LECTURES

ON THE

PRINCIPLES OF SURGICAL DIAGNOSIS:

ESPECIALLY IN RELATION TO SHOCK AND
VISCERAL LESIONS.*Delivered at the Royal College of Surgeons of England.*

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LECTURE III.—*Concluded.**Temperature in Shock, and Reaction—Shock in Relation to Operations—Value of Stimulants in Diagnosis—Causes of Fatality in Shock.*

Temperature is a sign of considerable importance, as diagnostic of the intensity of shock and of the energy of reaction, as well as of many allied conditions resulting from various causes; and, as I have already remarked, a careful study of the subject will well repay the pathologist for the time and trouble he may bestow upon it. In an admirably arranged and philosophical Essay on Shock, by Mr. Jordan of Birmingham, the author introduces some interesting statistics respecting temperature; his results

or after the operation in those cases which recovered. Chloroform seems to exercise little or no influence on the temperature, under these circumstances. In the fatal cases, no such fall took place. The temperature has been rarely observed to fall below 97 deg. during the shock; consequent on an operation. In one case of amputation in which I had it tested, there was no change in the reading of the thermometer during the incision through the bone.

In the Reaction succeeding an operation, if the temperature exceed 104 deg., the prognosis is decidedly unfavourable; but not necessarily so, if no rise occurs, provided the general condition of the patient be not otherwise unsatisfactory, as tested by the circulation, respiration and degree of prostration. Yet, it should be remarked, there is not the same definite relation between temperature and the heart's action and breathing, after the infliction of injury by violence as in medical fevers. The maximum temperature is reached in from twenty-four to forty-eight hours after operation, in cases which recover. In falling from the highest point, the descent is usually gradual and steady till the normal standard is reached; and there it is arrested.

Before Death, in acute sthenic diseases, the temperature rises till the time of death; and it is higher, just before death, in cases of inflammation following brain-injury, than in other cases recorded in the surgical wards. I shall exemplify this fact in a future lecture; and I may now remark that the highest death temperature of which we have a record was 106 deg., in a case of abscess of the brain complicated with pyæmia, to which the accompanying chart refers.

Scalp-wound: Concussion: Suppuration in Brain: Pyæmia: Death Twenty-two Days after Injury.

are in great measure, though not wholly, in accordance with those which I have obtained, with the able assistance of my friend and former pupil, Mr. Wagstaffe, now the surgical registrar at St. Thomas's Hospital.

In simple *Shock* and *Reaction*, the fall in temperature appears to average about one or two degrees, as tested at the time of the patients' admission into the hospital—generally about half an hour or an hour after the accident; and the reaction is marked by a rise in temperature to over 100 deg., and usually below 103 deg., within the next thirty-six or forty-eight hours. When the shock is complicated by the occurrence of *Hæmorrhage*, even to a moderate extent, the fall in temperature has appeared, in some instances noticed, to be in excess of what might have been anticipated; in excess, that is, of the consequence of direct shock, plus the direct consequences of simple hæmorrhage. In one remarkable case of cut-throat, in a man of 63, the thermometer registered 91.2 deg. one hour after the injury, and remained at this standard, without varying, for another hour; and the highest point it reached, during reaction, was 100.1 deg. in twenty-four hours. The hæmorrhage was not excessive in this instance, and the patient recovered. His normal temperature was about 98.4 deg. Probably mental shock may have had some influence in producing this remarkably low temperature.

In *Rigor*, the temperature rises always shortly before the commencement of the attack, and remains high for a varying length of time,—generally about half an hour after the termination of the shivering. In the rigor of pyæmia, the height to which the temperature may rise appears to vary with the acuteness of the disease; ranging between 100 deg. and 106 deg.

In *Operations*, there was usually a fall of about half a degree, during

Where no reaction takes place after head injury, the temperature has been registered, before death, as low as 89.6 deg. The lowest temperature of which I have a record, where recovery took place, is that which I have already mentioned of cut-throat. Several cases of shock registered as low as from 96 deg. to 93 deg., and subsequently recovered. The highest temperature registered in cases discharged well, was 105 deg., in reaction after complicated fracture.

I have thought it desirable to throw these remarks together, though they are not all pertinent to the subject immediately under consideration. I shall reserve some further observations I have to make on temperature in shock associated with head-injury, until a future lecture.

