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Dissertation on inflammation

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XVIII.

Dissertation
on
Inflammation.

By
Augustus Sammis, B. A.
of Norwalk,
Candidate for a Licence.



Inflammation

The term inflammation is applied to that morbid condition which resembles closely in its features and effects, that which result from the application of fire to the living body. There is probably no affection of the human system, which has excited more than this, the interest of the pathologist, with respect to the conditions essential to its existence, & the mode of treatment applicable to it in its various modifications, and a D. sent. in the different organs & parts of the living body, and of such importance is it, that many pathologists have been disposed to refer all morbid conditions either to its presence, or as a result of its previous existence. The opinions with reference to its nature and modes of action, at different periods in the progress of mentioned disease, have varied with the different views that have prevailed during those periods. Speculation has run wild, and fancy and imagination have, at different times woven the most fantastic, and we might say ludicrous respecting the nature, causes, and treatment of this affection. But fanciful as they may be, and although inconsistent with those lucid & highly interesting deductions which have resulted from a more intimate acquaintance with the anatomy and functions of the human system, from careful experiment

and an impartial examination of its nature and course & they may afford us the advantage of knowing the many fallacies, which have sprung from mere visionary conjecture and by thus lessening the probability of an error we find our investigations, and by closing the various avenues of error, conducted us into a path which may lead to a correct and reasonable view of its nature, & one that is consistent with our knowledge of the healthy action of the functions of the various organs of the human system.

Our limits will not admit of more than a brief allusion to the various theories which have been entertained upon this subject at different periods of the world. It is said that the views of Hippocrates respecting the nature of disease, governed those generally of the medicine world, exerting more or less influence over those opinions of various sects, down to the close of the last century. At different eras, as some peculiar principle, exerted its sway over the human mind, all theories were bent to it and from this fact it is probable that reason was perverted and all investigations partial, & directed to one end only, to discover the consistency between the facts that were presented to their contemplation and the one principle they had adopted as the guide of all their investigations.

Thus at one period chemical sciences had attracted the attention of physicians, & all disease was attributed to some change in the chemical composition of the fluids. Others again were disposed to refer entirely the operations of the human system to the government of the same laws that control & regulate the operations of inanimate matter. The erroneous views which existed upon this subject were undoubtedly owing to the ignorance of the circulation of the blood, and even after the discovery of Harvey, although the course of the blood in the lungs & the connection between these and the lymphatic system had been clearly ascertained, yet the most minute capillary system, which is now immediately concerned in the phenomena of inflammation, was still unknown & this led to the adoption of theories of the same fanciful & absurd character as had existed previous to this important discovery. It was thought that the blood & humors were vitiated by an excess of acid or alkali, or by becoming too viscid or glutinous, or too thin & watery. That the circulation must be rapid or too slow, and even subsequently in the examination of the capillary system, conjecture exerted a powerful influence over the prevailing views of the age. Disease was supposed to arise from the nature of the globe

ules of the blood their size and form compared with the vessels in which they circulated, that heat was produced from their trituration and friction, that they were inserted like wedges into the small vessels, were delayed, that they were rendered acrid, irritating and inflammatory from an excess of acid, that by stagnation they became solid & coagulated, that by powerful reaction the crude mass was converted into chlores, the tumor subsiding by the formation of pus, and the humor eliminated and conveyed away by the natural passages of the body. The solids also from debility were supposed to be concerned in the production of disease from the imperfect action of the functions of nutrition. It is natural to suppose that entertaining ideas so fanciful in their character that their modes of treatment should correspond, & accordingly we find in their list of remedies delaysents, insipiscents, antiseptics, chlorescents &c,

But it would be strange indeed, if there were not some faint glimpses of truth amid the numerous errors that so long prevailed with reference to this important subject. Its progress was like that of many other principles in the various departments of science

and as the mind attained more correct views of the structure & proper actions of the different parts of the physical system, its theories became more consistent with fact and at length after winding through all the mazy labyrinth of visionary & conjectural speculation it emerged into the light of a clear & consistent theory upon a subject so intimately & extensively concerned in the various phenomena of disease. It is highly interesting in tracing its progress, to perceive how the struggling with error as theory after theory was demolished by the leading minds that successively arose in the advancement of medical science.

