FURTHER REMARKS
ON THE
ULCERATIVE PROCESS.

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READ 9TH DECEMBER, 1834.

IN the last volume of the Transactions published by the Medico-Chirurgical Society, it did me the honour to include some observations on the ulcerative process, as it occurs in joints. My object in that paper was to point out the mode in which the cartilage covering the articular ends of bones is absorbed in some forms of joint disease, and to shew that the cartilage was not absorbed per se, but through the agency of a structure probably evolved for the special purpose of completing that process.

Three forms of disease were described, which appear to illustrate this mode of action ; viz., 1st, the loss of articular cartilage that attends upon the chronic inflammation of the synovial membrane ; secondly, the more active destruction of the articular cartilage that attends acute inflammation of the joint ; and thirdly, the absorption of cartilage that accompanies

strumous disease of the cancellated structure of bone.

It may be recollected, that a fourth process of ulceration of cartilage was adverted to, in which that structure appeared to undergo a change in its organization independent of foreign agency. This form of ulceration of articular cartilage I did not at that time enter upon, as it appears to me to be an action altogether different from absorption, and analogous to the softening of the intervertebral substance. The term disintegration was employed in contradistinction to absorption; the one being a loss of substance from an absorbent action, the other being the result of a disorganization of texture. It is this latter form of action to which I wish to direct the attention of the Society. It is the primary ulceration of cartilage described by authors.

In speaking of ulceration in the former paper, I have considered it, as it is usually understood to be, an action of the absorbents by which the parts that lose their integrity are absorbed and carried into the general circulating mass. Observation, however, of this process, under its varied modifications, has led me to regard ulceration, in its strict signification, not as an absorbent action, but as a process of degeneration, or a softening of tissue, analogous to that action by which the medullary part of the brain and scrofulous tubercles become converted into a purulent mass.

In the early formation of abscess, and in the acute phlegmonous suppuration of cellular membrane, this softening process may be satisfactorily observed. The first step which nature takes in forming an abscess, is a deposit of the solid or fibrinous part of the blood, either mixed with or free from the red particles, according as the action is acute or chronic. This solid deposit remains for a certain period unchanged, but at length becomes softer in consistence, and towards the centre exhibits all the characters of completely formed pus. The cavity thus formed either increases in size by the same process, or the sides of the cyst become organized, and secrete pus. Thus the fluid in an abscess at first is the product of a softening process; afterwards it is a secretion from the vessels of the walls of the cyst. In phlegmonous inflammation of cellular membrane, an incision into the diseased texture demonstrates the several stages of the deposit, from its first formation as a firm yellowish substance to its gradual change into a softer mass, and its final conversion into well formed pus.

But in many diseases the softening extends not only to fibrinous or tubercular deposits, but also to the organized tissues of the body; and under its influence large portions of vascular tissue become broken down and mixed with the purulent depôt. In the red hepatization of the lungs under pneumonia, the cells of the organ are infiltrated with a solid deposit in sufficient quantity to render the lung

solid, but still allowing the natural vascular tissue to be distinguished. In the more advanced stage of pneumonia, or the grey hepatization, the vascular tissue of the lung is no longer discernible; it is blended with the fibrinous deposit, and presents a uniform greyish solid mass. If time be allowed for the deposit to soften down, the natural texture of the lung is found to have lost its consistence, and breaks down under slight pressure; and in many instances appears to be resolved into a puriform mass. The same train of actions may be observed in the chronic tubercular disease of the lung, and in the strumous disease of absorbent glands. In a scrofulous gland, the deposit of tubercular matter, the softening process, the gradual blending of the natural tissue of the gland with the scrofulous mass until it can no longer be distinguished, can each be clearly followed, until the whole is converted into a mass of pus, here and there intermixed with the debris of the original glandular structure.

Ulceration is a process analogous to the softening attending suppuration; it is a degeneration of tissue, a change in the affinities existing between its component parts, by which it becomes changed from a solid organized texture to a fluid inorganic mass. It differs from gangrene in being a vital action; while gangrene, by at once producing death in a part, prevents any such change taking place. In gangrene, the supply of blood to the part altogether ceases, while the integrity of tissue is preserved; under ul-

ceration, the circulation in the vessels continues during the action, and the part still belongs to the living mass, and remains under the influence of vital action until its separation is completed.

