arise those cases of "pathological piety," of which Dr. Wendell Holmes wrote; this is due to their lack of energy, to the timidity that accompanies this lack of energy, and also to the fact that, being more suggestible than most children, they are more open to emotional appeals. Often, too, they are "pathologically intellectual;" they pore over books, and are supposed to be studious, and do in fact learn book lessons better than the vigorous boy who neglects work for games, though not proportionately to the time they devote to them. These "studious," and sometimes really bright, children rarely redeem the supposed promise of their youth. Their poring over books is really due to the fact that reading is the easiest of all intellectual operations save one, requiring neither application, observation, nor thought; but unfortunately there is a popular belief that it is a sign of an intellectual disposition, and this encourages the young neurasthenics to indulge in the pernicious habit. The very easiest of all intellectual operations—day-dreaming—they learn early too, though it does not come to its full development till after the expansion of the self-centred emotions at puberty. Puberty often brings masturbation—a vice caused by the action of the newly-aroused sexual feelings on a listless, day-dreaming mind. At a more advanced age their instinctive turning away from effort may lead to the habit of drinking. I do not mean that most neurasthenics drink; I do not think they do; but I believe that in some cases neurasthenia minor helps to promote the habit. It is easier to loaf in the bar of a restaurant than to plod on at hard work, or to exert the constant self-control and consideration for others that are necessary in society. In adult life the languor continues, and is usually increased in spring; in the morning the sufferer wakes slowly and wakes tired, the tiredness lessening as the day advances; the weakness of will continues, and there is a want of power to roll away worries and unpleasant thoughts from the mind. It is this last feature that renders neurasthenia minor so potent a factor of unhappiness. Vasomotor instability and defective metabolism are common. So also is constipation; in those cases in which atonic dyspepsia has preceded an attack of neurasthenia major, it has probably been a symptom of neurasthenia minor.

It will be observed that some of the symptoms ascribed above to neurasthenia minor in childhood are often attributed to postnasal adenoids. The two conditions are very often associated, but to explain the nature of their association will require more knowledge of the etiology of adenoids than we possess at present.

It is unnecessary to enumerate the now well known symptoms of neurasthenia major, but a few words may be said about its etiology. From the pathogenetic point of view there appear to be two classes of cases.

1. Cases arising from shock. Among these I include not only traumatic neurasthenia, but also cases arising in a previously healthy individual from any sudden and severe mental shock. I have not myself seen an example of this last, but cases are described.

2. Cases due to the exacerbation of neurasthenia minor by depressing (or toxic) influences. The chief of these influences appear to be: (1) Worry and anxiety, (2) a relaxing climate, (3) certain illnesses, (4) prolonged drug intoxications, (5) prolonged autointoxication, (6) prolonged malnutrition, (7) prolonged exhaustion.

Of these, the first is far the commonest, and it is an influence to which the subjects of neurasthenia minor are especially liable. The second I have not seen described, but circumstances have led me to see a number of cases of it. The rest I have not seen, and have taken on the authority of others. I have known autointoxication to exacerbate both neurasthenia minor and neurasthenia major, but cannot satisfy myself that I have seen it actually convert the former into the latter. The seventh must be rare; cases ascribed to overwork are usually due to worry.

Though it does not come under the heading of this paper, a few words may be allowed on the upbringing of children subject to neurasthenia minor. Such children should receive a careful physical education, having a view not only to their vigour, but also to their power of co-ordination, and to a prompt and correct sequence of sensation and action. Their sensory acuteness, observation, and memory of observed facts should all be trained. Reading should be carefully supervised and limited, and all dawdling and day-dreaming rigorously repressed. Both in childhood and in adult life relaxing climates should be avoided.

REFERENCE.

¹ BRITISH MEDICAL JOURNAL, October 18th, 1902, p. 1208.

THE KNOCK-OUT BLOW ON THE POINT OF
THE JAW.

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In boxing contests a number of rounds are fought of two minutes' duration, there being one minute's interval between each. If a man cannot come up after that interval he is the loser, and if he be knocked down during a round he is given ten counted seconds to recover and resume his feet, or, if unable to do so, he is declared defeated. When large purses are at stake and reputations to be made or lost, the competitors endeavour as speedily as possible to effect a *coup de grâce*; and the blow which most effectually does this is one on the point of the jaw, the physiology of which is of interest.