With this brief and hasty allusion to some of the errors opinions which were entertained in the early history of the healing art we turn to an equally brief notice of those of the present age, & the first subject which is presented to our contemplation is that of the physiological and pathological considerations of the circulation. The nervous & circulatory systems are two principally concerned & affected in the phenomena of inflammation, of the former the ganglionic, of the latter the capillary system seem to demand our primary attention, although

The other two great divisions of each of these systems may be more or less connected with the production of this morbid condition. With regard to the capillary system it has been a subject of much discussion with different physiologists as to their powers, proposing any action independent of the heart & large arteries. Some deny that we have any proof of irritability in the true capillaries and affirming that the contraction of the heart is the principal cause of the passage of the blood through these vessels. But it is now generally acknowledged that they have strong powers of extension & contraction and that their contractility increases in proportion as they become smaller. Their independent action seems to have been amply proved by the various experiments of different & distinguished physiologists, some upon the circulation in the mesentery of the frog and web of its foot. Here so long as the circulation proceeded naturally no change was perceptible in the diameter of the small arteries or capillaries, but upon the application of stimuli an alteration in them was immediately observed, the contraction continuing sometimes, for a considerable length of time at other ceasing in about ten minutes and the

repels resuming their natural dimensions, We have also it is now proof of the contractility in the different momentum of the blood in various parts of the body. An emotion of the mind as a sentiment of shame or feeling of resentment causes the cheeks to become flushed or by other emotions as that of fear they lose emptiness of their contents and the countenance becomes pale. Also an confirmation of this, the phenomena of local inflammation itself have been observed in which there is an increased redness of the part, without the general circulation exhibiting signs of an increased activity & excitement; and as it is known that the functions of secretion & nutrition are performed, it would seem absolutely essential to the proper accomplishment of this important function, that these vessels should possess the entire control of the fluids circulating in them.

And yet it is not denied that other causes may exert an influence over their activity. The increased activity of the general circulation may propel the blood through these vessels in such quantities and with such force as to overcome their contractile power, But this taken in connection with the proofs of their possessing a

distinct power in themselves would evidence merely that both their causes were concerned in the discharge of their peculiar function. We next come to the consideration of the influence of the nervous system upon the circulation. Upon this subject there has been the same discrepancy in the opinions of different physiologists, some ascribing the action of the heart and arteries entirely to the influence of the cerebro-spinal system, while others adopt an opinion directly the reverse, But the more we consider the correct conclusion, it becomes us to give an impartial consideration to the arguments advanced in favor of each supposition. From experiment it has been ascertained that the circulation may continue even after the brain & spinal marrow have been entirely destroyed, but the independent power was exerted only for a short time, becoming gradually less until it entirely ceased, evidently showing that the vigorous & healthy action of these vessels is indirectly dependent upon the cerebro-spinal system. And again it is evident that it is not directly dependent on this system from the fact that when a portion of the body has its connection with it entirely destroyed as in paralysis the

function of circulation & nutrition have to a certain extent still been carried on. Both systems of nerves accompany the blood vessels, the filaments of the sympathetic following them to their minutest ramifications. The proper conclusion here then would seem to be that these two systems are dependent on each other that their influence on the circulation is united at once showing the entire connection & beautiful harmony that pervade the system, that there is no exclusiveness in its operations, but that they must all combine for the healthy & vigorous preservation of the principle of life.

