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ON

Adhesive Inflammation

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"The blood, as it flows in the small transparent vessels, or soon after it escapes from the system, may be seen, when under a microscope, to consist of corpuscles, the large majority of which are red, floating in a colourless fluid. — The *Siquor Sanguinis*. This fluid differs from the serum which separates from the *crassamentum* in the process of coagulation, as it holds in solution the fibrin or plastic material of the blood, the coagulation of which, enclosing the corpuscles, constitutes the *crassamentum*. The fibrin of the blood is the material of nourishment to the tissues in the vital process of nutrition; and its effusion as an event of inflammation constitutes an important and necessary condition in the reparative processes of the animal organism. In the progress of inflammation it is thrown out more abundantly

than can be appropriated to the nutrition of the part, and from the exercise of the vital force with which it is endowed, becomes an organized portion of the animal body.

It is not proper for us to attempt an explanation of the essential nature of inflammation. Whether it depend upon increased action in the capillaries, as taught by Hunter, or upon diminished tone as contended for by Wilson Philip and others, is not of material importance to our subject. The point of departure, is no doubt, in the nerve fibres of a part. Some intrinsic or extrinsic influence, stimulates or excites the nervous fibrils of a part, and, through the sensorium, it calls for defence, and the plastic fibrin is supplied in increased quantity by increased determination of blood, ubi stimulus ibi affluxus, or, in the language of Mr. Smith:

"If the tissue which in its normal condition, attracts from the blood the materials of its own life and growth, be interfered with, by physical, chemical, or other source of disease, another series of actions is set up, of which the attraction of considerable quantities of blood is most conspicuous, and which in their totality constitute inflammation". In the beginning of the inflammatory process, the blood flows into the capillaries in larger quantity, makes its transit through them more rapidly, and escapes into the venous radicles with tolerable facility, but at length the minute blood-vessels become overdistended, the corpuscles, particularly the colourless ones, seem to adhere to the walls of the capillaries, or roll on sluggishly and haltingly, until at length the circulation is impeded, and the blood stagnates in the minute vessels of the part. Phenomena of this kind have been

repeatedly noticed in the frogs web and other membranous tissues when suffering inflammation. When the inflammatory turgescence has reached its highest degree in membranes, particularly serous membranes; the liquor sanguinis or dissolved fibrin of the blood is effused upon their free surfaces, constituting when organized; false membranes; or if the inflammation exist in a part which has no free surface, the lymph accumulates in the texture of the part, resulting in indurations, tumors &c. The plasma does not seem to be effused from mere mechanical distention, but from a vital law, which is conservative in its nature — a manifestation of the vis medicatrix naturae. The demand for plastic lymph is anticipated; as in inflammatory blood, fibrin exists in increased quantity — a fact ascertained

by Sir Charles Scudamore. The effusion and organization of Coagulable lymph, is the means by which tissues are regenerated, wounded parts united and loss of substance restored — by which abscesses are environed so as to prevent diffusion of pus, the intestines agglutinated, arteries obliterated &c. The manner in which tissues are thus restored, or wounded parts united is by cellular development, as the original tissues are formed in the embryo. Minute granules are formed in the effused liquor sanguinis, which are gradually converted into cells. By the imbibition of fluid from the blastema in which they float, the granules or cytoblasts throw out a projection in the form of a delicate vesicle, which increasing in size, becomes a cell, with the granules embedded in its walls; These again become hollow by

a similar process, and a remaining granule becomes the nucleolus. Thus cells are formed, which arrange themselves in such way as the vital endowment of the tissue in which the reparative process is in progress may influence. They may form flattened disks as in the cuticle and epithelium, or continue embedded in a substance formed of the blastema as in bone and cartilage; They may become spindle shaped or stellate and form fibres as in ligamentous and muscular tissues, or tubular canals may be formed by their arrangement in continuous lines, with loss of substance where in contact, as in vascular and nervous tissues. Thus from the variety of organizing force which a cell may possess, various normal or abnormal tissues may be developed. Suppose we have a solution of continuity or breach of

texture in a part. What phenomena present themselves? Increased afflux of blood is soon directed to the injured part, the tissue attracts from the blood a quantity of the liquor sanguinis or plastic lymph, in which new organic cells are developed after the manner above mentioned, and they become a living tissue similar, in most instances, to that from which the fibrin was effused, and a cicatrix is the result, which is denser than the surrounding tissue. The manner in which bloodvessels are formed in this new tissue is thus described by Dr C. S. B. Williams: "The inflamed capillaries project at different points in pouches and diverticula and form loops, these give way, the blood is injected into the lymph, and if something of channels were previously formed, by the linear arrangement and communication of cells; a current in them is produced by the vis a tergo, and the

blood returns by a reversal of the weaker currents." Vogel, a german anatomist, teaches that bloodvessels in such instances as the one above described, are formed from the blastema alone, and entirely independent of adjoining capillaries; but as new vessels have not yet been seen in isolated masses of lymph, we rather entertain the view of Dr Willianis.

