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ON

THE SEAT OF HEADACHE

IN THE

SYMPATHETIC NERVE,

AND ON SOME OF

THE RULES OF TREATMENT, DRAWN FROM ITS CONNEXION
WITH CHRONIC ILL HEALTH.

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MDCCCXLVIII.

THE SEAT OF HEADACHE

BY

WILLIAM SMITH, M.D.

THE SEAT OF HEADACHE IN THE STOMACH
THE RULES OF TREATMENT
WITH OTHER ORIGINAL RESEARCHES

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BY WILLIAM SMITH, M.D.

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ON THE
SEAT OF HEADACHE IN THE SYMPATHETIC NERVE,
&c.

WHEN headache is dependent on disease of the membranes of the brain, the cranial bones, or the scalp, the pain plainly follows the usual law of pain. The cause of the pain has its seat in one or other of these several textures, and the consciousness of the sensation is referred to that seat. But when the cause of pain has its seat any where in the encephalon itself, it becomes a question what the organs are through which the consciousness of the sensation arises. Of the several parts composing the encephalon, some, and these form the largest portion, may be cut or punctured in living animals without any discoverable effects; others cannot be so treated without the occurrence of paralysis or convulsions; others again, when dealt with in the same manner, are the source of pain; but the consciousness of that pain is not referred to the parts acted on, but to the extremities of nerves originating in those parts. We should expect, then, that the effects of disease within the encephalon in man, would correspond to these results of experiments on animals. That acute inflammation, for example, should affect the greatest part of the encephalon, without giving rise to pain at all—that when the same invades a certain number of parts, paralysis or convulsion should occur without pain; and that when it seizes any of the remaining parts, pain should uniformly arise, referred, however, not to any part of the encephalon, but to parts supplied with sentient nerves from the encephalon.

No such rule, however, is observed. And if the facts recorded in the pathology of the brain be attentively considered, it will be found, I think, that headache has been remarked along with uncomplicated disease of almost every particular part of the encephalon.¹ Yet it remains a question whether the consciousness of pain be referred in these cases to the affected part. This question cannot be determined in a direct manner, because such a reference cannot be judged of with exactness in the encephalon any more than in the other organs, of the changes on which we have not been rendered conscious in the state of health. The advantage of direct observation is, therefore, unavailable in this instance.

There are, I think, only three conceivable modes of explaining the occurrence of headache in affections of the encephalon itself, consistently with the established laws of the animal economy. In one of these the assumption is made, that the reference of the consciousness of pain is not to the seat of the actual irritation, but to the extremities of the nervous filaments in the adjacent membranes or the scalp; in the two others, the reference is held to be made to the real seat of the cause of pain.

The first is at present the common view, though it does not appear to have met with a very searching investigation from physiologists. It is dependent on what is termed the reflection or radiation of sensation.² A typical example of this reflection of sensation occurs in toothache. The acute impression made on a few filaments of the fifth pair of nerves, exposed by caries of a tooth, being transmitted to the origin of these filaments in the encephalon, excites not merely the usual change necessary for the consciousness of pain, and its reference to their extremities in the carious portion of the tooth, but flows over on the adjacent parts of the encephalon, where other filaments of the same nerve take their rise. These being thus stimulated in the same manner as those of the affected tooth, give origin to the like sensation; and the consciousness of this accessory sensation of pain is referred to the whole cheek of the same side; and in this way is explained the diffusion of the pain. In like manner, in symptomatic headache, for example, the extremities of the par vagum in the stomach, or of the splanchnic or sympathetic nerve in the bowels, liver, or uterus, being irritated, the impression is conveyed to the origin of the affected filaments in the nervous centre; and being supposed to spread to the other parts of that centre, where sentient filaments, distributed to the dura mater or to the scalp, originate, gives rise to the consciousness of pain there. And similarly, according to this view, when the cause of pain is seated in the encephalon itself, the irri-

¹ See Abercrombie on Diseases of the Brain, cases 53, 54, 55, 56, 57, 58, 60, 69, 100, 106, &c.

² Todd and Bowman, Physiology, vol. ii. p. 368; also, Part Third, p. 115. Müller, Physiology, by Baly, vol. i. p. 697.

tation is supposed to spread to the region where nervous filaments of the dura mater, or of the scalp, originate; and thence the consciousness of pain is referred to those parts. The objections to this mode of explanation will be stated after a short consideration of the remaining views.

