Gulstonian Lectures

ON

FEVER AND INFLAMMATION.

DELIVERED BEFORE THE
ROYAL COLLEGE OF PHYSICIANS, LONDON,
1859.

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LECTURE III (*concluded*).

XVII.—CRISIS, PROTRACTION, AND RELAPSE: FEVER.

THERE are no diseases in which the transition from unfavourable to favourable symptoms is more marked than in primary contagious fevers. Thus, in typhus, in the great majority of those who recover, the turn in favour of the patient is determined within a period of twenty-four hours. In our exposition of fever, we have treated the corpuscles of the blood as living bodies. And in all phenomena depending on the actions of living bodies there are epochs or periods; there is a time of germination, maturity, and decline. And symptoms of fever, because they are based upon an independent action or metamorphosis of the blood-corpuscles, have also their analogous epochs.

When the fluid of the blood is disordered short of affecting the corpuscles, and some form of inflammation arises for its depuration, there is but one preternatural depurative reaction: namely, that of the fluid upon the common tissue, denoted by the inflammation. But in fever there are two preternatural reactions: one, and the first, that of the corpuscles, whereby they extricate themselves from a virus; or, in other words, excrete a poison, and transfer it to the fluid in which they swim: the other, and subsequent one, that of the fluid whereby the virus is handed over to the common tissue for expulsion by some form of inflammation. In both kinds of inflammation, namely, those without fever, and those consequent on fever, the inflammation has reference, not to the state of the corpuscles, but to the state of the fluid of the blood.

The crisis, or maturity and termination of fever, then, depends on two events, both of them vital actions: *first*, the discharge of the virus from the corpuscles; and *secondly*, its discharge from the plasma. If there be obstacles to the discharge of the virus from the corpuscles, symptoms of fever will be protracted; should there be hindrances to its discharge from the plasma, forms of inflammation will be protracted.

If the corpuscles have freed themselves from the virus, but there are hindrances to its discharge from the plasma, then the imperfectly depurated fluid may react upon the convalescing corpuscles, and symptoms of fever be renewed. And the more probable will be this renewal, or relapse, where inflammation is acting the part of a depurative organ. But let it be observed in the circumstances presumed, the fever into which the patient relapses has a different *condition précédente* from the fever with which he was first attacked. The first fever has an aerial origin, the second, or prolonged fever, is due to imperfect depuration of the plasma. Let us examine this point in more detail.

When causes of hardship and sickness abound in the mixed population of a crowded city, complex forms of illness must often occur. These it is very difficult to unravel, because the persons are not, or have not been, continuously under medical observation. We therefore again refer to the crew of a ship, where, from the inmates being seen daily, and from other circumstances, the sequence of events can be better followed.

Formerly, in long voyages, it has not unfrequently happened that a salt diet, bad water, and confinement on board the ship, have produced in the men that state of blood which founds, upon the slightest local provocation, chronic ulcerations on the exterior of the body. Also, in addition to the exterior ulcerations, various forms of bowel complaint, diarrhoea, and chronic dysentery, have been present. With the crew in these conditions, the ship has sailed into an unhealthy port, and some of the men have taken fever from the poisonous atmosphere of the shore. Here fever has arisen from the aerial source; but the symptoms, history, and termination of the fever will vary greatly in the different men; because the anatomical conditions in which they severally are when they enter upon fever are different. And when the aerial fever has run its course, or when its proper

epoch of termination has arrived, we have seen men linger in fever, or seem to fall back—relapse—into fever. The reason is because the latent anatomical lesions, present before the aerial fever set in, have now, from the commotion of that fever, themselves become influential by giving indraught to morbid matter into the blood; in creating, not a continuation of the aerial fever, but another—the typhoid pyrexia, or fever. In such cases the patient no doubt relapses into fever; but he does not relapse into the same fever; it is into another and a different one.