As we have previously stated, the errors and absurd theories that were formed with reference to the phenomena of inflammation, arose from ignorance of the true anatomy and physiology of parts, but as this advanced theory became more consistent and clear, yet subservient to the period when medicinal means were entertained, founded on the acute and careful investigations of experimental philosophy, much perplexity existed as to the actual condition of the parts concerned in the medicinal operations

of this disease. It was found difficult to render consistent the fact of swelling which must result from an increase in the size of the vessels with the idea that in an increased activity of them there must necessarily be also an increase in their contractile power and a diminution of their caliber. Hence arose the hypothesis, that all the phenomena must depend on a relaxed condition of the vessels as primary, and this doctrine was adopted by some of the most distinguished physiologists. It probably originated from too superficial an examination of the action of the vessels, during the change which took place in them from the application of exalts to the parts. It has been stated by Dr Wilson, that he could create increased action in the capillaries without producing inflammation, but that when it was established the vessels were found in a state of preternatural distension & debility and similar though slightly modified views were entertained by other individuals. It was apparently ascertained, that certain stimuli applied to living parts produced an increased flow of blood and a contraction of the vessels. During this state of excitement the part affected is so far from gaining anything like the

appearance of inflammation that the size of the vessels was diminished, and the part pale; But if the stimulus be long continued or increased in power, the small vessels which in their natural state, admit only one series of globules, become so dilated, as to allow an accumulation of so much less fluid and redder blood in them which loses its globular appearance, & moves much more slowly than that which previously passed and if the stimulus be removed, the vessels do not soon regain their original state & that time is required for them to recover their contractile power to restore them to their previously healthy condition & prevent the blood propelled by the heart from heaping up the dilatation" Hence it may be inferred that inflammation consists in a debilitated condition of the capillaries whereby the balance between the large and small vessels is lost, and the latter become distended. The changes which occur in the parts & the subsequent contraction of the vessels seem to be exactly stated. But and not merely the mechanical effects taken into consideration without regard to the vitality & sensibility of the parts, So far as the theory goes it seems plausible, but it appears inadequate to account

for all the facts. When a stimulus is applied to a part there is an increase in its sensibility accompanied generally, with some degree of pain & if the stimulus is continued it causes the contractility of the vessels to as a natural consequence of this morbid excitement an increased flow of blood takes place towards the point of irritation which also acting as a stimulus hurries the circulation still more, until considerably more than the usual quantity of blood is collected in these vessels, & as the neighbouring vessels are not equally excited, the fluid in the distended vessels is not carried off as quickly as it arrives. Hence an accumulation ensues, & a preternatural distension follows, not from a previous debility of the capillaries, but from this fact. It has been ascertained, that blood vessels, like other elastic tubes, are capable of being distended to a certain point without losing their elasticity, but as the pressure of the blood increases, it finally becomes more than they can resist, especially if the larger vessels are also irritated & the general circulation hurried, & with the distension the action of the capillaries finally ceases, for becoming dilated beyond the limits of their elasticity, they gradually lose their power over their contents & thus becoming mere inert tubes

the circulation proceeds in a languid & sluggish manner. Hence it appears to me the debility of the vessels is not their primary condition, but a secondary effect resulting from over distension. As a natural consequence of this altered condition of the parts, its healthy functions are interfered with. The natural change in the blood ceases, retaining its viscid new appearance not only in the capillary arteries, but also in the veins, the coagulability of the blood is increased by a deficiency of serum, & the globules becoming blended the functions of the part are finally almost entirely suspended. The condition of the part then seems to be the following: an increase in sensibility, and quantity of blood with a morbid distension of the vessels, swelling & redness, the appearance of a malar spot, increased heat, and pain, the circulation at first hurried, then languid and oppressed, with an interruption of the healthy action of the part. This is called the state of active congestion or first period, which by an increase in the morbid action is followed by inflammation, succeeded by a number of phenomena which give a full & decided character of the disease.

There may be a debilitated state of the vessels, resulting from many causes, allowing an accumulation of blood in them

and a slow and a new circulation with swelling of the
part & a red reaction takes place from the stimulus of
the blood inducing subsequently an inflammation which may
remain, in this condition, which is called that of passive
congestion. In the one there is complete cessation of the ac-
tivity of the part, in the other reaction ensues, a vital effort
to restore the part to its original healthy condition, char-
acterized by an increased circulation followed by the
gradual removal of the symptoms of inflammation.