The second view assumes, that though the encephalon be generally destitute of sensibility in health, yet, like some other parts, it may become sensible under certain morbid conditions, and that this sensibility is independent of nerves, being altogether *sui generis*. Thus the hemispheres of the brain are in so far concerned in every sensation of pain, from whatever source, that though they may not be necessary, as some think,¹ to the mere consciousness of the sensation, yet they are necessary to the remembrance of the consciousness. But as in man, when awake and free from the influence of such agents as chloroform and ether, there is uniformly the remembrance of pain, the hemispheres of the brain must be admitted to be ordinary agents in every complete sensation of pain. When, then, a sufficiently powerful morbid cause operates on the substance of the hemispheres, there may be, according to this view, what is equivalent to a concentration into one of all the several ordinary steps or stages in the process of sensation; these are, 1, an impression on the extremity of a nerve; 2, the extension of that impression to the sensory tract of the nervous centre; 3, a primary physical change there; 4, a transmission upwards through the white filaments to the hemispheres; 5, a secondary physical change there; 6, a consciousness complete enough to be remembered. Or the second view simply amounts to this, that the hemispheres, being the essential seat of sensation, must be capable of sensation, at least when the impression is of sufficient force, even though the subordinate instruments in the ordinary process cannot come into operation. Of this view also hereafter.

The third conceivable view of this question is that here proposed for adoption. It is contained in the three following propositions:—1, That the susceptibility to pain, under certain morbid conditions—some temporary, some permanent—is no special endowment of the substance of the encephalon, but the result of the ordinary law of susceptibility to pain in the vascular solids. 2, That it is not the encephalon, either in its grey or white matter, or the nerves concerned in its proper functions, which are subject to the first effect of irritation in the production of headache, but the nerves subservient to its vitality as an organ of the animal machine. 3, That these nerves are the filaments of the sympathetic, diffused throughout the encephalon in company with the nutrient capillaries.

How far these views bear examination must now be considered.

¹ Grainger on the Structure and Functions of the Spinal Cord, p. 11.

To go back to the first—the case of headache which most distinctly suggests the reference of the sensation to the cranial nerves, is the pain over the left brow in derangement of digestion. This pain is instanced by Todd¹ as a well-marked example of reflected sensation, the primary impression being conveyed to the nervous centre through the par vagum, and thence reflected to the extremities of the frontal branches of the fifth pair. In this explanation it does not appear why the highest branches, namely, the frontal branches of the ophthalmic portion, should be the channel of the reflected sensation, rather than the branches of the second portion and the sentient branches of the third portion, the points at which these originate being obviously nearer the part of the nervous centre disturbed by the impression conveyed from the stomach through the par vagum. Nor does it appear that there is any greater direct evidence in favour of this explanation which makes the case an anomaly, or at least exceptional, than for the supposition of the pain being really in the anterior part of the left hemisphere, consequent on irritation of the gastric filaments of the left vagus nerve, which keeps it within the general law. It is impossible to deny, on just grounds, that phenomena entitled to be termed *reflected sensations* do occur; but it is an error to regard these as the result of a law extensively applicable to the acts of the animal economy. They seem to arise under the unusual stimulation of sentient nerves, and differ widely in character from *reflected motions*. Without the constant operation of the great law on which reflected motions are dependent, the animal machine would quickly come to a stand. On the contrary, the phenomena falling under reflected or radiated *sensations*, are, as it were, erroneous acts of the system, comparatively rare, incidental, forming no part of the ordinary operations in its economy, the result almost uniformly of morbid causes. The conditions on which the unequivocal examples of reflected sensations arise, are obviously the intenseness of the impression made on the extremities of the nerve first affected, and the proximity in the nervous centre of the origin of the nervous filaments, through which the reflected sensation is conceived to be conveyed. But these conditions are not obviously present when irritation of the stomach is supposed to be transferred through the par vagum to the first portion of the fifth pair of nerves, and still less when irritation of the bowels, liver, or uterus is represented as exciting headache on the like principle. If there be affection of the encephalon at the origin of the fifth pair of nerves, then there may be pain of the scalp, independently of any radiation of sensation, or in accordance with the general law.