“During seven months in 1831, eleven hundred and forty-five cases of fever were treated by me,” says Dr. Perry, “to a termination. Of this number there were nineteen relapses, averaging one in sixty; and I was particularly struck with the fact that these relapses, almost altogether occurred in patients who had been admitted in hospital on account of some local inflammatory affection; and who had caught fever in the house, or who were seized with it shortly after leaving the house. The incorrectness of calling *these* cases of relapse, is quite manifest, as it was an entirely new disease. It is as absurd to talk of a relapse of typhus fever as to talk of a relapse of small-pox, scarlet fever, or measles. When an increase of fever takes place after the crisis of typhus, it is owing to some other disease.”

Renewed accessions of fever after the crisis of typhus are regarded by Dr. Perry, and we think correctly, as analogous to renewed accessions of fever, after the crisis of scarlet fever, from disease of the kidneys, or from anatomical lesion in any other important organ. And generally, respecting the contagious fevers—scarlet fever, measles, small-pox, and typhus—it may be concluded of persons lingering in fever much beyond the natural periods of these fevers, that the fever of the latter part of the period is not the fever of the first part of it. It is thus, we apprehend, that persons are not unfrequently said to have scarlet fever and typhus. That is to say, more correctly, the typhoid pyrexia, from some anatomical lesion giving inlet to morbid matter to the blood, may follow close upon the primary fever. And it is not difficult to understand that an aerial fever may, through anatomical lesions occasioned by that fever, *glide* into typhoid fever without any interval by which the term relapse is made appropriate.

Thus fevers may interchange, or the one may be supplanted by the other. For persons may be approaching, or have just entered the state of typhoid fever, when an aerial poison introduces and substitutes the dominating typhus. On the other hand, persons recovering from the aerial fever, typhus or scarlet fever, may, through anatomical lesions, lapse into typhoid fever; but for fevers thus to glide, or relapse, into one another, the *conditions précédentes* of both fevers must have been present.

“Great numbers of the sick,” says Dr. Bryce, “admitted into hospital with scurvy, dysentery, and diarrhoea, were approaching, or had already symptoms of typhoid fever; when, upon being crowded together with others suffering from the true contagious typhus, that disease dominated all the rest.” Our interpretation of the fact noticed by Dr. Bryce, is that irritation, or disorder of the corpuscles of the blood—denoted by symptoms of fever—arises from debasement of the plasma; but that, when an aeriform poison of specific qualities reaches them, in their passage through the lungs, a contagious abnormal metamorphosis of the corpuscles is substituted in place of simple irritation. Also, in contagious fever, when the abnormal metamorphosis of the corpuscles has run its course, irritation of the corpuscles may continue, if anatomical lesions, giving inlet to morbid matter, remain.

Hectic and typhoid fevers are, then, both of the reactionary class; for both arise from debasement of the plasma through absorption of morbid matter from anatomical lesions. But the site of the lesion and the quality of the matter absorbed, occasion important differences in the history and symptoms of the two fevers. Then, again, of the two fevers in puerperal women, the one is a reactionary or plasma fever; the other is a primary or specific fever.

It results then, that anatomical lesions, giving inlet to morbid matter to the blood exist prior to the appearance of the typhoid pyrexia, or typhoid fever; the quality of the matter absorbed distinguishing this pyrexia from hectic fever. Contagious typhus belongs to a different class of fevers. Nevertheless, the typhoid pyrexia may introduce the poison of typhus. The order of events then may be as follows:—Hardships in diet diarrhoea, the anatomical lesions of diarrhoea giving inlet to morbid matter to the blood, typhoid pyrexia, typhoid pyrexia generating the virus of a primary fever. On the other hand

the order may be:—Aërial miasms, primary contagious fever, an anatomical lesion occasioned by that fever giving inlet to morbid matter to the blood, typhoid pyrexia.

We here give a tabulated view of these results, with the following explanation:—

Primary and generally aërial.	Specific and infectious.	Small-pox, scarlet fever, measles, typhus, etc.	Corpuscles of the blood diseased before distemperature of the plasma.
	Hectic and non-infectious.	From diseased joints or bones, pulmonary consumption, and other chronic anatomical lesions, with bland discharges.	Corpuscles of the blood disordered or diseased in consequence of debasement of the plasma.
Reactionary or plasma fevers.		From anatomical lesions of the mucous membrane of the bowel; of the puerperal womb; from surgical wounds and other anatomical lesions, with fetid and ichorous discharges.	
	Typhoid and mixed.		