The point of the jaw is situated on either side of the symphysis of the lower maxillary bone and corresponds nearly with the mental fossa; if a line, as in the photograph, be

drawn from this point to the centre of the odontoid process of the axis bone, which is the centre for rotation of the head, and is in close proximity to that for flexion and extension also, it will be seen what a powerful lever there is to turn the head in any direction. The attachments and feebleness of the muscles for rotation prevent much resistance being offered. The blow must be delivered hard and sharp, a stinging blow, weight is not necessary. The arm is usually bent at the elbow which is fixed, and the direction of the force is more or less at right angles to the line I have described, and slightly upwards, the hand falls upon the point shown by the asterisk; hence the head is jerked round suddenly to the full degree of rotation and backwards. The more unusual blow producing much the same result is an upper cut under the chin, the force is now upwards and slightly backwards.

Now a man, though in perfect condition, going strong, neither tired nor blown, receiving a blow such as I describe, instantly collapses and falls to the ground. He may be winning easily to all appearances, and in a future contest defeat the same opponent without trouble in a few rounds, still he falls, is counted out, and must accept his ill luck as the fortune of war. The man may fall in several ways, he may be lifted clean off his feet and land upon his back, or if he be coming in at the moment of impact he will drop on his face or side.

The attitude assumed in recovery, which may be instantaneous or delayed some minutes, rarely hours (unless some other element be introduced), is most characteristic. The fallen man begins to squirm about, raises his head and rolls his eyes around in an attempt to locate himself, and he tries to get on his side and elbow; he then makes a sustained but often futile effort to rise on his hands and knees; if successful in this he regains his feet, staggers around as if groping in the dark or like a drunken man; he may even if not counted out reopen hostilities, only, however, in most instances, to render himself an easy prey to his adversary, who floors him again. The sensations of the victim are not easily described, though any one who has experienced only a slight blow on the point of the jaw does not readily forget the feeling of helplessness which comes over him, and is well described by Mr. Allanson-Winn¹ in the following words:

The "point of the jaw hit" is a horrid head-jerking affair, compared with which a flush hit on the nose, with all its concomitant stars and stripes, is a mere fleabite. Even a moderate infliction of this terrible hit is sufficiently punishing to make one feel uncertain whether you are twisting round the surroundings, or the surroundings are twisting round you, or whether both are not waltzing away together; but a severe visitation, if it does not break the jaw, is likely to produce an absence of interest in subsequent proceedings, or a complete forgetfulness of all immediate and pressing engagements.

This blow is practically never fatal, an after examination of the man shows the heart's action to be excited only in due ratio to the condition of the exertion, pulse regular and of good quality, respiration the same; there is neither contraction nor dilatation of the pupils, no squinting, no severe headache, no clammy sweat, no cold extremities, and no ashy colour of the face; in fact, none of the usual signs associated with ordinary shock or concussion.

The following degrees of severity may be noted according to the force and accuracy of the blow: (1) Giddiness and visual disturbance, with loss of equilibrium; the man falls to the ground, is able to recover almost instantly, and resume hostilities little the worse. (2) Unconsciousness, several seconds elapsing before he is able to rise; then he is shaky, uncertain in his movements; he has no recollection of the blow, and evinces surprise and indefiniteness about his position. (3) Complete loss of consciousness, prolonged for several minutes or hours, which is not followed by perfect recovery, the man being left dull and apathetic, never to gain his old nerve and courage.

Equilibrium and the semicircular canals of the ears. That these canals have to do with the maintenance of equilibrium is now an accepted fact, proved by the experiments of Lee upon dog fish, and the researches of many others in the realms of physiology and also pathology. These canals are so placed in their respective planes as to be specially adapted for this purpose. The statical explanation of their action is not proved; but the kinetic theory is to be accepted. They also have had ascribed to them the power of preserving proper muscular tone. A close relationship exists between these canals and the eyes.

The frequent occurrence of nystagmus in disease of these organs must be noted, and also the normal bilateral deviation which occurs when the head is turned in any direction.

When a moderate rotation is imparted to the body, the endolymph currents convey a stimulus to the hair cells in the canals and the ampullae (*crista acoustica*), which raises a definite and clear impression in the brain and consciousness, and we are aware of movement and change of position, independent of vision altogether, though more accurately determined when the eyes are called into play.

A slight exaggeration of this occurs when a moderate blow is received on the point of the jaw; the head is jerked suddenly round on its axis, and this rotatory movement sets up currents in the endolymph, which, if the force be applied in the horizontal plane, cause surrounding objects to appear to move around; but if the plane be altered towards the vertical in more or less degree these objects seem to dance up and down as well.

