A TREATISE

ON

THE BLOOD, INFLAMMATION,

AND

GUNSHOT WOUNDS.

INTRODUCTION.

THE following pages, treating of inflammation, were first arranged in the year 1762, at Belleisle, after the complete reduction of that place. They were compiled from notes and memorandums of observations made in the course of twelve years' residence in London. During this space, my time was occupied in my education under the late Dr. Hunter, and partly in assisting him. In the winter season I was principally employed in the dissecting-room, where I taught the practical part of anatomy; in the summer I attended the hospitals. The truth of these observations was during the siege of Belleisle in some degree put to the test, by comparing them with many cases of wounds which were attended with inflammation. From the frequency of gun-shot wounds at that place, I was naturally led to arrange my thoughts upon the subject, and was induced to select them more particularly for the illustration of my opinions on inflammation. About the year 1770, when I began my lectures on the principles of disease, inflammation was the subject of a considerable part of them; and from that time till this, though I have been extending and correcting the materials, my principles remain the same. To distinguish the different species of inflammation*, and to

* In the course of this work I very often make use of the word species or specific, by which I only mean peculiarities or distinctions, and probably the term is much too loose in its application; for, as we are not entirely acquainted with the specific differences in disease, we may call that a species which more properly ranks as a genus, class, &c. Of morbid poisons we can make a correct arrangement; but with regard to disease arising from peculiarities in the constitution, we have no such absolute guides.

express my own ideas the better, I was naturally led to substitute such terms as appeared to me more expressive of what was meant than those usually employed. The best test of the propriety of these terms is, that they have been adopted by many medical writers since that period; and indeed my principles have undergone the same kind of test. In this some medical writers have been very liberal; for, not contented with taking hints, they have even laid hold of large portions of my lectures, screening themselves under the very honourable protection of their not being in print; and, at the same time, quoting authors to show their reading and their *candour*. It would appear that they consider the discoveries and opinions of a lecturer, found probably in a manuscript, as fair game; though their delicate attention to the rights of another would, no doubt, have prevented them from adopting the same doctrines had they been actually in print. Such freedoms have made me anxious to publish; not only because the public interests itself in the origin of every discovery or opinion, but because I wish to preserve my right, and also to give in a more perfect form what was thought worthy of the public even in a mutilated state. My respect for that public, however, has withheld me hitherto from publishing, that I might first be able to complete my subject, as far as time and other circumstances would allow me. I hope this publication will, at least, have equally good effects with those I have before produced, not only enabling persons to write on the same subject who could not otherwise have done it, but even to become critics in matters of which till then they were entirely ignorant.

I have endeavoured, as far as my other pursuits would permit, to form this work into a regular system, one part exactly depending on another. How far I have succeeded, the world must judge. But at the same time it ought to be considered as a new figure composed from rough materials, in which process little or no assistance could be had from any quarter; wherein the author is conscious of many imperfections, more of which he is persuaded he shall himself observe at every successive review.

There are many opinions respecting the animal œconomy peculiar to myself which are introduced, or frequently referred to, in the course of this work. It is therefore necessary to premise a short explanation of some of them, that the ideas and terms which are employed may be better understood. To others of them, however, this method cannot be applied, as they belong essentially to the body of the work, or are so immediately connected with it as to be best understood when treated in connexion with that part.

I shall carry my ideas of life further than has commonly been done. Life I believe to exist in every part of an animal body, and to render it

susceptible of impressions which excite action; there is no part which has not more or less of this principle, and consequently no part which does not act according to the nature of the principle itself, and the impressions thence arising, producing thereby infinite variety, both in all natural and diseased acts. How far every part has an equal quantity of life, or of the powers of life, is not easily ascertained; but if we were to estimate them by the powers of action, we should judge tolerably well. Disease would seem to give some intelligence with regard to this matter; but how far resistance to disease, and powers of restoration, depend on the powers of life, or simply on the powers of action[a], I cannot say; but I believe it may be set down as a rule that those parts that are endowed with most action resist disease most strongly, and in disease restore themselves most readily to a healthy state.

