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THE USE OF HEAT AND COLD APPLIED TO THE SYMPATHETIC NERVOUS SYSTEM.

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IN No. 25 of Vol. LXIX. of this JOURNAL, a paper on Diphtheritis was issued under my name. Since its publication numerous inquiries have reached me respecting the theory that I propose in that article, which it may not be improper to answer at this time. Before I proceed to its discussion, however, I will state, in answer to other inquiries—that I do not apply the ice or the cold dressing in diphtheritis merely “to the inflamed tissue” or “to the swelling in the laryngeal region” that usually accompanies the disease, but *invariably* to that portion of the cervical region, beneath which is situated the superior cervical ganglia of the sympathetic nervous system, allowing it to extend backwards to the spinous processes of the vertebræ. In this respect my treatment differs from any previously proposed. I would also state that I consider the application of the hot dressing to the site of the ganglia of the sympathetic system in the spinal region, and to the spine itself below the shoulders, secondary in importance to the refrigerant dressing applied in the cervical region, yet no severe case can be treated successfully without it; that I have found the use of iron in combination with strychnine not absolutely necessary to the recovery of the patient, but to hasten convalescence, and to prevent in a great measure the occurrence of those symptoms of debility of the motor portions of the cerebro-spinal nervous system that so frequently accompany and follow severe cases of diphtheritic disease; that I place no reliance “on gargles” or “internal applications to the throat, astringent or stimulant,” “as radical means of cure”;—yet when the disease is excessively putrid in type chlorinated washes may be used, in my opinion, with advantage—as such, the chlorate of potash and the muriate of ammonia I prefer. The alterative effect produced by the

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internal administration of the muriate of ammonia in the initial stage of the disease, I believe to be in some cases highly beneficial. As will be seen in the following portion of this paper, the theory that I have advanced respecting diphtheritic disease was not "extemporized to suit a certain system of practice," but is a "specimen brick" of a general theory from which a system of practice naturally arises that I have adopted for the past four years, in many instances with the happiest results. I "continue to apply the same treatment in diphtheritic disease that I advise," even in the most malignant cases, with unvarying success. I now propose to discuss briefly the importance of the sympathetic nervous system as a dominant tissue in the animal body, the important part its centres play in inflammatory processes, and to give an outline, at least, of a general theory and a system of practice founded thereupon, that I have adopted in many instances with the most flattering success.

The sympathetic nervous system presents to the student a field of inquiry that is rich in physiological and therapeutical interest. Its importance as a dominant tissue in the animal structure to which it belongs cannot be over estimated. Its functions controlling those of the organic glandular and circulatory systems, are manifestly second to none in the animal body. It is the fountain and channel of organic life. It is the agent that prepares from the blood in the wonderful laboratories of the secretory organs those fluids that are necessary in the various processes of the animal economy. It is the indirect force that reduces the aliment to primitive elements, and the probable one that diverts into the blood those that are requisite and assimilable, and the direct one that rolls this fluid in rythmical currents through the arterial channels that permeate the animal tissue. The cerebro-spinal nervous system through intellection, locomotion and muscular adaptation, provides the aliment, while the sympathetic is probably that which fabricates out of its appropriate elements the various tissues that enter into the composition of the animal body.*

* In this view taken of the sympathetic nervous system, it is considered *indirectly*, in part, the sole agent, from which are derived the organic forces that supply the body. That the sensitive nerves of the cerebro-spinal system have an office, and an important one, in the organic processes of nutrition and secretion, cannot be denied. The experiments, however, of Magendie and Longet, showing that destructive disease of the eye occurs much more quickly after the division of the trigeminal nerve in front of the Casserian ganglion, where it is joined by the sympathetic fibres which pass with it to the eye, than when the division is made between the ganglion and brain, seem to prove conclusively that the influence of the sympathetic is much greater than that of the sensitive nerves. As the *sole* agent of distribution, not of elaboration, the sympathetic centres are considered the fountain of secretory and nutritive vitality. On this point the opinions of Kirkes and Paget seem to me to be the best fortified and the most conclusive. They remark, in their *Manual of Physiology*, page 372—"Probably, therefore, the safest view of the question is to regard all the processes of organic life in man as liable to the combined influences of the cerebro-spinal and the sympathetic systems; to consider that those influences may be so combined as that the sympathetic nerves and ganglia may be in man, as in the lower animals, the parts through which the ordinary and constant influence of the nervous force is exercised on the organic processes; while the cerebro-spinal nervous centres and their ganglia are the parts from which the proper sympathetic ganglia derive supplies of nervous force, and from which, more often and more regularly than in the lower animals, the processes of the organic and the animal life are made to work in connection and mutual adaptation."

From this stand-point, and this alone, can be appreciated the importance of the functions of the sympathetic nervous system to the health and welfare of the animal body.