But let the blow be severe and then the rotatory movement is so intense that the nerve endings are stunned by the force of the sudden impact of the endolymph, the power of sustaining equilibrium is lost hopelessly, and the man falls to the ground in an unconscious condition. As soon as the fluid gains a condition of quiescence, he is able to grasp the situation, opens his eyes gradually, aided by touch and sight he regains his feet and soon feels himself again.

Captain Edgeworth Johnstone² states that the sudden twisting of the head, which he also recognizes as the primary movement, causes probably a jarring of the medulla oblongata, and a temporary constriction of the vertebral arteries, and anaemia of the brain; but this view I cannot accept.

We cannot constrict these vessels by merely normal rotation of the head, if they were constricted the symptoms produced would be entirely different from those I have described; we should experience them if our heads were twisted round beyond a certain point, which is not so; and again all these effects (concussion which in the severest type is added being eliminated) may be experienced if the body as a whole be rotated on a moving platform.

A centrifugal drying machine was, on one occasion, accidentally set in motion while a friend of mine was in it, and though quickly stopped, the inmate was already blind, helpless, unable to stand, and his memory was seriously affected; but all the symptoms speedily disappeared after a rest on the back.

A careful consideration of the signs I have endeavoured to describe will at once show that there is present something more definite than concussion and shock. The rotation of objects seen by the eyes in different planes is in direct relation to the direction in which the force of the blow falls, the several degrees of intensity in ratio to the amount of force of impact, and the speedy recovery in all but the most severe cases, when probably other elements come into play; and the fact that the blow must be such as to impart a rotatory movement to the head, or head and body as well; a flush hit straight on the nose, between the eyes on the side of the head, will knock a man down; but not with the signs of equilibrial disturbance; all point, in my opinion, to their origin in the endolymph in the semicircular canals.

REFERENCES.

- ¹ *Boxing*, Sports Library, by Allanson-Winn, p. 55. ² *Boxing*, by Captain Edgeworth Johnstone, p. 147.

The Goulstonian Lectures

ON

THEORIES OF IMMUNITY AND THEIR CLINICAL APPLICATION.

Delivered at the Royal College of Physicians, London.

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LECTURE III.

ACTIONS OF CURATIVE SERUMS OTHER THAN ANTITOXIC AND BACTERICIDAL.

WE have seen that the introduction of the serum of one animal into the tissues of another, especially of a different species, leads to the formation of antidotes to that particular kind of serum. In some instances indeed the serum of one animal may be toxic for another. The introduction, therefore, of a quantity of horse serum into the human body may not be—indeed, is not—always a matter of indifference. We know that in the case of diphtheria antitoxin a certain percentage of cases have eruptions, joint pains, etc., which are probably to be assigned to the alien serum. Perhaps the juvenile serum is of a more primitive nature than the adult, since children are said to stand prophylactic injections of diphtheria antitoxin better than those already grown up.

But in the case of antitoxic serums these side-chains do not interfere with their efficiency. Nor will any harm arise from a dose beyond what is necessary for mere neutralization of the toxin: on the contrary, the excess may dissociate a union of toxin and cell already completed. There is not at present any evidence to show that the toxin formed by the *B. diphtheriae* in the human body is not efficiently neutralized by the antitoxin formed in the horse's tissues.

With bactericidal serums the case is rather different, because for their efficient action both amboceptors and complement are required. It is obvious that efficiency will be attained only if both components are present in sufficient quantity, but it is the number of amboceptors resulting from the process of immunization which will determine to a large extent the potency of the bactericidal serum, since they are present in normal blood only in small quantity.

The complement, as we know, is much more unstable, and may, on keeping of the bactericidal serum, either disappear or be converted into complementoid. On the other hand, complement is present in quantity and variety in normal serum, so that the introduction of amboceptors alone in the bactericidal serum will often suffice for its efficient action. But the quantitative relations of amboceptor and complement are of extreme importance. It has been known for some time that a medium dose of a bactericidal serum may save an animal from a lethal infection, whilst a larger or smaller quantity fails to do so. The explanation seems to be as follows: If the two components are present in corresponding quantities the amboceptor will unite with the bacterium by its haptophore group, the complement will then fit into the complementophile group of the amboceptor, and the bacterium will be destroyed.

But with an excess of amboceptors an alteration of equilibrium takes place, and the affinity of the complementophile group of the engaged amboceptor for the complement may be altered. If increased there is no harm done, because the complements will unite with the already engaged—that is, effective—amboceptors. If the affinity remains equal the complements will be equally distributed and only half will take part in the bactericidal action, and the efficiency of the serum will be correspondingly reduced. If the affinity is diminished the result will be even more unfavourable, for then the complements will become first