In contradistinction to the type of presentation at these meetings, in which a specific phase of the work of one of the Hospital Departments is discussed, today's report by the Department of Physical Therapy is to be of a more general nature. It is our purpose to survey briefly the broad field of Physical Medicine, and further to outline the work and facilities of the Department in this hospital.

It is not without some misgiving that we have thus departed from the traditional and undoubtedly more scientific precedent, but the idea is not entirely our own. From time to time during the past several months it has been suggested to us by various members of the Hospital Staff that such a discussion would be of value in acquainting both their own and other clinical groups with the many helpful applications of Physical Therapy to the various fields of medical practice.

The need for a better orientation of the medical world in general toward the field of Physical Medicine cannot be denied. It has been stated that this lack of understanding is something of a vicious circle - there is an inadequate number of trained instructors because the medical schools have not taught physical therapy, and the schools have not taught physical therapy because there has been an inadequate number of instructors. It is only within very recent years that the subject has been injected into the medical school curriculum; in fact, regular weekly lectures to the senior class were begun here at the University of Minnesota only during the past 1941 winter quarter.

This need for better understanding has been brought home to us from time to time by some of the requests we receive. All too often the call is merely for "physio" with no suggestion as to the type of treatment desired. Not infrequently the request is for "lamp" with no specification as to whether infra red or ultraviolet is meant. Undoubtedly there have been occasions when the request for "physio" is sent in as a despairing last resort; this of course, cannot be done away with completely and we realize that other departments are similarly confronted. We feel, however, that better cognizance of the possibilities and limitations of Physical Therapy could in many cases improve the treatment prescribed, and therefore we present this discussion in the hope that it may prove mutually beneficial.

History

Physical Medicine - logically so called because it includes diagnostic procedures as well as therapeutics, although in most cases the term is interchangeable with "Physical Therapy" and will be so used in this report - is probably the oldest and at the same time the newest of the medical sciences. It has been stated that photo- and heliotherapy date back to the day that prehistoric man first crawled out to bask in the warm sunlight. A crude early type of massage originated in the licking and rubbing of wounds and bruises.

Physical therapy has an early history within recorded time. Chinese writings of as much as five thousand years ago described gymnastics, and it is known that the Persians, Phoenicians, and Egyptians were familiar with massage as well. The sun was worshipped by the Egyptians and many other early peoples as the god of healing, and the practice of heliptherapy was widespread among the Greeks and Romans. The Romans were probably the first to popularize fever- and hydrotherapy through their use of baths. The first known use of electricity in medicine occurred in the time of Christ, when shocks from the torpedo fish were introduced as treatment for gout and headache.

During the Middle Ages, the development of Physical Therapy was halted to a large extent, as might be expected of a subject whose fundamentals consisted of heat, light, and bathing. However, with the Renaissance there was a rebirth of scientific investigation, and the basis of much that is now included in

Physical Therapy was worked out.

The visible spectrum was discovered by Isaac Newton in 1666. In 1675 Roemer calculated the speed of light, and in 1678 Huygens introduced the wave theory of transmission of light. It was not until 1800 and 1801 respectively that the infra-red and ultraviolet portions of the electromagnetic spectrum were discovered and added to the visible spectrum, and it has been only since 1924 that the entire spectrum, from the long Hertzian or wireless waves at the one end, through the roentgen rays, gamma rays of radium. and cosmic rays at the other, has been completed.

Electrotherapy actually began with the studies of the magnet and magnetism made by William Gilbert around 1600. It was he who introduced the term electricity. The use of the static machine and the current discharge from the Leyden jar were probably the earliest therapeutic applications of electricity and did not take place until about 1745. This latter is the type of treatment for which Benjamin Franklin was famous. The names of Galvani, Volta, and Faraday, are well known in the history of electricity. The therapeutic use of the faradic current was introduced by Duchenne between 1830 and 1850. Between 1890 and 1900 the effects of high frequency current on raising body temperature were studied by Tesla and by D'Arsonval, and in 1905 the first clinical use of what we now know as "diathermy" was made. Electrocoagulation was reported in 1907, and it was not until 1924 that the high frequency cutting current was perfected.

Hydrotherapy, which had reached a rather high stage of development in the Roman Empire, disappeared until the early nineteenth century, when hot moist packs for the treatment of inflammation were introduced by Priessnitz. Since that time the use of hot and cold baths and douches has been widespread, and at present two of the newer developments, namely the whirlpool bath and underwater exercises, have had general recognition.

Fever therapy has apparently been known since ancient times when it appeared as a side effect of hot baths, but it has been only since 1918 that specific application to disease has been made.