The second view need not detain us. It must be regarded merely as a last resort, in case the two other views should be dis-

¹ Todd and Bowman, Physiology, Part Third, p. 115.

proved. It violates the ordinary simplicity of physiological laws. Yet were it discovered that there is no such phenomenon as the reflection of sensation, and that no nervous filaments accompany the encephalic capillaries, while it distinctly appeared that the chief part of the substance of the encephalon becomes, under certain conditions, the immediate seat of the consciousness of pain, then we should be compelled to admit two laws of sensation, one in which nerves are essential instruments, and one direct, without the intervention of nerves. But no such necessity is likely to arise.

As regards the third view, which ascribes headache affecting the encephalon to the ordinary process of sensation, exercised by means of minute nervous filaments spreading from the sympathetic throughout its substance, it must be admitted that the existence of such nerves cannot be demonstrated. Nevertheless, the evidence falls little short of demonstrative. It is not doubted by our best authorities, that the sympathetic is distributed in the rest of the body co-extensively with the vascular system. Our most recent accounts of the process of inflammation, to which all vascular parts are subject, assign an important share in that process to the nerves of the capillaries. What would become of these views did the capillaries of the encephalon possess no nervous filaments? If the conclusion be all but inevitable, that the sympathetic is spread elsewhere co-extensively with the bloodvessels, nothing but a confusion of ideas as to the endowments of the nervous substance could lead to the belief of an exception in regard to the bloodvessels of the encephalon. But the force of this evidence, as far as it goes, being admitted, it may yet be said that the nervous filaments accompanying the capillary bloodvessels are not sentient but organic nerves—nerves not destined to become susceptible of pain, but for the maintenance of nutrition and a high vitality. The sympathetic has all the characters of a nerve adapted for presiding over organic rather than over animal acts. Yet it contains both motor and sensitive filaments. It is an incontrovertible fact, that parts supplied exclusively with nerves from this source—for example, the bowels—are susceptible of the most acute pain.¹ It is not unlikely that the general feeling of bodily wellbeing, and that of bodily discomfort, are dependent on opposite states of the vascular filaments of this system of nerves; and, indeed, Bouillaud has expressly ascribed the latter feeling to such a cause. It is not necessary for the object before us to settle whether the sympathetic be an independent portion of the nervous system, and what is the nature of its connexion with the cerebro-spinal axis. It is enough if it shall appear that there are sentient filaments in the sympathetic; and that

¹ See Swan on Diseases of the Nerves, 1834, p. 289; Grainger on the Spinal Cord, p. 136; Müller, Physiology, by Baly, vol. i. p. 742; and Todd and Bowman, Physiology, Part Third, p. 143.

these filaments, distributed along with the encephalic capillaries, are the immediate instruments of sensation in headache affecting the substance of the encephalon, whether the primary central acts be dependent on the cervical ganglia, or on the cervical portion of the spinal cord. The small amount of nervous substance contained in the plexuses surrounding the carotid and vertebral arteries, hardly forms any objection to this view, when it is considered that, compared to its volume, the encephalon, owing to its unusual supply of blood, and the general fluidity of its constituents, contains but a small proportion of matter in a solid state of organization, or in a form capable of having sensibility imparted to it.

It is a valid reason in favour of this view, that the same principle of explanation is applicable to what seems at first sight an anomaly in the observations made on the spinal marrow, and the trunks of the nerves of sense. The following is Muller's statement of this case—"An apparent contradiction occurs in the nerves of sense and in the spinal cord, namely, that there is sometimes pain in the part to which the irritation is applied, as well as in the extreme filaments, and that pain is not merely felt in all the parts which receive nerves from below the seat of a lesion of the spinal cord, but that the injured or diseased part itself is painful. * * * We are at present ignorant why sensations should at one time be felt in the peripheral parts; at another, in the spinal cord itself."¹ The solution of this difficulty is easy, if it be admitted that filaments of the sympathetic accompany the capillaries of the spinal cord and of the sentient nerves. When the sensory columns of the spinal cord, or the trunk of a sentient nerve, is subjected to any common stimulus, the consciousness of the consequent sensation is referred, in accordance with the ordinary law, to the extremities of the nervous filaments which have thus been stimulated, whether at their origin or in any part of their course. But when a more permanent stimulus operates at the same points, by which the capillary circulation at those points is much excited, then the sensibility of the filaments of the sympathetic distributed there is developed, and the consciousness of the sensation is referred to the extremities of these in the part acted on. Nor is it surprising that a considerable turgescence of capillary vessels should rather affect the nervous filaments spread on their own coats, than the filaments of the nerve which they nourish.