Reaction implies pre-existent shock; it is the living organism—subdued, confused, narcotised by violence; bowed down but not broken—rising with a rebound, which exalts its functions beyond their normal standard, and may thus prove, by its excess, destructive. This result, however, is practically limited to head-injuries, unless some mortal lesion have accompanied the shock, or reaction bring with it fatal hæmorrhage. The period at which reaction comes on or is fully established, varies considerably according to the nature of the injury, the degree of depression, and the age and condition of the patient. The shock inflicted by operations is that which most interests the surgeon, and that which he naturally watches with most anxiety and care. And yet, as experience ripens, we feel less anxious about excessive reaction, as we learn to view its symptoms as the necessary precursors of healthy repair. In capital operations, unless much blood has been lost, from eighteen to twenty-four hours generally suffices for such an amount of reaction as is indicated by the ordinary so-called febrile symptoms. The pulse is quickened,

the skin hot, the tongue furred, and there is thirst. This condition is accompanied, simultaneously, by manifestation of increased local action at the seat of operation. Consequent on the culmination of these symptoms somewhat later, not infrequently the second and even the third night after an operation are passed more restlessly than the first. Yet, so far from being a source of alarm, we accept the very activity of these reactive signs as a measure of nature's resentment of the injury inflicted, and of her earnest intention to engage energetically in repairing the mischief. I do not usually regard it as a satisfactory announcement if, at my first visit after an operation, I am informed that my patient is so tranquil and unmoved in every respect, as scarcely to betray the fact that a severe ordeal had been so recently endured; and, if the pulse and skin confirm this statement, the prospect of the case is far from encouraging. No doubt, owing to peculiarities in both physical and mental temperament, there are exceptions to this rule; but I am now speaking of the ordinary run of cases; and in such I do not hesitate to say that excess is more promising than deficiency of reaction. But there is a second period through which this reactive stage has to pass, and one which may naturally excite more anxiety on the part of the surgeon; when instead of subsiding, these feverish symptoms continue, with impaired general power, and nervous excitement becomes the predominant characteristic, with its attendant sleeplessness and a disturbed intellect. The tongue then becomes a valuable index of the condition we have to deal with; if moist and, though white, not coated, we may employ the necessary means to allay nervous irritation. But if a dry, glazed, or furred tongue accompany an unhealthy, decomposing wound, with an extending blush of surrounding inflammation, just reason for alarm exists, as we thus have intimation of having lost our best auxiliary in the digestive organs; food is not assimilated, and medicines, even including opium, are generally worse than useless. Stimulants alone remain to us; and it is surprising how large a quantity, as in some instances also of protracted shock, may be taken with impunity. An improved appearance of the tongue is often, I had almost said usually, the first indication of an improving condition under these anxious circumstances.

It is essential that the condition I have just described should not be confused with that of nervous delirium. The latter state usually supervenes earlier after the infliction of injury; its development is sudden, and with premonitory symptoms which might be overlooked by an inattentive observer; and during the existence of the delirium, the pulse is comparatively tranquil, and the tongue clean. It is a condition in which the too keen edge of nervous insensibility requires to be blunted by opium. The question of operating under shock has naturally engaged the attention of surgeons, and constitutes one, of the most momentous character, in which a prompt and discreet judgment must be formed. I do not hesitate to say that the diagnosis of each individual case must rest, more or less, on its own merits; but some general rules for guidance may be adopted, to supply the lack of special experience. Observation has taught me that operations of some severity may be undertaken, during shock, without seriously adding to the risk, if security against loss of blood can be ensured. The period at which nature most resents interference is when she is making the effort to establish reaction; and the influence of this second blow on the nervous centres is much the same as that in reactionary hæmorrhage: the nerve-energy in the one instance and the blood in the other, have already been partially exhausted by the first demand; and the resources of either system fail when called upon for a further effort: serious reactionary hæmorrhage and recurrent shock are equally alarming; the two combined are almost certainly fatal.