Massage and corrective exercise also have a long history. They were well used by Paré in the sixteenth century and by many others since, but the actual establishment of mechanical therapy on a scientific basis probably begins with the work of Pehr Henrik Ling, the father of "Swedish Massage," in the early 1800's.

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It will appear from the foregoing that the field of Physical Medicine has a long and varied history; many of its empirical applications go back as far as recorded time and a great amount of its basic physics dates from the early days of the Renaissance. It is notable, however, that most of the underlying physiology, and thus an appreciation of its actual possibilities and limitations, is of quite recent origin. This will be discussed in dealing with the specific forms of treatment.

Krusen, in his new book "Physical Medicine," from which much of the material in this report is taken, classifies the field of Physical Therapy into five divisions, namely, Thermotherapy, Light Therapy, Electrotherapy, Hydrotherapy, and Mechanotherapy. These will be taken up in that order and briefly enlarged upon.

Thermotherapy

A. Fever Therapy

Formerly much of general therapeutics had been aimed at lowering temperature in disease, but since it has been noted that many diseases which are self-limited are accompanied by spontaneous temperature elevation, while others which are not self-limited have no concomitant rise in body temperature, much investigation has taken place into the effect of artificially induced fever on various pathological conditions.

Sporadic ventures into the field have been made in the past, but it is only since introduction of the use of malaria by Wagner-Juaregg in 1918 and more particularly in the past decade that great progress has taken place.

Artificially elevated temperature has been induced by many methods other than those included in the field of Physical Therapy, such as malaria, relapsing fever, rat-bite fever, and non-specific protein injection; we are concerned here with the production of fever by physical means. Among these may be listed hot baths, douches and sprays, hot packs, radiant heat cabinets, diatheramy (both conventional and short wave), and hot humid air cabinets.

The basic principles of producing artificially elevated temperature by physical means are (1) increased input of heat energy, accomplished by raising the environmental temperature or application of high frequency currents, and (2) a decreased output brought about by insulating against heat loss. Of these, the latter is said to be the more important - a temperature once raised is quite easily maintained without further application of heat, provided proper precautions are taken against heat loss.

During the course of induced fever, certain definite physiologic effects are known to occur. The pulse, respiratory and circulatory rates, are increased and there is a marked peripheral vasodilatation. The leukocyte count rises during and after the fever session, reaching its maximum several hours after the temperature has returned to normal, and ranged from 10,000 to 60,000 per cubic millimeter. There is a marked increase in the percentage of polymorphonuclears, as well as some degree of shift to the left. A tendency toward alkalosis occurs as a result of hyperventilation and may be further accentuated by depletion of chlorides, which will occur if they are not replaced during treatment. The basal metabolic rate has been shown to increase approximately 7% for each degree of temperature elevation.

The therapeutic effects of fever have been widely studied. It is known that only a few bacteria have thermal death points which can safely be reached by elevation of body temperature, and it is in the treatment of the diseases caused by these organisms, namely, the Gonococcus, Meningococcus, and Treponema pallidum, that fever therapy has been most successful. However, results do not correlate closely with those of in vitro experiments, and this together with the fact that certain other conditions have shown more or less satisfactory response to artificial fever, gives rise to the conception that the effectiveness of hyperpyrexia is due at least in part to the stimulating effect of fever on the defensive mechanism of the body.

An interesting recent development has been the combined use of fever- and chemotherapy. It has been demonstrated by in vitro experiments that the effectiveness of the sulfonamide drugs (at least sulfanilamide and sulfapyridine) is markedly potentiated by elevation of the temperature at which the cultures are incubated. This has been translated into clinical meaning by the remarkably high percentage of success in treating cases of gonorrhea which have failed to respond to sulfanilamide alone by the combined use of sulfanilamide and artificially induced fever. A few cases of brucellosis and bacterial endocarditis have been reported as "cured" by this combined treatment and it would seem that the field should be worthy of much further careful investigation. Similar investigations into the combined use of fever and the arsenicals in the treatment of syphilis have been and are being made, and present reports indicate that a parallel situation may obtain there.

In regard to the proved clinical use of fever, this much may be said: Gonorrhea and syphilis are known to respond very favorably. However, since chemotherapy for both conditions is much more easily available, this can and should be tried first. Cases which fail to respond should be given the benefit of the combined treatment, and in cases in which serious complications develop

(i.e., gonorrheal arthritis, septicemia, endocarditis) this should not be long delayed. Chorea is known to respond almost universally satisfactorily to fever treatment, and reports have been made of definite improvement in cases of rheumatic fever treated by the combined method. Other conditions in which artificial fever therapy has been used with varying degrees of success are certain cases of atrophic arthritis, particularly early acute and subacute types, intractable bronchial asthma, selected cases of meningococcal infection, and undulant fever.