Such disintegration of organized tissues, and their conversion into their original elements, is consistent with the usual operations of nature ; and for animal structures to resume their former elementary state, and again to become the fluid of which they were originally composed, is by no means an unnatural transition.

The integrity of animal bodies is preserved by a vital force acting on the component parts of living tissue, as chemical affinities produce and preserve the various heterogeneous compounds. What the peculiar agent may be that is employed in preserving this integrity of vital structure, admits not of demonstration. Probably it will be found to be the organic system of nerves acting to the same purpose as electric agency does in maintaining the ordinary chemical combinations ; electric agency in the inorganic world being the type of the nervous influence in the animal. We do not possess the means of reducing this proposition to a demonstration, for the division of a nerve only cuts off animal sensibility, leaving the organic sensibility unimpaired ; as is shewn in the phenomena of inflammation being as perfect in paralysed parts as in those retaining sensation. A change in the nervous energy supplied to a part may

probably be the cause of that kind of disorganization of tissue termed ulceration.

My grounds for this view of ulceration appear to be upheld, both by the want of proof that absorption is in any way concerned in the formation of an ulcer, as well as by evidence of it being a work of disintegration or degeneration of tissue. It is probable that ulceration was first assumed by Mr. Hunter to be an act of absorption, by extending the analogy observed between the progressive and interstitial absorption to the ulcerative process. But the circumstances under which the former takes place differ from the occasions in which the latter is called into play: in progressive absorption Nature can effect her object in no other way. If a bone, or any soft part, receive the continued pressure of an aneurismal sac, it must yield to the pressure, and there is no way, but by absorption, of getting rid of the structure to be removed. Here, therefore, the absorbents must be set to work, and the part removed is carried into the general mass of fluids. But it seems unreasonable to apply the same reasoning and the same mode of action to the removal of textures by an abscess in its approach to the surface. Here clearly a different action takes place, and although some interstitial absorption may be produced by the pressure, each part in its turn undergoes an inflammatory action and the process of degeneration of tissue, and gradually adds to the depôt of pus. The distinction and contrast between these two actions is shewn in

the change that takes place in the intervertebral substance of the spinal column under the pressure of an aneurism, and that which occurs in scrofulous abscess or ulceration.

In the progressive absorption produced by the pressure of an aortic aneurism on the spine, it may be often noticed that the bony part of the column is extensively destroyed, while the intervertebral substance remains entire, and even projects unchanged amidst the eroded bone. The laws that regulate absorption enable the comparatively inorganized fibro-cartilaginous tissue to remain passive under the pressure, while the more highly organized bone is irritated by it, and is gradually absorbed under its influence. But in scrofulous ulceration, the intervertebral substance is not unfrequently the part in which the action of degeneration begins; large masses of the fibro-cartilaginous structure degenerate and disappear, cavities containing pus are found in its substance, and the broken-down fibres surrounding the walls of the abscess, sufficiently attest the nature and progress of the action. Under the one action, the intervertebral substance is the first to yield; but the other, which is a process of absorption, it resists.

The supposition that nature carries into the circulating system noxious matters and poisoned tissues, which can be more effectually and more safely got rid of by other means, is carrying analogy beyond the bounds of probability. But if the formation of

an ulcer be an act of absorption, the parts that are removed in the formation of a chancre are so disposed of; the absorbents, in forming a chancre, carry into the system tissues tainted by the venereal poison, and must therefore in every instance contaminate the whole mass of circulating fluids. That an action so deleterious to the system should uniformly accompany the formation of every venereal sore, is highly improbable; and if it were so, a bubo ought to be one of the earliest accompaniments of chancre. But during the ulcerative stage of chancre, the glands in the groin usually remain free from infection: it is when the ulcerative stage is at an end that the gland enlarges and bubo forms. In other words, when the absorbents are most actively engaged in producing the ulcer, and in carrying the poisoned mass into the gland, the latter exhibits no sign of irritation; but when the absorbents are inactive the gland begins to enlarge. It is a fact which every surgeon can bring to his mind, that during the most active stage of phagedænic venereal sores on the penis, a gland rarely enlarges, and that bubo is only to be apprehended during the granulating stage of chancre.