There is, moreover, an objection to the explanation of symptomatic headache by the reflection of sensation, which does not apply to the view here maintained. If a sensation be reflected in the nervous centre to other nervous filaments than those by which the impression was conveyed thither, we should expect that the primary sensation and the reflected sensation would be uniformly of the same kind. Hence, if intense pain of the head be produced by reflection to the nerves of the dura mater, or of the scalp, from a primary irrita-

¹ Muller's Physiology, by Baly, vol. i. p. 802.

tion of the nerves of the stomach, the liver, the bowels, or the uterus, the same kind of sensation—namely, intense pain—should at the same moment exist in one or other of these organs. This, however, is far from being uniformly the case. On the contrary, there is no difficulty in admitting that agents which do not immediately excite pain, may so stimulate the nervous filaments of one or other of those organs, as to disturb the capillary circulation at their origin sufficiently to produce headache in a direct manner.

A few points remain to be noticed which seem to confirm the view which I have been urging. The great cause of temporary headache is obviously local turgescence of the encephalic capillaries. And though the encephalon, owing to its approach to fluidity, be, as a whole, nearly as little compressible as water; yet, in consequence of that almost fluid character, local turgescence of capillaries is more readily admissible than in other organs, the capillaries around the affected part being proportionably compressed. Again, the encephalon being not one organ but a congeries of organs, each endowed with separate functions, upon the ordinary law of excitement under living acts, is liable, beyond other parts, to local determinations. And the encephalon, being the seat of impressions derived from every vascular point of the rest of the living frame, is subject to determinations and other transitory changes, not only from causes affecting directly its own vessels, but from any morbid cause that strongly operates on the nerves even of the most distant parts. Lastly, though causes operating directly within the head, as the effects of intellectual exertions, or of emotions of mind, do very often give origin to such determinations of blood, yet these must more generally result from irritation of the distant extremities of nerves; or, in short, transitory headache is more frequently of what is termed the symptomatic character.

The frequency of speedy relief to headache, when not dependent on serious disease within the head, by the sanative efforts of nature, with or without the aid of remedial measures, has led perhaps to an over-estimate of merely palliative means and temporary treatment, somewhat to the neglect of the principles of a radical cure. A paper of this kind does not afford scope for the discussion of the merits of the ordinary well-known remedies for headache, which I say are chiefly palliative.

The radical treatment, as concerns symptomatic headache, lies in such means as remove sources of irritation throughout the body, and such as so improve the general health as to obviate the renewal of the same irritations. We find headaches occurring under the most opposite states of the system, in the plethoric state, in the anemic, the chlorotic, the scorbutic, the petechial state, the nervous state, the state of increased, the state of diminished, the state of perverted secretion; and lastly, in states of vitiation of the great excretions of the system. Any one of these states, or at least a strong

tendency to any one of these states, may exist without the actual presence of a distinct disease, thus constituting what is conveniently termed chronic ill health. With various diseases chronic ill health combines so as to render the ordinary means of cure unavailing. Symptomatic headache, however, is not so much a disease united with chronic ill health, as a usual part of certain kinds of chronic ill health.

Chronic ill health is a more or less perverted state of the vegetative or assimilative functions, usually consequent on errors of diet and regimen, or on privations and subjection to unfavourable influences arising out of forced occupations. Mere common excesses are not the only errors of diet and regimen, it often happening in modern civilized life, that the habits adopted expressly for the preservation of health become the means by which ill health is perpetuated. It may be observed, that a valetudinarian cast of the constitution being suspected, often on slight grounds, and numerous peculiarities being imagined to exist, the sufferer immediately begins to adopt habits deemed corrective of these, in which he is very prone to deviate far from the standard of healthful regimen. Rules for the supposed preservation of health are seldom safe, when leading to usages much different from the practice of those who keep their health without rules. Between excess and deficiency in the amount of aliment there is but a small interval; and there can be no doubt, that while excess was the prevailing fault in former times, and still is with too many, there are not a few instances met with now in which an under quantity of aliment is taken to the prejudice of the health. The habitual dyspeptic is very apt to sacrifice his general health to the fear of disquieting his stomach, forgetting that dyspepsia can never be cured so long as the stomach participates in a general defect of nutrition throughout the system. Nor must it be forgotten how often a person may indulge in luxurious living without thereby obtaining adequate nourishment.