Mention should perhaps be made of the controversy over the comparative merits of malarial and physically induced fever. Reports as yet do not clearly indicate the superiority of one type over the other; in fact, it is becoming more generally evident that clinically they are fairly comparable. It is evident that malaria is somewhat more readily available and is less expensive. On the other hand, artificial induction gives a much more readily controlled and predictable fever, and is more adaptable to combination with modern chemotherapy. The issue is at present by no means settled.

Here at the University Hospitals our facilities for the use of artificial fever are limited but fairly satisfactory, and the record of the number and type of cases treated since inauguration of the Fever Therapy Department in 1936 which is presented herewith, illustrates the degree of experience in this field. At present all treatments are carried out in the one Kettering Hypertherm, a type of hot humidified air cabinet, which the hospital possesses. As a rule but one case can be treated a day, although in a few instances where only a short session is required, two runs are possible. This limits the number of treatments then to about six a week. Formerly two such machines were available and in use; since the advent of sulfanilamide and subsequently through the lack of available space, it has been necessary to curtail the activities of this particular branch of the Department.

B. Local Application of Heat

The local application of heat is one of the more common physical practices used in medicine and is so well known that it will be touched on but briefly here.

Fundamentally, heat can be applied in three ways - by conduction, convection, and conversion. In conductive heating, the heat is transmitted by actual contact with a heated body. Convective heat is that which is thrown on to the body from an outside source, such as a heat lamp, and will be discussed under light therapy. Conversive heat is developed in the body through the action of high frequency currents, and will be mentioned in the discussion of diathermy.

Physiologically, the effects of heat are sensory and vascular. A local vasodilatation with hyperemia, sweating, immediate erythema, and an increase in local temperature and metabolism occurs. Effect on the peripheral nerve endings is described as sedative, analgesic, or "tonic."

The use of hot moist packs for various inflammatory conditions is well known, and the common devices for home application of heat, such as hot water bottles, chemical and electric heat pads, and electric blankets, need no further amplification. Hot paraffin packs are a convenient method of applying local heat when other methods are not available. The Elliott treatment for applying heat to various body cavities by a closed hot water system is familiar, and similar devices for the use of hot air are manufactured.

In the Department of Physical Therapy here, local heat is seldom used except as an adjunct to other forms of treatment such as a preliminary to massage or exercise. Here it is valuable in relief of pain and for relaxation of muscles.

C. Cold Therapy

At this time, the use of cold in therapy is of a limited nature. Local

cold application, chiefly by means of ice packs, is commonly used for vasoconstriction and subsequent diminution of hemorrhage following trauma, such as sprains and contusions. General application of cold by means of packing in ice or mechanical refrigeration, is under investigation for treatment of carcinomatosis. Not enough is yet known of this subject to make further mention of it.

Light Therapy

Light therapy signifies treatment by radiant energy, and includes use not only of the visible spectrum but of the infra-red rays extending below the longest wavelengths of visible light and the ultraviolet rays abote the opposite end of the spectrum.

A. Ultraviolet

Ultraviolet light is that portion of the electromagnetic spectrum whose wavelengths vary from 390 millimicrons to 13.6 millimicrons and thus comprises the range between visible light and the roentgen rays. Its actions are chemical and the field of its use is referred to as actinotherapy. Because of differences in the reactions produced by various wavelengths within the group, it is customary to further subdivide ultraviolet energy into two classifications: (1) the near ultraviolet, whose wavelengths extend from 390 to 290 mimmimicrons, and (2) the far ultraviolet, ranging from 13.6 to 290 millimicrons. Wavelengths below 150 millimicrons are further classified by some as "extreme" ultraviolet, and are said to have no therapeutic application, since they are absorbed by air, and therefore transmitted only in a vacuum.

In general, the depth of penetration of ultraviolet radiation may be said to vary as the wavelength; however, even the longest of the near ultraviolet rays penetrate only to a depth of two millimeters, while the far ultraviolet does not even penetrate through the stratum corneum of the epidermis. Similarly, wavelength seems to govern physiologic reactions produced. The shortest rays are those having bactericidal and cell-destroying properties, those of the middle range possess antirachitic effect and are those which convert ergosterol to vitamin D, while the longer "near" ultraviolet is the portion responsible for the production of pigmentation. Thus it can be seen that an appreciation of the various properties of the subdivisions of ultraviolet radiation is important in deciding which type shall be used in therapy, depending on the effect desired.

Sources of therapeutic ultraviolet light are numerous. Strong summer sunlight contains up to 5% ultraviolet radiation, practically all of which lies in the near ultraviolet zone. Carbon arc lamps are available which, through admixtures of certain metals with the carbon of the elextrodes, emit ultraviolet radiation with wavelengths extending through the near ultraviolet, and in a small degree into the far ultraviolet. Quartz mercury vapor lamps yield considerably more of both the near and far ultraviolet, while the "cold quartz" type of lamp produces a concentrated far ultraviolet of marked bactericidal power.