Ulcers of all kinds, if closely watched in their formation, clearly exhibit the breaking up of the tissue, and its gradual conversion into pus. In the earliest stage of an ulcer, before the vesicle has burst or the skin given way, the extent of substance lost is always compensated for by the amount of fluid formed. In its progress, when rapid, and when a

large portion of structure is quickly destroyed by ulceration, a corresponding quantity of pus may be always seen to occupy its place; and when the action is more chronic, as in fibrous structures, the debris of the tissue can be seen mixed with the purulent fluid. The same process can also be seen in its several stages in the separation of a dead from a living part, in the formation of "the white line of separation." This "white line" is usually regarded and described as an adhesive process, formed for the purpose of absorbing the margin of the living texture that adjoins the dead part, and thus casting off the latter. But it will be found to be analogous in all respects to what takes place in the suppurative process that attends the commencement of an abscess. The white line is an effusion of the fibrinous or coagulating part of the blood, which in part assists in sealing the blood-vessels, and afterwards in forming granulations, and in part softens down and effects the separation of the gangrenous mass. Observation of this process will prove that this, like others that have been improperly attributed to absorption, is an act in which the absorbents do not take a part.

A carious tooth is a familiar example of ulceration. The breaking up of the bony part of a tooth is a living action, analogous to that by which ulcers of soft parts are formed: the gradual destruction of its texture may be observed, from its first change to its complete degeneration. That it is a living action may be also inferred from the circumstance that no

such change has been observed in a tooth, after its removal from the body. Dead teeth do not decay.

I had lately a remarkable opportunity of examining this process in suppuration of muscular fibre. A man was admitted into the hospital labouring under symptoms of fever, and affected with violent tetanic spasms of the muscles of the extremities and back. On examination after death, numerous collections of pus were discovered in those muscles that were affected during life. The pus was not found in the interstitial cellular tissue, as it is in ordinary abscess, but in the midst of degenerated muscular fibre. In the longissimus dorsi muscle I found several collections, varying in size from a pea to a filbert, consisting of a yellowish-red pus, and surrounded on all sides by the truncated ends of muscular fibre in a state of ulceration. The cyst that forms the parietes of a common abscess was wanting; the loose end of each muscular fibre that floated in the pus looked yellowish, and was softening at its extremity into a similar coloured opaque pultaceous mass. In tracing the fibre from where it was healthy into the depôt, it presented traces of regular degeneration, gradually losing the appearance and consistence of muscle, until it acquired, at the loose extremity, all the appearance of the pus in which it terminated.

It is difficult to explain or to reconcile the action of some remedies with the supposition of absorption

being concerned in ulceration. One of the most powerful remedies that we possess, and that exerts a remarkable control over the ulcerative process, is iodine. The most active phagedænic ulcers, that threaten the destruction of parts, are often found to yield in a surprising manner to the influence of this medicine, and to put on a healthy granulating appearance. And yet iodine is thought to act powerfully in increasing the action of the absorbents; tumours of considerable size often yielding to its action and becoming absorbed. How is it, that in the healing of an ulcer it checks and puts a stop to the absorbing process, and in the case of a tumour quickens the action of the absorbents and gets rid of the mass? Here are two actions of a remedy opposed to each other, and inexplicable so long as ulceration is regarded in the light of absorption. In the same person, and often on the same limb, we see the beneficial effects of iodine in the arrest of a spreading cachectic ulcer, and the absorption of a venereal node or periosteal effusion; two actions that present a paradox to those who view ulceration as effected through the agency of the absorbents. But the action of this and other remedies that arrest the progress of ulceration, is effected through another medium than the absorbents; it would seem to depend on some additional nervous or vital power imparted to the ulcerating surface, by which its vital energies are reinforced, and which enabled it to resist those repulsive forces that tend to disorganize it.

As the disposition to ulceration accompanies inflammation in persons whose constitutions are morbidly irritable, or in whom action is joined with debility, the effect of local applications, as well as of internal remedies, is more easily understood under this view of the process. The action of argenti nitras in healing an ulcer of the cornea affords an illustration in point. The breaking up of the texture of the tunica adnata and anterior laminæ of the cornea occurs in weak scrofulous children; the application of the nitrate of silver destroys the surface which is in a state of impending disorganization, and by imparting a healthy energy or stimulus to the other parts of the ulcer, checks the ulcerative disposition, and brings the ulcer into a healing state. Such is the mode of action, probably, by which local remedies generally stop the destructive progress of an ulcer.