It should, however, be borne in mind that the nervous tissue is the only seat in the animal body of *actual force*, that all the organs and apparatuses of which it is composed are only passive instruments or agents for its awakening, life-giving power. As the student investigates the processes of life, as exhibited in the animal body, from the obscurity and doubt that overshadow some of the functions of the nervous tissue he is apt to lose sight of its importance as the fountain of the *vis a tergo* that endows other less obscure organs with all their wonderful capabilities, that so challenge the admiration and arrest the attention. Indeed, it seems to me that the agency of the nervous tissue in all of the vital processes in the animal economy, especially that portion from which originate the secretory and nutritive forces, is ignored too much by medical students and authors of the present day. A disease, whatever it may be, is "all lung," "all liver," "all kidney," or "a complication of visceral difficulties," as the case may be, according to the opinion of too great a proportion of those whose decisions illustrate the science of medicine in our country. That one or more of these important organs, in each instance, may be diseased, I do not doubt; yet behind them in the nervous tissue, by whose secretions their capabilities and powers are awakened into activity and usefulness, is the primary trouble and derangement. To aim a blow at the seat of the disease, whatever it may be, forms at least a part of the most efficient therapeutical endeavor that the human mind can devise.

These considerations have led me, during the past four years, to attempt to make a more direct application of certain therapeutical agents to the primary seat of disease, viz., the nervous centres, than I find advised by the most prolific and erudite writers on the theory and practice of medicine. In this investigation my attention has been directed chiefly to the ganglionic centres of the sympathetic nervous system. The therapeutical agents that I have used in this connection the most freely and successfully are heat and cold. These two agents are of course applied externally. The idea of applying heat and cold externally upon the ganglionic regions of the sympathetic nervous system, as therapeutical agents, was suggested to my mind by witnessing operations in the office of a dentist friend, in which cold applied to the patient's jaw became an anæsthetic agent of sufficient power to enable the operator to extract teeth without pain and without injury to the patient. The fact of being able to accomplish this refutes the objection raised by some against this mode of practice, "that the centres of the sympathetic nervous system lie so deeply beneath the surface as to be entirely unaffected by the external application of heat and cold." It is highly probable that the effect of either agent, especially that of cold, when experi-

enced even in a slight degree by the tissue of the sympathetic nervous system, modifies more or less the elaboration and transmission of the *spiritus vitalis*, or its own proper secretion.*

May this not afford an explanation to the fact, that when the sympathetic ganglia in the spinal region (assuming that this portion of the sympathetic system governs the organic functions in the cutaneous system) are in a state of excitement and the individual is perspiring freely, a cold current of air coming in contact with the region of the spine at once checks the perspiration and is sometimes followed by a chill and some local congestion?

Where diaphoresis is desired, the happy result that follows the application of the hot dressing to the site of all the sympathetic ganglia in the spinal region, is another proof of the susceptibility of the nervous centres beneath to external applications. In the cervical and in the upper portion of the dorsal region the remoteness of the nervous centres of the sympathetic and cerebro-spinal systems from the external surface cannot be urged as an objection to the probability that their tissues may be deprived, partially or completely, of the power of elaborating and transmitting their secretions of nervous force or fluid, or may be stimulated to a greater efficiency in function by the proper application of the refrigerant or hot dressing to the epidermis above them. The happy results that follow the proper application of each dressing in various diseases abundantly substantiate this point.

It has been my experience that inflammatory processes, occurring in only those organs that are supplied with sympathetic and sensitive nerves arising from nervous centres *above* the sixth dorsal ganglia of the sympathetic system, are immediately cut short by the treatment I advise. Inflammatory processes occurring in other organs of the body are restrained and modified by the application of the same principle of treatment, but in less degree. Inflammatory processes occurring in any tissue or organ supplied with sympathetic nerves arising from nervous centres above the third cervical ganglia of the sympathetic system, are the ones that are the most successfully treated by this mode of practice; as at this point, or at any point in the cervical region, the nervous connection between the cranial portions and the rest of the sympathetic and cerebro-spinal nervous systems may be partially or completely broken by a proper application of the refrigerant dressing.

Besides the direct stimulant and sedative effect produced by the application of the refrigerant and hot dressing over the site of certain ganglia of the sympathetic system, a similar or miniature one is probably experienced by adjacent and perhaps remote centres be-

* In every instance when the application of the cold and hot dressing is advised in this paper, it should be understood as applying not only to the two principal trunks of the sympathetic nerve in the spinal region, but to corresponding portions of the spine itself. This is necessary in order to control the functions of the sympathetic spinal ganglia seated upon the posterior or sensitive roots of the cerebro-spinal nerves.

longing to the same system, resulting from sympathetic impression or conduction of the peculiar state or condition of the centres receiving the direct impression. Thus by applying the refrigerant dressing to the superior cervical ganglia of the sympathetic system, not only is the elaboration and transmission of the *spiritus vitalis* retarded and perhaps abolished in their tissue, but the state or condition they experience during its effects is sympathetically assumed by adjacent and even remote ganglia belonging to the same system. This sympathy finds an analogy in certain diseases incidental to the cerebro-spinal nervous system.