Many of the applications of ultraviolet irradiation in the therapy are well known. Its use for the extrapulmonary types of tuberculosis is perhaps most widely accepted. Earlier workers avoided ultraviolet in the treatment of pulmonary tuberculosis because of its reported tendency to increase hemorrhage, but more recent investigation has failed to corroborate this, and ultraviolet therapy is coming into more widespread use for all types of tuberculosis. Tuberculous peritonitis and enteritis are said to respond satisfactorily to this type of treatment. It should be remembered however that light therapy is merely an adjuvant in the treatment of tuberculosis and is never to be relief on solely.

Ultraviolet radiation has found widespread use in dermatology. Reports of as high as 90% cures in lupus vulgaris have been made, especially with the

Finsen type of carbon arc treatment. Other conditions reported to be benefitted in greater or lesser degree are pityriasis rosea, certain cases of chronic eczema, pruritic dermatoses, and psoriasis. In many of these, ultraviolet seems to be of most use when combined with other forms of local treatment. Erysipelas probably deserves especial mention. Prior to the advent of sulfanilamide, ultraviolet was the treatment of choice. It would seem now that chemotherapy gives a higher percentage of cures, but it is possible that the initial use of ultraviolet followed by sulfanilamide may be advantageous. It is probably wise to avoid the concurrent use of these forms of treatment or to follow chemotherapy by ultraviolet, as there is some experimental evidence to suggest that the two counteract each other, and cases of sensitization to ultraviolet by sulfanilamide have been reported. In ophthalmological work use of ultraviolet in treatment of various forms of corneal ulceration and abrasion has been reported as satisfactory. In diseases of the throat ultraviolet has been described as particularly useful for treatment of tuberculous laryngitis. An interesting clinical observation which we have made here is the remarkable relief offered by use of the cold quartz applicator in acute pharyngitis. Ultraviolet radiation also seems useful in promoting healing of indolent ulcers. Widespread use of ultraviolet in prevention and cure of disorders of calcium metabolism (rickets, tetany, spasmophilia) both through irradiation of the patient and of food to improve the vitamin D content has been a development of recent years. Another recent use of ultraviolet is the utilization of its bactericidal properties for the sterilization of air, particularly for use in operating rooms, nurseries, and the like.

Ultraviolet equipment here consists of three mercury quartz lamps, one of which is portable and can be used throughout the hospital, and a cold quartz lamp equipped with suitable applicators for orificial work.

B. Infra-red

Infra-red radiation comprises a segment of the electromagnetic spectrum extending from a wavelength of 770 millimicrons, and thus immediately adjacent to the lower, or red end of the visible spectrum, to wavelengths of 15,000 millimicrons. As in the case of ultraviolet, this range is subdivided into two groups, the "near" infra-red, made up of wavelengths of from 770 to 1400 millimicrons and "far" infra-red, wavelengths of from 1400 to 15,000 millimicrons. The chief difference in the effects produced by the two types of infra-red lies in the depth to which they are able to penetrate beneath the body surface. Near infra-red is said to penetrate to levels of approximately one inch, while far infra-red penetrates at most one centimeter. However, practically all the far infra-red is absorbed at the skin surface, while 95% of the near infra-red is absorbed within two millimeters, so to all intents and purposes both have a very superficial action, with the shorter "near" rays affording slightly greater penetration.

The action of infra-red is entirely that of heat and has no demonstrable effect other than those described for methods of heat application. Its uses are the same as those of other methods of applying external heat.

Infra-red generators are in general of two types - the luminous and non-luminous. Luminous heaters make use of tungsten or carbon filament lamps and generate a relatively high percentage of near infra-red rays. They are most useful in producing capillary hyperemia because of their better penetration. Non luminous heaters, of which the ordinary bathroom heater is an example, generate chiefly radiation of the far infra-red wavelengths and produce heating of the outer layers of the skin.

The Department here possesses both types of lamps. Their chief use is as a preliminary to massage and exercise.

Electrotherapy

Electricity as a therapeutic entity has had wide use and possibly wider abuse; it is well known that much medical quackery is carried on through the utilization of various electrical devices. However, there are several definite uses to which electricity may properly be put and which are of definite therapeutic and diagnostic value.

A. Galvanic Current

The galvanic (constant or direct) current as used in medicine is a uni-directional current of low voltage and amperage. Voltage is usually less than 100 and amperage is usually below 50 milliamperes. At present it has three chief uses in physical therapy - electrolysis, iontophresis, and muscle stimulation.

Electrolysis is accomplished by the concentration of caustic positive ions at the negative or active needle electrode, and is used principally for epilation.