The formative energy of the effused fibrin may be of an inferior grade, from some abnormal state of the assimilating function. Its capacity for organization may vary in different degrees, and its products correspondingly differ in their complexity of structure — granulations or tubercular deposits, such as are sometimes found upon the peritoneum and arachnoid, are some such products, and as the organization of such deposits is different or inferior to.

that of the texture with which they are connected, disease may ultimately be induced in contiguous parts. The lymph exudation may, in fact, be totally incapable of organization, and is then thrown off in the form of pus.

All organized parts will unite, in a healthy constitution, if kept in contact while in a state of adhesive inflammation. A tissue will unite with a similar or a dissimilar tissue, as bone with bone, nerve with muscle &c. Parts which have been entirely severed from their connection with the body, may unite, as in a case where a portion of a finger was entirely separated; mentioned in "Sir Astley Cooper's Lectures". Dissimilar textures may form union after total disconnection; as in the transplantation of the spur of a cock to his

comb, and the gland of a coxal to the abdomen of a hen, instances of which are recorded by Hunter.

All tissues are not regenerated. It seems that those possessed of a high vital endowment or whose functional usefulness will not be destroyed, by the non-reproduction of the tissue, are not regenerated. This is the case with muscle, gland &c, which tissues, if divided are generally united by a dense cellular cicatrix, Muscular contraction is still available in this case, and glandular secretion may continue from uninjured portions of a secreting organ, though a cellular cicatrix exist within its substance. In tissues of an inferior grade in the scale of organization, or in those in which non-reproduction would materially interfere with the functional activity of the

part, regeneration of tissue is generally complete, and the new tissue possesses the properties of the original. If there be any tissue doubtful in this connection it is the nervous. Certain experiments of Schwann, Steiner and others, showing incontrovertibly that sensation and motion have returned to parts the nerves of which had been divided; and even though a small portion of the trunk of the nerve had been excised, sufficiently evidence the reproduction of nervous tissue; unless the nerve force passed with undiminished energy through a cellular cicatrix. In the transplantation of portions of the skin, as in the operation called rhinoplasty, where the original connection has been severed on all sides; the return of sensation is indisputable—so says Dieffenbach, a

surgeon of very extensive experience in such operations. "It is truly wonderful that in nervous fasciculi, containing motor, sensitive and sympathetic fibres; each of those fibres should join to one of similar function

The union of fractured bones, is probably one of the most remarkable results of the effusion of plastic lymph — of adhesive inflammation — If we have a fracture of a long bone, the femur, for instance; plastic fibrin is effused from all the parts around, which were injured at the time of fracture; from the cellular tissue, the bone and periosteum, in fact, from all the parts suffering inflammation, This plastic exudation gradually becomes consistent, at length ossifies, and forms a temporary capsule, which envelopes the ends of the bones, tends to hold them

in apposition and protects the exudation and process of ossification which goes on within. The divided ends of the bone exude lymph which slowly becomes cartilaginous, ossific deposits gradually changes this young cartilage into bone, the newly formed portions thus slowly approach each other until they meet and unite; the medullary cavity is restored in its substance, and the form of the new bone becomes not unlike the original. It is sometimes the case, that, from frequent motion or other disturbing cause, the process of ossification does not take place, and the effused fibrin is converted into a ligamentous tissue which unites the bones, or something like a synovial membrane and ligamentous capsule, may connect them, forming pseudarthrosis or false joint.

In our efforts to remedy cases of this kind, we seek to reproduce adhesive inflammation, by rubbing the ends together, or the introduction of a Seton &c, in the hope that the renewal of plastic effusion may result in ossification. All bones when fractured do not thus readily tend to bony union. The bones of the cranium, pelvis, patella &c, most usually unite by fibrous or ligamentous tissue. We see a wise design in this; for if bony union was the result of fractures of the cranial bones, formations of irregular or tuberos shape might seriously incommode the delicate cranial contents; producing epilepsy and other anomalous nervous affections. In long bones, if ossific union does not take place, their usefulness as

instruments of locomotion is destroyed, so in them the tissue is generally reproduced.