But a distinction must be made between cases in which profound shock succeeds a severe injury, and those in which a similar condition is the consequence of a slighter cause. We frequently meet with instances of both classes, in which the symptoms present no essential points of difference, and equal alarm might be excited by the one as by the other. Yet, experience teaches us that we may measure the probable duration and intractable quality of the shock by the extent and severity of the injury, especially if complicated with loss of blood; and that a speedy reaction and normal re-establishment of the nerve-functions may be expected, where the lesion is not serious. Under such circumstances it is better to wait for reaction, before any fresh shock is inflicted: for the exhaustion of nerve-force is more apparent than real; just as the loss of a small quantity of blood may, in some individuals or under certain circumstances, produce complete but transient syncope, without exhaustion. The treatment of shock does not come within the range of my subject: but it is not foreign to my purpose to notice the diagnostic value of stimulants, when the long continuance and intensity of the symptoms justify or demand their use. If their exhibition be unheeded, if the looked for response be not given by the heart to the whip and spur, we may judge the exhaustion to be great indeed—a condition with which we meet when the shock is the constitutional expression or warning of a fatal visceral lesion.

The administration of chloroform in profound shock I look upon as in-

admissible. It subserves no good purpose, for the sensitiveness to suffering is numbed or deadened; and if a sufficient quantity be given to induce complete insensibility, the risk of paralysing the respiratory act is greatly aggravated, in a state in which all the organic functions are so feebly performed, and the animal force is at so low an ebb.

In my experience, shock, *per se*, is rarely, unless immediately, fatal. I have seen many cases of shock, without special brain-injury, so profound as to suggest the presence of fatal visceral lesion: yet recovery occurs after a longer or shorter interval; and may constitute the only test by which we conclude that no such injury has been inflicted. In suddenly fatal shock, whether the hurt be received on the head or neck, or in the epigastrium, or be a consequence of general concussion of the whole frame, the arrest of the heart's beat and of respiration are indirectly due to paralysis of the brain. The pneumogastric is probably almost exclusively a centripetal nerve, conveying impressions between the important organs to which it is distributed and the brain. Thus, it communicates the sensations of hunger, thirst, and repletion from the stomach; it gives warning of the presence of carbonic acid in the lungs: and that it possesses an analogous function, in relation to the heart, we conclude from negative rather than positive evidence. Division of the vagus nerve scarcely influences the heart's beat, whereas its stimulation by galvanism retards it. The cardiac branches of the sympathetic are abundantly distributed to its muscular structure: irritation of the brain and spinal marrow modify the heart's action; and its rhythmic movements are arrested when the spinal cord is suddenly destroyed. Mental influence, again, proves the sway which is exercised by the cerebrum over the heart. From these facts I conclude that the special function of the pneumogastric, in relation to the heart, is to communicate impressions made, simultaneously or independently, upon it and upon the lungs, to the brain. Cognisance may thus be taken of the presence of unoxygenated blood within its cavities; or its sympathetic action in unison with respiration may be thus secured. Certain it is that the regulated rhythm is seriously deranged by causes, such as shock, tending to disturb the healthy relations of nerve-force in these organs. To what, then, is the oft-cited death from a blow in the epigastrium to be ascribed? It is not due, I apprehend, to any inhibitory quality attributed to the pneumogastric in relation to the heart's contraction; but rather to the indirect impression upon that organ through the violence offered to the pulmonic and gastric plexus of the vagus, and thence conveyed to the brain: the ulterior consequence being suspension of both respiration and circulation simultaneously. Whether the pneumogastric nerve is the medium of a direct controlling influence over the action of the heart in these results, I do not know. Indeed, I must admit that I cannot understand how this negative influence—for as such the inhibitory property ascribed to this nerve must be regarded—is exercised, and what it may be. Probably further investigation may throw more light on the subject.

I have thus endeavoured to bring within the limited compass of the time allowed, some of the leading features of shock and its sequelæ. The many recent interesting experiments bearing upon nerve-function, held out to me the temptation to diverge into the pleasant paths of physiology; but I have felt compelled to restrict myself to very brief allusions to these subjects;—and I may now remark, in anticipation, that I must in like manner, in the subsequent lectures, avail myself, without entering into details, of such physiological facts as recent investigations have unfolded.