Iontophoresis is a method of introducing drugs through the skin by the repellant action of one pole of a constant current source. This subject was reported in the Staff Bulletin last year and will be described but briefly. The two drugs most widely used at present are histamine and mecholyl, both of which are introduced for the purpose of causing a prolonged local vasodilatation. Since both are positive ions, they are driven into the skin from an aqueous solution by means of the positive electrode of a low intensity constant current. Some use has been made of iontophoresis in arthritis and in a few other conditions where a lasting local hyperemia is desirable.

A diagnostic use is made of the galvanic current in a part of the test for reaction of degeneration. The interrupted galvanic current may be used for stimulation of weak muscles following nerve degeneration.

B. Faradic Current

Faradic current is an intermittent alternating current produced by an induction coil of the type with which every medical student is familiar. For medical purposes a current of low intensity is used. Because of its rapid intermittent cycle (50 to 100 per second) it stimulates nerve but not muscle directly. It is this fact that makes it useful in testing for reaction of degeneration. The greatest clinical use of faradic current is in stimulating muscles which are weak (as in disuse atrophy) but in which the normal nerve supply is present.

C. Sinusoidal Current

Sinusoidal currents are alternating currents and are classed as slow or rapid depending on their frequency. They are usually produced from a constant current source by means of a mechanical current reverser. The principal use of sinusoidal currents is in exercising weak muscles with or without normal nerve supply.

D. Diathermy

Diathermy may be defined as a method of heating the body tissues by means of high frequency electric currents which are of relatively high voltage and amperage, as compared to the other types of therapeutic current mentioned. Currents of very high frequency oscillate too rapidly to cause neuromuscular excitation, hence cause no "electric shock." On the other hand, because of the resistance of the body tissues to their passage, heat is generated.

1. Conventional diathermy

The rapidly oscillating current used at the time of the introduction of diathermy soon after the beginning of the twentieth century was produced by means of spark gap machines. Frequencies of from 1,000,000 to 3,000,000 per second can be produced in

this manner at wavelengths of from 300 to 100 meters. For heating body tissues with this current it was found necessary to apply electrodes closely and accurately to the body surfaces in the region to be treated. As the current passes thru the body from one electrode to the other, heat is generated by resistance, in accordance with Ohm's law.

2. Short wave diathermy

With the development of the vacuum tube oscillator, it was found that currents of much higher frequency could be produced. At present, frequencies of from 10,000,000 to 100,000,000 per second (wavelengths of from 30 to 3 meters) are utilized in therapy, and their use is known as short wave diathermy. With these higher frequencies it is not necessary that the electrodes come in actual contact with the body, as in the case of conventional diathermy. Instead of a closed circuit, the electrode and the body, with the air space between them, serve as a condensor in the circuit.

3. Surgical diathermy

In surgery, use is made of the intense heat concentrated at a small electrode when used in conjunction with a large indifferent electrode in a high frequency circuit. Further discussion of this subject will not be carried out in this report.

The physiologic effects of diathermy are those of heat; its peculiar advantage over other local applications of heat is due to its penetrating power. It is generally believed that conventional diathermy currents follow the path of least resistance and thus heat best along blood vessels and lymphatics which are relatively good conductors. Short wave probably heats in this manner also, but in addition there have been many claims of selective heating of tissues according to their dielectric constants. This effect is probably very limited, however, since there is no very marked difference in dielectric constants throughout the body, and in addition the effects of circulation and temperature control probably lessen any temperature differences which may occur. There is much argument about the manner and depth of penetration but it seems that with conventional diathermy there is a gradient from greater heat at the skin surfaces inward, while with short wave this may be governed, at least in part, by the distance of electrode spacing from the skin. Claims of specific bactericidal action have been made, but in general these have not been borne out.

The chief uses of medical diathermy then are those of locally applied heat, particularly when this is desired at some depth beneath the body surface. It is of value in most suppurative processes, where the production of hyperemia is of known benefit. As an adjuvant in the treatment of sprains and dislocations it is useful, and may be helpful in applying heat to arthritic joints. Diathermy is well adapted to heating the pelvic organs and may be helpful in conjunction with other methods of treatment. An interesting and valuable use is in the treatment of suppressed kidney function, where in combination with other treatment, it may be life saving. The mechanism involved is supposed to be increased filtration due to increased circulation through the kidney, in addition to the marked sweating usually induced. Considerable use may be made of diathermy in the diseases of muscles, tendons, and bursae, such as deep contusions, sprains, myositis, fibrositis, tenosynovitis, and bursitis. In these conditions, particularly after the acute stage, the treatment is usually combined with massage and exercise. In various types of neuritis, neuralgia, and radiculitis, mild heating by means of diathermy may be very effective in relief of pain and in diminishing inflammation. Most pulmonary conditions have shown little response to diathermy, although it may at times be helpful in pneumonia. It has found widespread use as an aid in the treatment of sinusitis.