§. 1. *Of diseased Actions, as being incompatible with each other.*

As I reckon every operation in the body an action, whether universal or partial, it appears to me beyond a doubt that no two actions can take place in the same constitution, nor in the same part, at one and the same time; the operations of the body are similar in this respect to actions or motions in common matter. It naturally results from this principle that no two different fevers can exist in the same constitution, nor two local

[a] [I believe a distinction should be made between resistance to disease and the powers of restoration. The former would seem to be in proportion to the vital energy residing in a part independently of action, as in a fresh-laid egg subjected to cold, whereas the latter would appear to be in proportion to the vital energy conjointly with the powers of action. Action, in the physiological sense of the word, can neither be supposed to exist in an unorganised body nor in an organised body stiffened by cold, although it is well known that living bodies are capable of resisting the effects of a low temperature under both these conditions; that is, the vital principle resists by a species of simple antagonism, just as gravity resists force, or chemical attraction electricity, although the former powers may be overcome by the latter when the latter are in greater intensity. In disease also, and especially in epidemical and infectious diseases, the weak and debilitated are most liable to catch the infection, and generally fall the first victims; so also in poisons, those parts which are least endowed with life are those which perish most readily. On these occasions, action, it is true, is produced; but then it is a subsequent, or at the most only a concomitant, effect, intended for the reparation of the injury and absolutely necessary for this purpose. However, it is highly probable that the powers of a part or of the system may be temporarily increased by certain species of fevers and inflammations, which may thus indirectly tend to increase the power of resistance. On the same principle, infection is most effectually resisted by those who are actively engaged in the pursuits of life.]

diseases in the same part, at the same time. There are many local diseases which have dispositions totally different, but, having very similar appearances, have been supposed by some to be one sort of disease, by others to be a different kind, and by others again a compound of two diseases. Thus, the venereal disease, when it attacks the skin, is very similar to those diseases which are vulgarly called scorbutic, and *vice versâ*. These, therefore, are often supposed to be mixed, and to exist in the same part. Thus we hear of a pocky-scurvy, a pocky-itch, rheumatic-gout, &c. &c., which names, according to my principle, imply a union that cannot possibly exist.

It has been considered as contradictory to this opinion that a patient might have the scrofula, scurvy, venereal disease, smallpox, &c. at the same time. All of this is indeed possible; but then no two of them can exist in the same part of the body at the same time: but before one of them can occupy the place of another, that other must be first destroyed, or it may be superseded for a time, and may afterwards return.

When a constitution is susceptible of any one disease, this does not hinder it from being also susceptible of others. I can conceive it possible that a man may be very susceptible of every disease incident to the human body, although it is not probable; for I should believe that one susceptibility is in some degree incompatible with another, in a manner similar to the incompatibility between different actions, though not of so strict a kind.

A man may have the lues and the smallpox at the same time; that is, parts of his body may be contaminated by the venereal poison, the smallpox may at the same time take place, and both diseases may appear together, but still not in the same part.

In two eruptive diseases, where both are necessarily the consequence of fever, and where both naturally appear after the fever nearly at the same distance of time, it would be impossible for the two to have their respective eruptions, even in different parts, because it is impossible that the two preceding fevers should be co-existent.

From this principle I think I may fairly put the following queries: Do not the failure of inoculation, and the power of resisting many infections, arise from the existence of some other disease at that time in the body, which is therefore incapable of another action?

Does not the great difference in the time, from the application of the cause to the appearance of the disease, in many cases, depend upon the same principle? For instance, a person is inoculated, and the puncture does not inflame for fourteen days, cases of which I have seen. Is not this deviation from the natural progress of the disease to be attributed to another disease in the constitution at the time of inoculation?

Does not the cure of some diseases depend upon the same principle? —as, *e. g.*, the suspension or cure of a gonorrhœa by a fever.