In this table, the first column exhibits two classes of fever: and the last column shews how we consider them dependent upon the physical constitution of the blood, and upon properties usually assigned by physiologists to the corpuscles.

Injurious substances dissolved in the air and inhaled by the lungs, and specific poisons introduced in very small quantity into the blood, produce infectious or contagious fevers. A contagious virus is generated in the blood; and forms of inflammation follow upon the fever. The examples in this country are small-pox, scarlet fever, measles, and typhus. In these fevers, it is the *quality* and not the *quantity* of the poison which is operative. For the quantity, as in the inoculated poisons, may be *exceedingly small*; but its effects are great, by reason of some independent action excited by it in the blood itself. This independent action, which extends through the whole mass of the blood, is, we say, the result of a contagion, contact-action, or fermentation amongst the blood-corpuscles; an *abnormal metamorphosis* which issues in the generation of a contagious virus. And the phenomena, because dependent on the vital action of cellular bodies—the blood-corpuscles—have therefore a *crisis*, a more or less decided or marked epoch of rise, maturity, and decline. The rise, crisis, and decline of contagious fevers corroborates the conclusion which bases phenomena of fever upon the vital actions of cellular bodies.

Spoiled materials constantly ebbing back into the plasma from chronic anatomical lesions with *bland discharges*—such as diseased joints, protracted suppurations, pulmonary consumption, etc.—distemper the fluid of the blood; and reiterated or deuteropathic distemperature of the fluid disorders the corpuscles and produces *hectic fevers*. In these fevers, there is no evidence of that kind of independent action in the blood which issues in the generation of a contagious virus. They are non-infectious; therefore there is an absence of proof of any specific quality in the matter introduced into the blood. Hectic fevers, moreover, have no marked epochs of maturity and decline; and that the symptoms of fever depend upon the constancy and reiteration of the spoiled material seems proved; because they continue whilst the source of absorption continues, but disappear when it is removed, as it often can be, by amputation or by some other surgical operation. Hectic fever, then, depends on the permanence of the source of spoiled material; on a continuousness of absorption which debases the fluid, and, through the fluid, the corpuscles of the blood. Symptoms of fever follow from their disorder; but this disorder—if we may so speak—is one of constant fretting and irritation, from the constancy of the ebbing back of spoiled matter into the plasma. There is no independent action in the blood, such as issues in the generation of a contagious virus. Pathogenetical substances, then, introduced into the blood, occasion fever; by their quality, when a very small amount excites an independent action in the blood-corpuscles, which

has its rise, maturity, and decline, and issues in the generation of an infectious virus; by quantity and reiteration, when continuousness of introduction occasions constancy of irritation amongst the corpuscles, denoted by hectic and non-infectious forms of fever, which decline and disappear when the source of morbid absorption is removed.

Interposed, as it were, between these two fevers—contagious and hectic—are *typhoid fevers*, or *typhoid pyrexia*. These sometimes have the characters of the contagious, sometimes of hectic fever; because the forms and symptoms which these typhoid fevers may assume are determined sometimes by the quality, and sometimes by the constancy or reiteration of the morbid matter. In proportion as the quality is more offensive or specific—as when the source of absorption is hospital gangrene, ulceration of the mucous coat of the bowel, a surgical wound with an ichorous discharge, or the puerperal womb—the fever approaches in all its phenomena to the contagious forms of fever. On the other hand, the more the symptoms of fever depend upon reiteration of the morbid matter, as when the source of absorption is an anatomical lesion with a more bland discharge, then the more the phenomena observed in the patient approach to those of hectic fever.