The Physical Therapy Department here is equipped with one conventional diathermy machine for which several types of special applicators are available, and one short wave machine which has both condensor pad and induction cable

circuits as well as a surgical diathermy circuit. Equipment for the use of simple galvanic and faradic currents and for iontophoresis is also available.

Hydrotherapy

Hydrotherapy implies the use of water for therapeutic purposes, and by definition may include water in all its states - steam, liquid, and ice, - applied either externally or internally. Chiefly, however, it is taken to mean the external application of water in its liquid state, although various irrigations and douches may be included.

A. General hydrotherapy

General hydrotherapy includes the use of full baths of various sorts, the Hubbard tank and the therapeutic pool, showers or sprays, general body douches, which implies the playing of a stream of water from a hose nozzle over the body, and full body packs.

Full baths depend in general on temperature for their effect. Cold baths are used for stimulation, neutral or warm baths for sedation, both for various toxic effects. The Hubbard tank and the therapeutic pool are used for underwater exercises, a fairly recent and important field. Sprays, showers, and douches are of course stimulative, and are usually combined with massage of some type. Body packs may be used as thermal measures, are frequently used for sedation in various agitated or convulsive conditions, and when cold, may be used to reduce fever.

B. Local Hydrotherapy

The more common uses of local hydrotherapy are Sitz baths, contrast baths, whirlpool baths, and irrigations of the various body cavities. Sitz baths are best adapted for the home treatment of various inflammatory conditions within the pelvis. Contrast baths find their greatest application in the treatment of arthritis and peripheral vascular disease. The whirlpool bath, which as the name implies depends on the mechanical agitation of a tub of heated water, was designed originally for the after treatment of amputation stumps, but now finds its greatest use in the mobilization of extremities after local injury such as sprains or dislocations, or after removal of plaster or other methods of fixation following fractures. Irrigations of the ear, nose, and throat are of known value, as is gastric lavage for the treatment of obstruction or dilatation and for the removal of poisons.

The physiologic effects of hydrotherapy are chiefly sensory and circulatory, and derive principally from the temperature and manner in which the water is applied. Thus stimulation, sedation, vasoconstriction, and hyperemia, may be described. In addition the whirlpool bath provides a gentle massage which allays pain and helps to reduce swelling. Underwater exercise is of value in the treatment of weakened or paralyzed muscles and is used chiefly for poliomyelitis and other paralyses, and in the early management of muscles weakened through disuse.

Hydrotherapy equipment of the University Hospitals consists of a whirlpool bath and a therapeutic pool.

Mechanotherapy

Generally speaking, the field of mechanotherapy is that of massage and exercise.

A. Massage

Massage is much more than mere rubbing. There are different types of massage, each of which possess different properties, and it is necessary that the proper type be chosen with regard to the effect desired. In general these effects may be spoken of as reflex and mechanical. Light superficial stroking is useful for sedative purposes, and in diminishing pain and muscular spasm. Somewhat heavier stroking, applied centripetally, aids mechanically in the return flow of blood and lymph and increases local circulation in the part. Heavier pressure applied as

kneading or friction is of use in the stretching or breaking down of adhesions.

Massage is best applied manually. Numerous mechanical devices have been introduced which purport to give effective massage, but there is no method of massage which can not be better given and more perfectly controlled when performed by a well trained physical therapist or masseur. In general, massage should always be preceded by some form of local heat, thereby promoting muscle relaxation and making the massage more efficient.

The uses of massage are legion. It is valuable in arthritis, as applied to the atrophied muscles about the joints involved. Deep forceful massage is the only known beneficial treatment for the entity described as fibrositis. Massage can be very useful as an aid to the peripheral circulation in the management of heart failure, and finds added use in the treatment of peripheral vascular disease. Sedative massage may be helpful in functional nervous disorders and for relief of pain in the various types of neuritis. Massage combined with exercise has widespread use in the after treatment of fractures and a variety of orthopedic conditions, including many forms of back injury, poliomyelitis, and paralysis due to peripheral nerve injuries.

B. Exercise

Exercise in a therapeutic sense may be defined as the "scientific application of bodily movement designed specifically to maintain or to restore normal function to diseased or injured tissues." Four varieties of corrective exercise may be described; these are: (1) passive exercise, (2) assisted active exercise, (3) free active exercise, and (4) active exercise against resistance. The essentials in the use of exercise are a skilled, well trained operator and a cooperative patient. Many mechanical aids to exercise have been devised, and some are of undoubted use, but in the main, the simpler the exercise and the less apparatus used the better.