Adhesive inflammation or the adhesive process, is in fact the basis of Operative surgery. In all his operative procedures, the Surgeon endeavors to so place his incisions that "union by the first intention," or adhesive inflammation may be promoted. In wounds where there is no great loss of substance, though extensive and severe, by placing the parts in apposition, removing all foreign matter &c, nature sometimes repairs most frightful injuries - and the Surgeon "receives praise for labors not his own." Those plastic operations which have for their object, the restitution of lost parts, the remedying of congenital

defects or arrests of development, as rhinoplasty, cheiloplasty, staphyloplasty, tenotomy as connected with orthopaedic surgery, depend for their success upon the adhesive process— if the inflammation passes this stage or the effusion degenerates into pus, the operation fails. Ligation of arteries, whether for the staying of haemorrhage or the cure of aneurism, can only be successful by adhesive inflammation being set up in the endangium, thus sealing up the vessel and converting it into a fibrous cord. Injections for the radical cure of hydrocele are based upon the same process, i.e. the effusion of coagulable lymph and consequent obliteration of the tunica vaginalis.

The serous membranes, of all the

textures are most prone to adhesive in-
 flammation. The peritoneum, pleura,
 arachnoid &c, all throw out fibrin
 abundantly when suffering inflamma-
 tion and adhesions between their ap-
 posed surfaces are frequently found,
 Probably more than half the cadavers
 examined, present adhesions to a greater
 or less extent in some of the serous
 sacs, most commonly the pleural,
 The effusion of coagulable lymph may
 be said to be the termination of in-
 flammation in serous membranes,
 It is true that suppuration some-
 times takes place, but only from
 some vice of the system, The ad-
 mission of air &c, The adhesive
 process in the large serous sacs is
 often preventive of more serious
 damage. Ulcerations of the bowels

would often perforate the intestinal tunics and the contents escape into the cavity of the peritoneum, even it not that the effusion of lymph upon the peritoneal surface opposes a barrier to perforation— in such cases folds of intestine may become agglutinated to each other, ulcerate through, and a false passage be established. In intestinal invagination, the contained portion of bowel may slough, and adhesion occur between the peritoneal surfaces of the upper and lower portions at the point of junction and in this way complete recovery may take place. Hepatic abscess is often prevented from bursting into the abdominal cavity by plastic adhesion,— it may point externally and adhere to the

abdominal walls, or adhering to the
 bowel their contents may be dischan-
 ged into the intestinal tube. The ab-
 scess may even penetrate the diaphragm,
 the contiguous diaphragmatic and pul-
 monary pleurae become agglutinated,
 and the pus find its way into the
 bronchial tubes. A surgeon would
 be loth to plunge a bistoury into a
 hepatic abscess, unless he was satis-
 fied adhesion to the abdominal wall
 existed; in fact the process of slowly
 opening them with caustic, has for its
 object the more certain induction
 of the adhesive process. I have met
 with a case of lumbar abscess in
 which the pus found its way into
 the colon and was discharged per
anum— The patient recovered, and no
 doubt has the colon adhering to the

loins. Similar plastic adhesions take place in the pleura in tubercular vomica, by which effusion of their contents into the pleural cavity is prevented. The protective influence of adhesive inflammation is well exemplified in phlebitis; if the inflammation is localized by the effusion and organization of lymph, and a collateral circulation is established, all goes on well, but if the inflammation be not thus environed, purulent contamination of the blood is the dreadful consequence.

Adhesive inflammation, though often a conservative process, is not always so. A drop of lymph may obstruct the pupil, or the iris may adhere to the cornea in front or the capsule of the lens behind, and par-

tial or total blindness result bands of adhesion may embrace and strangle a portion of intestine, or the pericardium may adhere to the heart, and by crippling its action and free play, cause hypertrophy, dilatation &c.

Mucous membranes rarely throw out dissolved fibrin, and adhesion in them rarely occurs; This is a very important provision of nature, for if mucous membranes effused plastic fibrin as the serous, the worst of consequences would necessarily result. The inlets and outlets would often be obstructed, and the entrance of incrementitious or the exit of excrementitious matters entirely cut off. The effusions from mucous tissues are rather corpuscular than

fibrinous and rapidly become purulent, It is true that casts of the bronchial, and uterine membranes, are sometimes expelled in the form of adventitious membranes, but they are unorganized, and are rather albuminous than fibrinous in their character. Adhesion may occur between mucous surfaces as in the vagina from difficult or instrumental labors, in the fallopian tubes of prostitutes &c.

The adhesive process is best promoted in wounds, by staying haemorrhage, removing all foreign matter, placing and retaining the parts accurately in apposition, the application of light dressings, and the observance of the antiphlogistic regimen. If it be the indication to prevent adhesion, as in mucous canals, keeping the parts asunder

and encouraging suppuration and granulation, will be proper.

Mercury is our great internal controlling remedy in adhesive inflammation. It was in iritis that the power of mercury to cause the absorption of coagulable lymph was first recognized. In the inflammations of serous membranes, and in parenchymatous organs where we desire to check adhesive inflammation, and cause the absorption of lymph; this remedy should be pushed until its specific effect is induced, and the action maintained as long as the symptoms may indicate it. Venesection in most cases should precede this remedy.