The fitness of the blood and of the several organs of the vegetative functions to perform efficiently their respective offices, depends on the completeness of the process of nutrition in each. But that process cannot be otherwise than imperfect in chronic ill health. In a chronic state of ill health, then, whether headache or any other source of suffering be the immediate object of attention, the first consideration is, by what means a commencement of improvement may be made, so that, by the gradual application of those, the sanative powers of the constitution may be brought at last to operate without embarrassment. For it is a mistake to suppose, that the physician has any greater direct power over the cure of disease than the surgeon has over the healing of wounds.

The leading principle for the treatment of chronic ill health, and for the permanent removal of the uneasy sensations attendant on it, is the exact adjustment of the food, drink, air, and warmth, to the present necessities of the system.

Chronic ill health may be connected with the plethoric state, in

which event the means of correction are best understood; though even here, perhaps, a nicer adjustment than what the ordinary antiphlogistic treatment affords might be made, by a careful study of each instance in accordance with the principle just laid down. In this case, as well as in the less sanguine and the anemic states of chronic ill health, there may be irritating matters to be evacuated, neutralized, or sheathed, before any progress can be made; for which purposes purgatives, even emetics, antacids, diluents, and demulcents, may be requisite. It is no doubt true, as these irritating matters are continually reproduced while this state of health continues, that evacuants in former times have often been too freely, and even detrimentally, employed, and that diluents and demulcents are of safer use. But it is only the frequent repetition of purgatives that can be hurtful; and the example of trainers for the ring may be regarded as conclusive in favour of the utility of such evacuants as a first step, when the health is to be improved. And though a feeling begins to rise in the profession against strong purgatives, owing to the abuse of these remedies in the earlier part of the century, it is undeniable that some of those, when used with moderate frequency, have the power at once of evacuating acrid matters, and of promoting a more healthy action and secretion in the abdominal organs. Of this description are croton oil, oil of turpentine, and colchicum. The liquor potassæ is the best of the antacids. To their diluent effect is probably owing, in a principal measure, the reputation, in health impaired by dissipation, of some of the less active thermal waters,—witness the Bath water, so much extolled by Heberden in such cases. And it is not impossible that the far-famed repute of the decoction of sarsaparilla for the correction of ill health, which I firmly believe to be well founded, may be owing to no higher quality than its demulcent effect.

I just now referred to the practice of trainers for the ring; and I would now instance their success in improving the respiration, and also the strength and resistance of the muscular system, and, in particular, the action of the skin, as an encouragement to attempt, hardly on similar, yet on parallel principles, the restoration of vigour to the vegetative functions, when impaired by the progress of chronic ill health. The case which comes under the management of the modern trainer, is commonly that of a naturally vigorous young man, whose wind has become impaired, his belly protuberant, his muscles flabby, by all kinds of excesses. A few doses of purgative medicine suffice to relieve the digestive organs from any immediate impediment. After being kept for some time on a regulated diet of plain food, with alternate exercise and rest, he can draw a fuller inspiration, hold his breath longer, and recover it sooner when lost; the muscles become firmer, and contract with force; he is less easily stunned by a blow, and the skin becomes clear, smooth, well coloured, and elastic.

It is, however, only the example of the trainer, not his rules, that we are to follow, in chronic ill health. Every case will require a special direction. It has often been a subject of surprise to medical men, that mineral waters should be of so much efficacy in the restoration of health ; but the wonder ceases, when it is considered that, independently of any thing more in the water than a mild diluent quality, the residence at a watering-place, under proper regulation, is nothing else than that kind of training here recommended. A watering-place may be dispensed with, if we can command the same kind of management elsewhere.

For particular morbid conditions, the common well-known rules of treatment are available, too much interference being avoided. In every case where there is the least obscurity as to the nature of the headache, the head should be kept shaved, and cold applied as often as seems to be necessary, to avert unsafe determination of blood. Alterative remedies, as causing least disturbance, are generally best adapted for the ordinary treatment. Under the head of alteratives falls cod-liver oil, which has an inexplicable effect in the promotion of nutrition.

When the excretions assume an anormal character, various well-known remedies are at least of temporary benefit. But neither the bile, the alvine evacuation, nor the urine, can deviate far from the healthy state, without a previous fault in the quantity or quality of the food or drink, in the supply of fresh air, or in the primary processes concerned in the preparation of the aliment ; and therefore the first and principal attention, even in these cases, is still due to the means of promoting a healthy nutrition.