There is no arbitrary assumption here, in arguing differences in the symptoms and phenomena of reactionary fevers from differences in the quality of the matter absorbed into the plasma of the blood from different conditions of anatomical lesions, or different states of ulceration. The fact of difference of quality in the matters discharged is demonstrated in surgical ulcers, some of which discharge a bland and laudable pus, others a thin, irritative, and fetid ichor. Nay, the same anatomical lesion or ulceration will differ in the quality of the matter discharged—and therefore in the quality of the matter which may be absorbed—on two consecutive days. It results, then, that if the corpuscles of the blood take on a general and independent action from a poison which may come into contact with only a few of them, an infectious or contagious virus is generated in the blood, and infectious or contagious forms of fever appear: whereas, if the corpuscles of blood suffer only constant irritation or fretting from the continuousness of the presence of an irritating matter in the plasma, a contagious virus is not generated, but *non-infectious* or *hectic* forms of fever arise. The contagious or primary, and the reactionary or hectic, are the two classes of fever which we conclude to be dependent upon the physical constitution of the blood. In the one class, the corpuscles are disordered, irrespectively of the fluid in which they swim. In the other class, debasement of the fluid is antecedent to disorder in the corpuscles. But the two parts of the blood are much too closely associated with each other, for impairment of the quality of one part to continue without impairment of the qualities of the other part. Therefore fever of the one class may glide or relapse into fever of the other class. And it would seem, from the physiology of the corpuscles, that contagious fevers from aërial poisons must relapse into fever from debasement of the plasma, were it not so ordered that forms of inflammation perform the office of a depurating organ. The corpuscles of the blood generate the contagious virus, and they transfer it to the plasma; and should the specific form of inflammation characterising the fever fail of fixing it in the common tissue, symptoms of fever are renewed.

The same poisonous atmosphere may be breathed for the same time by a number of persons, and it will produce fever only in a few of them; because the corpuscles of the blood have different degrees of resistance in different persons. A poison in the atmosphere is a *condition précédente*; it is not the logical antecedent of contagious fever. Some physiological element of the body must be disturbed, or must be interposed between the aërial poison and symptoms of fever. This physiological element we have concluded to be the corpuscles of the blood.

In like manner, it is not every distemperature of the fluid of the blood that occasions hectic fever. On the contrary, the first effect of simple distemperature of the fluid of the blood is to occasion new, or to aggravate existing forms of inflammation. It is only when the cause of the dyscrasy of the fluid is permanent and has overcome the resistance of the corpuscles, that symptoms of hectic fever appear. Anatomical lesions (ulceration and suppuration) have therefore only the same relation to hectic fever, that poisons in the air have to contagious fever. They are *conditions précédentes*, and not the antecedents of the fever. Extensive ulcerations and suppurations exist without hectic fever, because the anatomical lesions must have become continuous inlets of spoiled material to the blood, and

the fluid of the blood must be thereby continuously debased before symptoms of hectic fever appear.

It has not unfrequently happened that persons in dissecting the dead body or in necroscopic inspections have pricked their finger; of such many escape without inconvenience, whilst another, more unfortunate, may be attacked with fever; and recover only after extensive inflammations and more than one large critical abscess. The reason is because the puncture, or anatomical lesion, is only a *condition précédente*. A contagious disorder amongst the blood-corpuscles is the proper antecedent of fever; and distemperature of the fluid of the blood is the proper antecedent of inflammation and critical discharge. Fever from the puncture, therefore, does not arise unless the blood-corpuscles be affected.

So, again, anatomical lesion, or follicular disease of the mucous membrane of the bowel, is a *condition précédente*, and not the *antecedent* of typhoid fever. A great number of persons may be suffering hardships, and may be afflicted with chronic dysentery and diarrhœa, or with follicular disease of the mucous membrane of the bowel; but only a very few of them may fall into typhoid fever; and these may not be those with the worst, or most extensive anatomical lesions. The reason is because the state of fever does not depend upon the anatomical lesions in the manner of an antecedent. Symptoms of fever make their appearance only when the lesions are giving inlet to morbid matter into the blood, which, either by quality, or frequency of iteration, disorders or irritates the blood-corpuscles.