The ever-recurring tendency to generalisation is specially exemplified in the development of physiology in association with physical laws. New discoveries disturb our existing convictions; but out of confusion comes, or, we may feel assured, there will come, harmony and light: for we know that Omnipotence and Truth cannot be disjoined. Yet, in dealing with an influence so complex and so subtle as Life, our most delicate instruments are coarse and subject to error. The relation of nerve-force to muscular contraction, and the inverse development of convulsive movement in relation to the supply of nervous influence;—the apparent identity of muscular force and irritability, manifested in "the readiness with which muscle contracts, being in direct proportion to the amount of force accumulated in its structure;"—the fact experimentally proved, that muscle more readily contracts in the absence of nervous influence; and also that "in the absence of volitional or other excitement, both the nervous and muscular systems can accumulate their own special forces, and that to an extent which can never become apparent under normal life conditions;" (Morris, *On Muscular Irritability*, in *Journal of Anatomy and Physiology*, 2nd series, No. 2.) the assumed inhibitory influence of nerve-force over muscle; the startling doubt which experiment seems to raise, as to the limitation of volition to the encephalic centre; probably, however, explained by the exaltation, as we descend in the scale of creation, of co-ordinating nerve-power from several and independent sources; the probable localisation of special attributes, as that of speech; these are some amongst the many physiological phenomena and problems, allied with the subject I have been

considering, on which further investigation will throw more light, and will bring into more harmony as that light is imparted. In physics, the universality of wave-motion, as the connecting link between mind and matter, recommends itself by its comprehensive grandeur: and the principle involved in the correlation or conservation of physical forces—that force or energy, like matter, may be transferred or converted but not annihilated—has opened a wide field for investigation in its relation to physiology. All seems to point in one direction—to the inclusiveness of the laws and the simplicity of the instruments by which such varied, such complex results are obtained; and in this contemplation the mind is elevated by the conviction which is forced upon it, that the relative quality of magnitude is, like time, simply an accommodation to our finite intelligence: the myriads of worlds on which we gaze in the infinity of space, individually of bulk too vast to be encircled by the earth's orbit around the sun, and the microcosm of our own bodies, yea, even the animalcule which is invisible to our unaided sense, are framed by the same Omnipotence, and governed by the same Omniscience;—and that each is perfect in its own degree, and equally cared for, in the adaptation of the laws which determine its existence, and secure the fulfilment of its destiny.

NOTES ON THE TREATMENT OF CHOLERA.

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IT is with some diffidence that I submit the following remarks on the treatment of cholera, as the plan which I have for some years pursued is so different from that so ably advocated by Dr. George Johnson, and endorsed by so high an authority as Sir Thomas Watson; but I saw such immediate relief follow the administration of nutriment, of a kind to be described presently, in collapse, and in a very large proportion of cases the disease ran a course so different from what I had seen previously, and went on to cure, that I am disposed to submit an abstract for the consideration of those of my professional brethren in England, who, unfortunately, have now comparatively so many opportunities of treating this intractable destroyer.

In 1860, I published some remarks in the *Transactions of the Bombay Medical and Physical Society* on what I considered should be the rational treatment of cholera; and in these remarks I divided cholera into four stages: 1, preliminary diarrhoea; 2, true cholera with vomiting and purging of the characteristic rice-water evacuations; 3, collapse; and 4, reaction. I may briefly state that I considered the disease to consist, pathologically, in a blood-poison, devitalising the blood to such an extent in fatal cases, as to cause death at the lungs from the inability of the blood-corpuscles to assimilate oxygen.

For the treatment of the first stage, I then used astringents, with one or two full doses of opium, with which stimulants, of either the alcoholic or the ammoniacal class, might be advantageously combined. I considered that both opium and alcohol should be used with caution, because the disease might run on to the second stage, and we might be embarrassed by having carbonised the blood or locked up the secretions to too great an extent. Calomel I sometimes gave in this stage. In the second stage, the caution with regard to opium must be increased. Calomel should be given freely, sinapisms applied, and thirst allayed with some fluid capable of yielding oxygen to the blood; dry heat should be applied to the body and limbs. In the third stage, oxygenated drinks and light nourishment, such as Liebig's cold soup, must be given. The fourth stage is to be treated on general principles.

With respect to the treatment of the first stage, I have, since the time when my remarks were written, omitted entirely the use of astringents, finding that a draught containing fifteen or twenty minims of chloroform, with ten or fifteen minims of tincture of opium, with a drachm of spirit to render the chloroform miscible with water, was exceedingly efficacious. During several years, when cholera was more or less prevalent, I have treated a large number of patients by this method, and can only call to mind one case where the disease progressed to collapse, and two cases where diarrhoea went on to rice-water purging and vomiting.* It may be objected to this, that these cases were not choleraic purging; but the vast majority of them occurred during the time when cholera was present, and the symptoms supervened between midnight and five in the morning, with crampy pains in the stomach and bowels. These cases in India are specially suspicious, the patient going to bed quite well, and being awakened at the time named. During the prevalence of severe cholera, the same result was observed. The orders issued were, that every person suffering from diarrhoea was at once to come to hospital

for treatment; and this medicine was administered, with the general result that but few required a second dose.