The chief aim of passive exercise is the prevention of contractures and adhesions; manipulative breaking up of formed contractures and adhesions may be considered a special form of passive exercise. Assisted active exercise has its chief use in strengthening weakened muscles and in their re-education following disuse. This is true of muscles about arthritic joints and of those deprived of a portion of their nerve supply, as in poliomyelitis. Active exercise is used whenever possible in the correction of various postural deformities, mobilization of joints, prevention of contractures and adhesions, strengthening of muscles, and for general toxic effects. In instances when one muscle should be strengthened without stimulation of its opponents, resistive active exercise is used.

The physiology of exercise is that of muscle contraction, with its effects on metabolism, both in the muscle itself and generally, and the other effects of activity, such as increased pulse rate, blood pressure, respiration, and excretion.

The technique of exercise cannot be gone into here, but suffice it to say that exercises can and have been developed for almost all phases of neuro-musculoskeletal therapy, and that exercises for postural deformity, mobilization of joints, training and re-education of weakened muscles are all available.

At this point, mention may be made of "passive vascular exercise" and the intermittent venous occlusion (pressure cuff method of treating peripheral vascular disease. In the former, with the extremity sealed inside an air-tight glass boot, alternate positive and negative pressure is applied; in the latter, pressure of sufficient degree to produce venous occlusion is applied intermittently by means of a pressure cuff placed around the proximal portion of the extremity to be treated. In either case, the purpose is to help develop collateral circulation in the part and the treatment can be applied in cases of arterial insufficiency due to arteriosclerosis or following at safe

interval after thrombophlebitis.

Until recently a room was available where several patients could be treated at once by the cuff method; at present we are alimited to the use of a simple portable venous occlusion machine which the Department possesses.

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The accompanying table summarizes the number and types of patient treatments performed in the University Hospitals Physical Therapy Department during the past ten years and includes this year's treatments as of May 1st. The total number of patients treated is also noted.

This report has been a very superficial outline of the field of Physical Therapy, especially as it pertains to this hospital, and since it is merely an outline, no attempt has been made to substantiate statements by references or other data. More detailed information and complete bibliographies can be found in any of the standard works on Physical Therapy, a few of which are listed below.

1. Principles and Practice of Physical Therapy
W. F. Prior & Co., Hagerstown, Md.

2. Handbook of Physical Therapy
A. M. A. Press, Chicago.

3. Coulter, J. S.
Physical Therapy
Paul Hoeber, Inc., N.Y., 1932.

4. Granger, F. B.
Physical Therapeutic Technique
W. B. Saunders Co., Philadelphia, 1132.

5. Kovacs, Richard
Electrotherapy and Light Therapy
Lee and Febiger, Philadelphia, 1938.

6. Krusen, F. H.
Physical Medicine
W. B. Saunders Co., Philadelphia, 1941.

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FEVER THERAPY AT UNIVERSITY OF MINNESOTA HOSPITALS, 1936 - 1941

Diseases	Cases	Treatments
Arthritis	18	130
Asthma	13	60
Blastomycosis	1	2
Bronchiectasis	2	8
Chorea	21	172
Dermatomyositis	1	9
Dermatitis Herpetiformis	1	8
Diphtheria Carrier	2	19
Eczema	4	85
Gonoccal Infections		
Arthritis	43	211
P.I.D.	13	43
Prostatitis	2	20
Urethritis	15	49
Iritis	1	8
Ophthalmitis	1	1
Meningococcic Infection	1	3
Multiple Sclerosis	4	34
Ophthalmology		
Interstitial Keratitis	3	24
Iritis	1	2
Luetic Uveitis	1	1
Uveitis	1	1
Osteosarcoma	1	8
Osteomyelitis	5	41
P.I.D. (Non-specific)	3	19
Post Infectious Encephalitis	1	2
Pulmonary Osteoarthropathy	1	5
Rheumatic Heart Disease	1	1
C.N.S. Syphilis	23	169
Still's disease	6	94
Subacute bacterial endocarditis	2	4
Undulant fever	3	16
	195	1,249

SUMMARY

Department opened February 25, 1936.
One cabinet until January, 1938.
Two cabinets until June, 1939.
Total number of patients treated, 195) As of May 1, 1941
Total number of treatments, 1,249)
No deaths
No serious complications

PHYSICAL THERAPY AT UNIVERSITY OF MINNESOTA HOSPITALS, 1930 - 1941
(Each year noted as July 1st to following June 30)