Let me illustrate this principle still further by one of many cases which have come under my own observation. On Thursday, the 16th May, 1775, I inoculated a gentleman's child, and it was observed that I made pretty large punctures. On the Sunday following, viz. the 19th, he appeared to have received the infection, a small inflammation or redness appearing round each puncture, and a small tumour. On the 20th and 21st, the child was feverish; but I declared that it was not the variolous fever, as the inflammation had not at all advanced since the 19th. On the 22nd, a considerable eruption appeared, which was evidently the measles, and the sores on the arms appeared to go back, becoming less inflamed.

On the 23rd he was very full of the measles; but the punctures on the arms were in the same state as on the preceding day. On the 25th the measles began to disappear. On the 26th and 27th the punctures began again to look a little red. On the 29th the inflammation increased, and there was a little matter formed. On the 30th he was seized with fever. The smallpox appeared at the regular time, went through its usual course, and terminated favourably[a].

[a] [In our ignorance of the essential nature of diseases, the principle which is here laid down may be considered perhaps as too absolutely expressed. The disposition and appearances of specific diseases are unquestionably greatly modified by the existence of peculiar states of the constitution at the time, as of scrofula, gout, rheumatism, &c., and this in so striking a manner as to render the distinction between a *modified* and a *conjoint* disease almost invisible. Thus the affections which result from the abuse of mercury on a constitution affected with syphilis are *sui generis*, and cannot be produced by either of these poisons acting separately. Thus also the phenomena of smallpox and cowpox present many peculiarities which are scarcely reconcileable upon the doctrines laid down by our author. Dr. Willan, for example, found "that when a person was inoculated with vaccine and variolous matter about the same time, (that is, not exceeding a week,) both inoculations proved effective, for the vaccine vesicle proceeded to its acme in its usual number of days, and the maturation of the variolous pustule was attended by a variolous eruption on the skin." (*On Vaccine Inoculation*, p. 1.) Dr. Woodville also has said, "that if the cowpox matter and the smallpox matter be both inserted in the arm of a patient, even within an inch of each other, so that on the ninth day the same efflorescence becomes common to both the local affections, nevertheless inoculating from the cowpox tumour the genuine vaccine disease will be produced," (*Observations on the Cowpox*, p. 12.); but if the inoculation be performed with a mixture of the two matters, then the chance is equal that smallpox or cowpox will be the result, or the varioloid disease, either one of which is capable of conferring an immunity on the patient so affected. Here, therefore, are two diseases acknowledged to be distinct and constitutional, not only coexistent in the system at the same time, but (from the blending of the areolar inflammations) apparently in the same part. These phenomena are probably as uncommon in disease as the hybridous productions of the animal and vegetable world in reference to the usual course of generation. Of the latter there is no question, and I do not perceive any antecedent presumption against the occurrence of the former.]

§. 2. *Of Parts susceptible of particular Diseases.*

There are some parts much more susceptible of specific diseases than others. Poisons take their different seats in the body as if they were allotted to them. Thus, the skin is attacked by what are vulgarly called scorbutic eruptions, as well as many other diseases; it is also the seat of the smallpox and the measles: the throat is the seat of action in the hydrophobia and the hooping-cough. The absorbent system, especially the glands, are more susceptible of scrofula than most other parts of the body. The breasts, testicles, and the conglomerate glands are most commonly the seat of cancer. The skin, throat, and nose are more readily affected by the lues venerea than the bones and periosteum, which however suffer sooner than many other parts, particularly the vital parts, which perhaps are not at all susceptible of this disease. These differences may arise from the nature of the parts themselves, or from some regular circumstances, which must act as a pre-existing cause.