The following are the notes of two cases of cholera, treated as I have stated.

CASE 1.—Kublee, sepoy, aged about 25, was admitted May 22nd, 1866, at 10 A.M., complaining that he had much pain in the stomach, and saying that he had been purged three or four times during the previous evening, and that vomiting of white fluid had come on in the night. Pulse small and quick; anxious expression of face. He was ordered to have immediately fifteen minims of chloroform, ten minims of tincture of opium, and a drachm of spirit, in an ounce of water; and to have a mustard-poultice applied. I was then called by the native doctor, and found that for the time the vomiting had abated; the pulse was very small and quick. He was ordered to have five grains of calomel immediately; and the following drink every hour, or more frequently, in ounce doses.

℞ Potass. chlorat. ʒj; acidi hydrochlorici fort. ℥viij; acidi nitrici dilut. ʒiss; aquæ ʒxxiv. M.

During the next four or five hours, he was purged two or three times, and vomited many times, all rice-water evacuations. I saw him again at 3.30 P.M. He was collapsed; the eyes were sunken; the skin cold, but no sweating; the pulse barely perceptible, and that only at intervals. The voice was choleraic. He was ordered to repeat the calomel and chloroform, without the tincture of opium. At 4 P.M., I gave half an ounce of arrack in water, which was immediately vomited. He was ordered to have an ounce of Liebig's cold soup every half hour; and to continue the chlorate of potass drink. No raw meat could be procured, but a quantity of the soup was made from a freshly killed fowl, and he had the first dose about 5 P.M. At 7, I saw him again. No vomiting nor purging; pulse markedly improved; skin warmer.

May 23rd, 8 A.M. He had vomited twice in the night, and once had been purged, both rice-water evacuations. Pulse better; skin warmer. He had passed a little urine. The soup and chlorate of potass drink were continued. In the evening, he had vomited only once; the pulse was improving. The treatment was continued.

May 24th. He was much the same. The medicines were continued. In the evening, there was reaction with a full pulse; the skin was hotter than natural. Sago and light food were allowed; and he was ordered to continue the chlorate of potass drink.

Occasional vomiting supervened up to the 27th, when he appeared much better. The secretions had gradually returned.

May 28th. He wished to be discharged; and on the 29th was discharged, well and strong.

CASE II.—Rajica, Bheel sepoy, was admitted on May 22nd, at 8 P.M., from the same guard as the previous patient, and with the same symptoms. Chloroform mixture and calomel were given, and a mustard-poultice applied. Liebig's soup was ordered to be given frequently.

May 23rd. The pulse was still perceptible. There was no sweating. The cholera appearance was fully developed. The urine was quite suppressed. He vomited still, and had been purged twice, with rice-water evacuation. He was ordered to continue the soup and the chlorate of potass drink.

May 24th. The pulse was decidedly improved. The skin was naturally warm. He still vomited three or four times in twelve hours. No urine was passed. The treatment was continued. In the evening, hiccup had commenced, and was urgent. Pulse good. No urine.

May 25th. There was still much hiccup. He had passed no urine; and was still purged, but not much.

May 26th. He was still slightly purged. He was ordered to continue the soup and the chlorate of potass drink; and to have five grains of calomel, and a sinapism applied. He passed urine at 12 to-day for the first time. In the evening, the pulse was good; the skin natural. He had hiccup.

May 27th. He slept well; had been purged thrice in the night. The first was a natural bilious stool; the second and third were rice-water. He was ordered to continue the chlorate of potass drink; and to have sago-diet, etc.

May 28th. He had still hiccup; but seemed well otherwise.

May 29th. The hiccup stopped to-day.

June 2nd. He was discharged well.

A woman, the wife of one of the sepoys of the same guard, was admitted on May 23rd. She died two and a half hours afterwards, having been treated in the same way.

Another case was admitted on May 24th, and followed the same course as the first two detailed. The man was from 35 to 40 years of age, and much weaker. Yet the course was precisely that of the first two cases detailed, except that urine was not passed for three and a half days, and there was no hiccup.

At the same time, I treated a considerable number of cases of cholera.

* All did well.