Another point of much importance in the consideration of
the phenomena of inflammation is the morbid apperance
as in dissection. Our knowledge of disease must depend for
its accuracy, not merely upon the symptoms as they are pre-
sented in the living body, but on those combined with the
changes, that may have occurred in the tissues as an effect
of the morbid action, which has been introduced in the sys-
tem. But a difficulty here presents itself, the fact that
there may be appearances, resembling those of inflammation
which we only observe. The different parts of the
body assume various degrees of redness after death, which we
are liable to ascribe to the effects of disease. That such is

the fact, is now generally acknowledged. By carefully inspecting the organs immediately after death & noting their color and appearance, by a subsequent examination we shall find that these appearances have changed, Parts naturally white will have become red, and the bright red of other parts will have assumed a deep red or congested appearance and vessels be seen where none were previously perceptible, and it is also possible to produce these appearances in different parts by placing the body in different positions. There may be new spots in various parts, new lines following the course of the blood vessels, arising from the volume of the blood through their vessels, and rejecting the parts, and also the bile stains of the organs near the gall bladder have been mistaken for a morbid appearance. The red and congested condition of the more important organs as the lungs, heart &c probably arises from the contractile action of the small vessels, after the action of the heart has ceased; also the absorption of gases from the putrefactive process will produce different colors in the organs, from their penetrative power change the fluids and afford a brown green olive tints, &c.

Being aware of these facts, it is necessary therefore to

make a careful distinction between those purities or lar-
ger appearances, and those which are the result of disease.
From the facts stated above it is clear that redness alone
does not evidence inflammation, neither does a distension
of the vessels, and tumefaction or increased thickness of the
of the parts, as all these take place in the living body with-
out inflammation & in death from the gravitation of
the fluids & their translocation through the walls of
the vessels. The following are stated to be the only sure signs
of inflammation, Considerable increase of vascular-
ity with extravasation of blood & coagulable lymph,
& the formation of pus & other products. A very minute
injections chiefly of small arterial branches; a purple
colored disposed in dots & streaks occupying the whole thick-
ness of the tissue and not removable by pressure or ablu-
tion, spots of ecchymosis occasioned by the rupture of
some of the small vessels, effusion of blood on the sur-
face with infiltration within the texture of the tissue.
But several of these appearances result also from mere
passive congestion as redness and spots of ecchymosis &c.
The distinction between them is that the injection here
is sent in the veins, and has a dark color, while that

while that of active congestion exists in the arteries & has a bright pink hue; In the former the texture is flabby & loose & may be easily lacerated, while in the other there is a firmness of texture, indicating that a higher degree of activity has previously existed in the part. It is acknowledged, that at times it is almost impossible from these signs alone to distinguish accurately between these two forms of congestion, we must ergo take other circumstances into consideration as mode of death whether violent or mild, also the nature of the disease affecting the individual as these are diseases of the heart, asphyxia & such may have been agents in the production of a congested state of the membranes of the body.

Diagnosis This may be considered in two divisions, 1st When the inflammation is external, 2nd When it is deep seated, affecting the internal organs & tissues. In the former it is local existing within certain limits, & without the system being generally affected. In the latter it may extend to the whole system sympathetically, including constitutional & distant humors. In the former we find local signs apparent to the eye & touch. They had been stated to consist of four, color, heat, tumor & pain. The pain which accompanies inflammation may vary much in its intensity from simple soreness of the part to the most

violent suffering. But this alone is not always indicative of inflammation, as it may arise from nervous irritation in its most excruciating form without any redness or tumefaction of the part. How it arises from the irritation produced in the nerves by the exciting cause, or from the new connection which the parts here assume, producing a compression or distension of the nerves. There may be throbbing pain resulting from the compression of nervous matter at each pulsation of the artery, & the character of the pain will vary with the texture of the part, also be in proportion to the number of nerves with which the parts are supplied & to the severity of the inflammation. Where the nervous filaments are numerous the pain is acute. Where the parts are firm & unyielding it will often be exceedingly severe producing constriiction at distance - in the skin it is pungent & burning, in serous membranes sharp & lancinating in the mucous and cellular tissues, dull & obscure. When it is heavy and throbbing it is in the nature of subparietum. And this symptom is heat. The elevation of temperature in the part is perceptible not only to the patient but also to the physician. But this symptom alone cannot be relied on as indicative of inflammation. As this elevation of