It will be observed of this exposition that the *condition précédente* of fever, occasioned through miasms in the atmosphere, is external to, and apart from the body. A poison from the air affects the blood (the corpuscles) and fever is actually the first phenomenon of departure from health; whereas in reactionary fevers the *condition précédente* is within, or is a part of the body. Some anatomical lesion, and an irritative matter in the plasma, exist before, or are preliminary to symptoms of fever. A departure from the standard of health has therefore already occurred before; but, perhaps, without symptoms until the typhoid pyrexia appears.

In bringing our discourse upon a very difficult and interesting subject to an end, we have only in conclusion to observe that the doctrine of fever we have propounded is based on the physiological and physical constitution of the blood; on the known properties of cellular bodies; and on microscopical examinations of the state of the plasma and blood-vessels in the process of repair and inflammation. The chief points of the doctrine are:—

The fluid of the blood has a pathology distinct from that of the corpuscles.

Forms of inflammation, or of local poisoning without fever, make their appearance when there is dyscrasy of the fluid only: forms of fever when the corpuscles are disordered.

These points are submitted to your learned judgment and impartial criticism, as propositions; though, to our mind, they assume the aspect of truths, derived, as they are, from years of experiment and research upon the qualities of blood, and of the elements of repair and inflammation.

Upon the whole subject, the ideas we have endeavoured to express are, that numerous and various substances may circulate through the body dissolved in the fluid of the blood; and that the cellular elements of the body (including the corpuscles of the blood) have various affinities, and oppose various degrees of resistance to injurious matter. Therefore, if from distemperature of the fluid the common tissue be first disturbed, forms of inflammation first arise; if some local parenchyma be disturbed, the phenomena are those of local poisoning, delirium, coma, diuresis, purging, sweating, salivation, etc.; if the corpuscles of the blood be first disordered, fever is the result.

APPENDIX.

Experiment II, mentioned in our second lecture, refers to appearances of such a novel and remarkable kind, that we think the details, upon which success in repeating it depends, should be given:—

A glass tube, one-tenth of an inch in bore, drawn out to a point, is used for a pipette. Dissolve two grains of common salt and one grain of carbonate of soda in half an ounce of water. This forms a solution which may or not be used with sherry wine. Take a slip of glass, and receive on it a drop of fresh blood. Place, by means of the pipette, beside the blood,

but not touching it, a drop of the saline solution and a drop of sherry wine, thus:—

Let fall a thin piece of glass upon the fluid and they will mingle in various proportions. A good eighth object glass is required; we use a middle eye-piece; and it is essential, to see the tails, etc., that the edge or circumference of the mixed fluids should be looked at, and not the middle of the mass. We have made the experiment, with and without the saline solution, numberless times; and though never failing to produce tailed forms in some part or other of the mixed fluids, still we find it impossible to foretell what set of appearances will prevail *within* the corpuscles. Some one or other of the following forms will, however, be seen. Half an hour or more should be given for the best effects.

The way in which the wine and the saline solution take off all disposition of the corpuscles to adhere in rolls; the various prickly appearances which some of them assume; and the innumerable very different markings seen in the interior of others, are scarcely of less interest than the tails. Opinions may vary as to the nature of the motions seen in the tails. If there be motion in the fluid, the tails are of course influenced by it; nevertheless, there is a constant wavy movement, which seems independent of all motion in the fluid.

Where the undiluted wine has acted upon the corpuscles, they are entirely deprived of their colouring matter, and a minute molecular matter floats in the surrounding fluid without molecular motion; but, where the wine is acting and producing tails, numerous and variously sized molecules are thrown off from the corpuscles; and these all have an intense molecular movement. The change which the fluid undergoes in consequence is well worthy of especial notice.

ROYAL COLLEGE OF SURGEONS OF IRELAND. At a meeting held on June 6th, the following officers were elected for the ensuing year: *President*, Christopher Fleming, M.D.; *Vice-President*, Robt. Adams, M.D.; *Secretary*, Edw. Hutton, M.D.