Excepting in certain diseases, where the hot dressing should be applied over the site of all the ganglia of the sympathetic system, the refrigerant dressing should be applied only over those ganglionic centres that distribute sympathetic nerves to that portion or organ of the body in which the inflammatory action is occurring; while the hot dressing should be applied over the site of all those numerous centres that supply with organic vitality those portions of the body that are only sympathetically involved. Besides this effect, that of isolating partially or completely in its nervous connection that portion or tissue of the body where the disease may exist, from that portion that is only sympathetically involved, is to be desired.

The domination of one ganglion of the sympathetic nervous system over adjacent ones or over the entire system when stimulated or excited by morbid agency, is beyond question. That each ganglion possesses the capacity, during a period of health in the animal body, to secrete or originate a sufficient volume of the *spiritus vitalis* to carry on normally the functions of nutrition and secretion in the tissue to which it distributes nerves, with the aid afforded by corresponding sensitive nerves, is admitted by all. In fact it will be plainly seen that the integrity of the organic processes in the aggregate, or the organic health of the body, is dependent upon a *complete* fulfilment of the functions of *each* ganglion belonging to the sympathetic nervous system. This would of course include a normal distribution of the nervous force or fluid, as well as a normal elaboration.

That the nervous force may be diverted from its proper channels and become subservient to other purposes than to fulfil the functions of the ganglion that produced it, is manifest in many of the morbid processes occurring in the animal body.

This condition, or an abnormal distribution of the nervous force, underlies, in my opinion, all inflammatory processes excepting those of a specific or malignant character. It explains many of the phenomena incidental to inflammatory action that are otherwise difficult to understand. It explains the deficiency of action in the secretory glands and the impaired nutrition in all the tissues of the body, excepting the one involved, which characterizes a virulent inflammatory action. Taking this view of the subject, in symptomatic fever super-

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vening after a severe gun-shot wound, we see the organic forces of the body, or the *spiritus vitalis*, flowing from all the rest of the ganglionic centres of the sympathetic system to the aid of the nervous centres that distribute sympathetic nerves to the tissue or organ that sustains the lesion. We have, as the result, a diminished circulation and an impaired nutrition in the rest of the body. The entire sympathetic nervous system represents a certain available force that is just sufficient to fulfil normally the organic functions of the body; and if in a certain tissue or organ the process of reparation is superadded to that of nutrition and secretion, it logically follows that in the rest of the body organic vitality must be diminished.

[To be continued.]

CASE OF TRAUMATIC TETANUS, TREATED BY DR. L. BARTLETT,
OF NEW BEDFORD. APPARENT RELIEF FROM STRYCHNINE.

[Read by Dr. HENRY I. BOWDITCH at the meeting of the Suffolk District Medical Society, March 20th, 1864, and communicated by him to the Boston Medical and Surgical Journal.]

EZRA SHAW, of Carver, Mass., called on me Jan. 14th, 1864, in New Bedford, and gave the following account of himself. "Age, 48 years; height, 5 feet 8 inches; weight, 135 lbs; light hair and complexion; occupation, farmer." Three weeks previously, whilst chopping in the woods, inflicted a pretty severe cut with his axe in the instep of the left foot. One week afterwards, whilst chopping in the woods (about Jan. 1st), cut off the thumb of the left hand, just below the second joint.

The foot soon healed, and the thumb was healing well up to the 7th or 8th of January, when he made two or three applications to it of "*burnt alum*, on account of proud flesh." The alum caused much irritation. On the 12th, began to experience difficulty in opening his jaws and in swallowing, and arranged to start for New Bedford. On the 13th, could only partially open his jaws; had pain in attempting to chew solid food, and considerable difficulty in swallowing. Started for New Bedford. Experienced some vexations and threatened delays on the way, which aggravated above symptoms.

When I first saw him, on the 14th, at 12 M., he could open his mouth about one third of the way, so as to protrude the tip of the tongue. He had but three teeth in the upper jaw, one incisor and one bicuspid on the right side, and one molar on the left side. He had frequent, almost constant chills, accompanied with sweating. Tongue coated; no appetite; complained of much pain through the jaws on attempting to open them or to swallow. Some pain in the back, and pain and stiffness in the legs, especially in walking. Some pain and stiffness in the muscles of the neck. Bowels constipated. Ordered hot foot-bath, to be continued for *one hour*; two compound cathartic pills at bed-time, to be followed by Nichols's cold infusion of senna in the morning. Flax-seed and meal poultice, well covered