temperature may arise from many other causes, and it has been
remembered that it would be useless to attempt to give an expla-
nation of the cause of this phenomenon, as probably no perfect-
ly satisfactory theory has yet been established with reference
to the source of animal heat. It is summarily stated by you
on this to be owing to the blood passing in greater quantity
& increased velocity through certain of the vessels which con-
tinue permeable. The tumor or swelling arises first from
the dilatation of the vessels by an increased influx of blood,
and then by the subsequent effusion of serum, coagulable lymph
&c. We may also remark that neither is this sign alone charac-
teristic of inflammation as it may arise from various other causes
unconnected with inflammatory action, and the extent of
the swelling will also depend on the severity of the inflamma-
tion and texture of the part. The redness arises from an increas-
ed quantity of blood in the vessels. But the redness may be
occasioned by a transient hurry in the circulation producing
a momentary flush unaccompanied by the other symptoms
of inflammation. This would be merely a natural consequence
of increased healthy action; to become a morbid condition it
should be permanent & accompanied with pain heat and
swelling. Its intensity will also vary with the texture of the part

In fibrous membranes, in cartilage & tendon &c. is a slight white
in the mucous & similar membranes it appears a bright, pink
hue. It may exist in different shades, from bright, scarlet, to a dull
purplish color, deepest in the centre, and shade gradually off
into the surrounding tissue. Such briefly are the local symptoms of
this affection. But when internal organs are inflamed, these
signs may afford us but little assistance in diagnosis. In such
cases we must form our diagnosis, when the general symptoms
in connection with the disordered action of the organ itself.
But one of the previous signs can aid us here, viz. the pain and
yet this is not always present, as certain tumors may be inflamed
as the disease terminates fatally, without this evidence of its
existence although it may generally be discovered by pressure.
But one of the most important symptoms is the disorder in the
function of the inflamed organ, with an irritable state of the
constitution characterized by the usual febrile symptoms &
besides these various other signs are pointed out, as indicative
of the different localities of the disease, which consist in some
unnatural expression of the countenance, change in the
voice & actions by which the healthy performance of the functions
of the internal organs are manifested to our senses. When seat-
ed in the brain the face & eyelids are convulsed & the

eyes were a wild staring and heavy expression. A distension of the alve nasi & a drawing up of the corners of the lips & cheeks with protrusion of the eyes & heaving of the shoulders indicate its seat in the thoracic viscera. A sinking of the cheeks & drawing downwards of the angles of the mouth with a pinched and pallid appearance of the features and sunken eyes indicate an affection of the viscera of the abdomen. When it is seated in the brain it is also characterized by delirium & stupor of reason, by coma & convulsions, when it is seated in the lungs the voice is shrill, hoarse & feeble, with a pricking sensation & difficulty of breathing; in the pharynx it is characterized by difficult deglutition without any affection of the voice or respiration; in the lungs by cough & more or less bloody purulent expectoration, shortness and difficulty of breathing; in the stomach by severe pain in epigastrium with burning heat, excessive nausea and vomiting. The terminations of inflammation are briefly the following. 1^o The morbid condition may pass away without any alteration in the structure of the parts by what is called resolution, 2^o it may transfer its seat to another part of the system, by metastasis, or effusion may take

place when the suspended function of the part is restored; in suppuration or the formation of pus, in gangrene or the complete death of the part, in induration or a continuation of the tumor or in the opposite state of softening, occurring in the human muscular members.