§. 3. *Of Sympathy.*

It is unnecessary to give a definition of sympathy, for it is generally very well understood when applied to the mind, and also by medical men when applied to the body. In the mind its reference is external; it depends upon the state of others, and one of its chief uses is to excite an active interest in favour of the distressed, the mind of the spectators taking on nearly the same action with that of the sufferers, and disposing them to give relief or consolation: it is therefore one of the first of the social feelings, and by many useful operations inclines mankind to union. In the body, sympathy has only a reference internally to the body itself, and is not so evident as the sympathy of the mind, although in some cases we see its effects. It is either natural or diseased; but it is the diseased only that I propose at present to consider. I shall divide the sympathy of the body into two kinds, universal and partial.

By the universal sympathy is meant where the whole constitution sympathises with some sensation or action of a part. By partial sympathy is meant where one or more distinct parts sympathise with some local sensation or action. The universal sympathies are various in different diseases; but those which arise in consequence of local violence are principally three, viz. the symptomatic, the nervous, and the hectic fever. The symptomatic fever is an immediate effect of some local injury, and therefore is a universal sympathy arising from a local cause; the nervous has no determined form nor stages of the disease from the

first cause, as delirium, spasm, almost of all kinds and in all parts, locked-jaw, &c. The hectic fever is also a universal sympathy, attended with a local disease which the constitution is not able to overcome. Most of these will be more fully treated of when I have occasion to describe their causes.

I divide partial sympathy into three kinds: the remote, the contiguous, and the continuous.

The remote sympathy is where there appears no visible connexion of parts that can account for such effects. In these cases there is commonly a sensation in the sympathiser which appears to be delusive, and produces a wrong reference of the mind to the seat of the disease, such as the pain of the shoulder in an inflammation of the liver.

The contiguous sympathy is that which appears to have no other connexion than arises from the contact of separate parts. An instance of which we have in contained parts sympathising with the containing; such as the stomach and intestines sympathising with the integuments of the abdomen, the lungs with the chest, the brain with the scalp, and the testicles with the scrotum.

The continuous sympathy is where there is no interruption of parts, and the sympathy runs or is continued along from the irritating point as from a centre, so as to be gradually lost in the surrounding parts in proportion to the distance; and this is the most common of all the sympathies. An example of it we have in the spreading of inflammation, which will be often mentioned in this treatise[a].

§. 4. *Of Mortification.*

Mortification is of two kinds, the one without inflammation, and the other preceded by it. But as the cases of mortification which will be mentioned in this work are all of the second kind, I shall confine my observations to that species.

I consider inflammation as an increased action of that power which a part naturally possesses; and in healthy inflammations, at least, it is probably attended with an increase of power; but in inflammations

[a] [See the chapter on Sympathy, Vol. I. p. 317, for a more complete exposition of Mr. Hunter's views on this subject.

It is doubtless in many cases possible to trace the sympathy to a particular distribution of the nerves, as when, for example, the nerves of the affected and sympathising parts derive their origin from the same parts of the nervous centre. Thus, pain in the back is occasioned by irritation of the pelvic viscera, and hemicrania from caries of the teeth. A perfect knowledge of the minute anatomy of the brain, and of the functions of its different parts, would probably unfold the whole mystery of this subject.]

which terminate in mortification there is no increase of power[a], but on the contrary a diminution of it. This, when joined to an increased action, becomes a cause of mortification, by destroying the balance which ought to subsist between the power and action of every part. There are, besides, cases of mortification preceded by inflammation, which do not arise wholly from that as a cause, but rather seem to have something in their nature; of this kind is the carbuncle, and the slough formed in the smallpox pustule.

If this account of mortifications arising from no specific nature be just, we shall find it no difficult matter to establish a rational mode of cure; but before we attempt this, let us take a view of the treatment which has been hitherto recommended, and see how far it agrees with our theory. It is plain, from the common practice, that the weakness has been attended to; but it is plain that the increased action has been overlooked: and therefore the whole aim has been to increase the action in order to remove the weakness. The Peruvian bark, confectio cardiaca, serpentaria, &c. have been given in large quantities, as the case appeared to require, or the constitution could bear, by which means an artificial or temporary appearance of strength has been produced, while it was only an increased action. Cordials and wine, upon the principle on which they have been given, are rationally administered; but there are strong reasons for not recommending them, arising from the general effect which they possess of increasing the action without giving real strength. The powers of the body are by this treatment sunk afterwards in the same proportion as they had been raised, by which nothing can be gained, but a great deal may be lost; for, in all cases, if the powers are allowed to sink below a certain point, they are irrecoverable.