Type of Treatment	Number of patient treatments by years											
	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39	1939-40	1940-41*	Total
Diathermy	1582	1008	1327	959	1439	1113	1459	2075	1913	2572	1540	16,987
Ultraviolet	4141	3434	3254	3096	2468	2079	1830	1267	1650	1256	495	24,970
Infra-red	465	1286	2945	3321	3168	3154	2647	2025	1803	2352	1417	24,583
Massave and muscle training	659	1791	3616	3566	3552	3243	2901	2846	3183	3372	2695	31,424
Pool		358	431	382	263	447	381	924	158	845	200	4,389
Pressure Cuff (and Pavex)							752	587	1175	1009	698	4,221
Galvanic and faradic			20	45	Included in miscellanecus	65	167	158	169	116	85	825
Muscle testing			10	10		55	(Included in muscle training)					75
Suspension			12	48				90	39	7	12	208
Arm bath and whirlpool								19	114	231	581	945
Iontophoresis										399	7	406
Miscellaneous					152	414	35			18	77	696
Total	6847	7877	11,617	11,435	11,042	10,570	10,172	9991	10,204	12,277	7807	109,839
New patients	420	391	566	680	705	678	604	592	569	740	414	6,359

* July 1, 1940 to May 1, 1941

V. GOSSIP

Neurosurgeon William T. Peyton, who has just returned to his old haunts after a two month's clinical tour in the East attended a meeting of the Medical and Chirurgical Faculty of the State of Maryland. (The State Medical Association to you) The 143d annual meeting was held April 22, and 23 in Baltimore. Nearly half the printed programme consists of lists of officers, committees, county medical society officers and delegates. The meeting of the House of Delegates occupied the first afternoon and the second morning. I note they have what is called a "constructive recess." That would seem to be worth while. In the general sessions, the subjects are like this -- "Medicine and War," "Psychiatry and Morale." In the sectional meetings, big names predominate, and the subjects seem very appropriate. There are panel discussions, round table luncheons, and ten-minute scientific papers. Ten-minute scientific papers for general meetings are usually unsatisfactory. Ten-minute scientific papers are designed for special society meetings where small detailed presentations are made. Dr. Peyton told me they kept them strictly to time -- not one second over was allowed. I think most of us, if we boiled our material down, could tell it more rapidly. Still it takes time to put it over....In the weeks which have preceded Hospital Day, Monday, May 12, the Minnesota Hospital Association has had 35 radio broadcasts over Twin City Stations, covering every phase of hospital activity, and the various groups which participate in the functioning of the modern hospital took their places before the microphone: administrators, trustees, auxiliaries, nurses, dietitians, medical technologists, medical record librarians, pharmacists, housekeepers, social workers, physiotherapists, occupational therapists, institutional librarians, radiologic technologists, and many others. The complexity of modern hospital organization and the smooth way these various groups work together are interesting developments of our time. Minnesota Hospital Service protection now covers a large percentage of the people in Minnesota. Through prepayment of their bills, more people are able to use hospital service. Physicians everywhere are being asked to keep in mind the possibility of abuse of this program. Many times the attending physician suggests that the patient stay an extra day "as long as they have it coming." If every hospital patient stayed one extra day, it would seriously interfere with building up the reserve which is now assuming safe proportions. Physicians working in industrial plants also tell us that private practitioners are prone to give excuses to workers on slight provocation. School physicians in private colleges are deluged with excuses urging so and so to be excused from drill or gym. Often the private practitioner finds it difficult to say no but the success of the hospital program will depend upon cooperation of the profession.....There is a fine painting of Dr. Jennings Crawford Litzenberg now hanging in the departmental office. Old friends are urged to pay a visit and see this life-like representation of our good friend.....Harper and Brothers, publishers, have printed a series of "doctor" books for Paul B. Hoeber, Inc. of their medical book department. They are entitled "Help your Doctor to Help You." The subjects include Gallstones and Diseases of the Gall Bladder, Gastric or Duodenal Ulcer, Colitis, Food Allergy, and Migraine. The editorial board consists of Drs. Alvarez, Blumer, Clendenning, Cutter, Haggard, Matas, Mayo, Minot, Stokes, and Whipple. They are all written around the general theme "help your doctor to help you when you have this disease." They are very well done (no author announced), and even the covers are in appropriate colors: gallbladder - green, migraine - blue, colitis - blue and brown, etc...I received the following poetry from a gentleman in Trenton, N.J. who read my statements about growing older and living in the past:

HER FIRST LOVE

The years unrolled, as you'd peel a glove,
In a flash that awoke a sleeping pain
And flung back the hours of long-lost love
To hunger within her bosom again-
Calling over the dear dead, girlish days,
From the unspotted, vacant sky of youth;
Of the plight of lovers' cool walks and ways,
On the coveted path, denied to ruth.
She's back in her garden, of strange perfume
Where her early days, have slumbered and dreamed
And her glad 'first-love,' in the fulness of bloom
Is living once more, sweet as it seemed.