Treatment, It would seem necessary to premise that the most valuable modifications in this art depend on the severity of the disease, whether acute or chronic, on the state of the patient & the nature of the organ affected & we must also consider whether we exclude circulation of the extreme vessels or the activity of those common entering, with these elements our first attention. In general in the treatment of inflammation, two indications are laid down as essential. 1st To reduce the amount of blood circulating in the vessels & the activity of the heart & arteries, & 2^d To diminish directly the excitement in the part and modify the morbid condition of the extreme vessels. These two indications are not however always present. In all cases of acute inflammation accompanied with severe constitutional disturbance, general blood letting is of essential importance particularly so when it affects important organs. Although no precise & definite rule can be laid down as to the amount of blood to be abstracted there are several circumstances that may guide us in the proper employment of this remedy. 1st Among the symptoms of internal inflammation is that of the dis-

turbance of the function of the part. When this is restored it is
sure evidence of the cessation of the morbid condition. But if it
has only partially been restored or a relapse has followed, the fur-
ther abstraction of blood will be necessary. Another symp-
tom which attracts our attention is the pain & secretion as
a powerful & appropriate means of subduing it. It should
be employed until this symptom is relieved. But should this
only be partially relieved we require again it indicates further de-
pletion, But particularly does the pulse claim our attention
yet it varies in its character. In inflammation of one kind
it is frequent full & strong in others hard, & tense. These
conditions of the pulse being indicative of the employment of
this remedy it should be continued until the pulse is brought
as near as may be to the healthy standard, But however im-
portant this symptom may be in the indications for
the use of the lancet it cannot always be depended on alone
but it must be combined with the other signs as in some cases
of inflammation it may not exceed the healthy average or some
peculiarity of the person may render it when taken alone an
unsafe guide. We must also have regard to the duration of
the disease as when the disorder has been permitted to pro-
gress for a time the efficiency of this remedy becomes limited

But as we have remarked, the true indications here are not always present as there may be cases in which although depletion is indicated, general bloodletting may not be required. In such cases we have recourse to local depletion as when the inflammation is slight, the patient too weak to tolerate to admit of general bleeding, or when as we have just stated the active symptoms have passed &c.

There are other remedies, which also possess a powerful control over inflammatory action, as nauseating doses of the Tartar emetic, viz. $\frac{j}{4}$ of a grain in solution every two or three hours is given to the balance of the system. Opium is also used after full resection often with the most beneficial results, by its restorative agency, controlling the power of the heart & arteries, preventing reaction in the system and removing irritation. Its different preparations may be administered as the case may seem to demand either in full doses of from one to three grains of solid opium or a grain of its salts in solution. After resection, there is another principle which exerts a powerful control over inflammatory action, & that is results in a desiccation, This is one of the effects of the operation of purgatives, which is also combined with that of depletion, By increasing an irritated circulation of the mucous

membrane of the alimentary canal they exert a derisive
or revulsive influence upon the morbid action of distant
parts of the system. Mercury may also be included under
this class. So important has this remedy been considered that
with many it has obtained the reputation of a specific and the
term inflammation ad oed suggests this as the remedial
agent and ample experience has attested to its power in
checking the progress of inflammation in many of the tissues
and it is remarked with reference to it, that it appears to have
peculiar power in arresting or controlling the action of the
capillaries and preventing those changes from taking
place which are so destructive to the organization of in-
flamed tissues.

When its constitutional effect is speedily required it may
be administered after resection, two grains of calomel
or five of the hydrargyrum benedictum may be given every
alternate hour. But if this is not immediately required
it may be given at longer intervals. Its action on the bow-
els may be restrained with the addition of opium and
so happy is the effect of this combination over intestinal
inflammation that after resection it has proved it-
self the most efficient remedy we possess.

In reference to topical treatment where the inflammation part
can be reached it must depend as we have previously remarked
upon the condition of the vessels; when they are debilitated and
relaxed stimulant and excitant applications will be more
enter, but on the contrary where there is increased action
in them cold and sedative remedies will be the better ap-
plications to the part. In connection both mental and
bodily rest should be enjoined, and the diet should
be spare and mild.

A. S. Williams



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