The local treatment has been as absurd as the constitutional. Scarifications have been made down to the living parts, that stimulating and antiseptic medicines might be applied to them, as turpentines, the warmer balsams, and sometimes the essential oils. Warm fomentations have been also applied, as being congenial to life; but warmth always increases action, and therefore should be well adjusted to the case: on the other hand, cold debilitates or lessens powers when carried too far, but at first lessens action. Stimulants likewise are improper where the actions are already too violent.

[a] [By "*power*," I apprehend, is here signified the resistance which is offered by a living part to disorganization and death. By the expression, "*the powers of a part*," is generally meant the sum of the vital actions going on in that part, as circulation, growth, secretion, &c. Mr. Hunter employs the expression in a less complex sense, so as simply to express by it the degree and prevalence of the vital principle.]

Upon the principles here laid down, the bark is the principal medicine as yet known that we depend upon, as it increases the powers and lessens the degree of action. Upon many occasions opium will be of singular service by lessening the action, although it does not give real strength. I have seen good effects from it, both when given internally in large doses, and when applied to the part. It is proper also to keep the parts cool, and all the applications should be cold[a].

[a] [Notwithstanding the condemnation which is here pronounced on scarifications and warm dressings, yet experience and theory both tend to confirm the utility of this mode of treatment. The former, or scarifications, afford an exit to putrid matters, while the latter by their antiseptic qualities diminish the quantity which is produced, and at the same time modify its virulence. But it is not merely the constitutional effects which are lessened by these means. There cannot be the slightest question that the local effects are equally mitigated, and the pernicious consequences of sloughs and ill-conditioned pus in contact with the living textures materially lessened, by providing a free escape for these matters. This subject will be adverted to more fully when speaking of "diffuse cellular inflammation," in which the bad effects of putrid secretions in contact with the living solids are most conspicuously shown.

In regard to the advantages of bark, I need not here observe that its pretensions in the present day as a medicine in cases of mortification are rated much more moderately than they were formerly. Practitioners no longer think that strength is imparted to the system in proportion to the quantity of bark which the patient is made to swallow.]

PART I.

CHAPTER I.

GENERAL PRINCIPLES OF THE BLOOD.

AS the blood is allowed by all to have a considerable share in inflammation, or at least to be particularly affected by it, becoming, by its appearances, one of the signs or symptoms of its existence, and as the blood is a material object with me in the theory of inflammation, I shall begin my treatise with its natural history, a previous knowledge of which is the more requisite, because the accounts of this fluid hitherto given will hardly explain any of its uses in the machine in health, or of its changes in disease.

The heart and vessels are very active in inflammations; and as their structures and actions have not hitherto been understood, I have subjoined to the natural history of the blood an account of the structure of the heart and vessels, together with their actions in the machine; to which I have added one use of the absorbents not hitherto known.

As every natural action of the body depends, for its perfection, on a number of circumstances, we are led to conclude, that all the various combining actions are established while the body is in health, and well-disposed; but this does not take place in diseased actions, for disease, on the contrary, consists in the want of this very combination; and diseased actions, therefore, vary according to many natural circumstances, of which I propose to point out a few of the most striking instances.

Inflammation must have some exciting cause, and the same cause will produce an effect under one circumstance which it will not under another. I have therefore begun with the supposition of an injury, attended with such circumstances as do not excite inflammation, which will form a strong contrast to those which do, the opposite effects mutually illustrating each other; but as inflammation is a very general action of the vessels in disease, and is of various kinds, I have previously given a short account of several of the most common sorts of inflammation, which will explain the rest.