I have given this general view of the ulcerative process, as it was necessary in order to render clear the real nature of the action, as it occurs in joints, and to make intelligible the distinction which exists between the act of absorption and that of ulceration. The purport of my former observations on this subject, was to illustrate the mode in which nature effects the absorption of articular cartilage in some forms of disease, but especially in that chronic form of action usually regarded as strumous. My present object is to point out the difference between this mode of

removing the cartilage, and the ulcerative or destructive process.

The distinction is one that cannot fail to strike the pathologist. The one is a repairing process, established with a view to the ultimate ankylosis of the joint, and by an efficient provision to prevent an inflammatory process that would otherwise end in ulceration and suppuration. A membrane is gradually developed, by the agency of which the cartilage is absorbed, and which afterwards becomes the medium of ankylosis; thus the destruction of the joint is often prevented.

But ulceration of the cartilage is effected in the same manner as an ulcer is formed in soft parts; it is a destructive action that sooner or later is followed by suppuration of the joint. It commences in the structure of the cartilage itself, which, no longer under the influence of those forces that unite its integral parts, breaks up and becomes converted into a purulent mass, which mixing with the synovia of the joint, irritates the synovial membrane to inflammation, and ultimately to suppuration and ulceration.

Ulceration of cartilage, however, as a primary disease, is a much less frequent occurrence than absorption through the intervention of the membrane, described in my former observations on this subject. I do not remember to have examined a joint, that had been the subject of ordinary chronic inflammation,

in which this membrane was not found more or less developed. Nor have I seen an instance of chronic inflammation in the early stage of strumous disease, in which degeneration or ulceration of the cartilage existed as the primary action.

Chronic inflammation, however, after existing for many months or years in strumous subjects, may, and often does, become acute, and ulceration sometimes in such cases supersedes the absorbing process, and abscess rapidly forms. When such a joint is examined, the whole cavity is found to present the appearances (described in my former paper) accompanying the development of the membrane, and in one or more points signs of recent acute action are visible, in which, instead of a membrane being formed, the cartilage is found ulcerated or broken up, giving rise to abscess, and often to the necessity of amputation.

Nature endeavours so long as she can to remove the cartilage by absorption, in order to prevent the necessity of suppuration. For primary ulceration of cartilage leads to the formation of abscess. The breaking up of the tissue of the cartilage is equivalent to the suppurative process in softer tissues; it creates a product that must be got rid of; the synovial membrane is irritated, and ulceration with abscess is the result. In absorption of the cartilage through the intervention of the membrane, suppuration is not a necessary attendant, and we sometimes find the

whole process completed without abscess. But where the membrane is wanting, the process is analogous to the degeneration of soft parts, and is sooner or later followed by suppuration.

It is not intended to imply that every ulcerative process is uniformly followed by abscess. For in the instance of the cornea, ulceration sometimes takes place on its inner surface, and the products of the ulcerative process mixing with the mass of aqueous humour become so far diluted that they scarcely irritate the lining membrane of the anterior chamber. And it may possibly happen, that the same exception may take place in joints, and that the debris of the cartilage, reduced by long action to a perfectly homogeneous fluid, may mix with the synovial fluid of the cavity, and, producing no irritation, may be absorbed. The analogy, however, between the anterior chamber of the eye and other cavities will not strictly hold, as the former is the only cavity constantly distended with fluid, and therefore offers more than any other cavity the opportunity of the product of ulceration being absorbed.

The diseases in which the texture of the cartilage primarily undergoes ulceration, are, for the most part, acute from their commencement. The inflammation that follows wounds of joints often leads to the rapid ulceration of the cartilage and to burrowing abscess. In these cases the cartilage is found often to be extensively destroyed, and the bone laid bare without

any appearance of a membrane for the purpose of absorption. The remaining cartilage sometimes exhibits different stages of approaching disorganization; in some parts retaining its natural form, consistence, and appearance, in others being soft and spongy or even pulpy; and in those parts most advanced towards ulceration the fibre of the cartilage can be seen to separate, and flakes here and there appear to be almost detached. In the knee joint, under these circumstances, while the larger part of the joint presents the most extensive disorganization, the edge of the patella and femur occasionally shew the commencement of the absorbing process, which, as the inflammation increased, seems to have been superseded by the ulcerative.

The chronic inflammation of the synovial membrane, attended with absorption of the cartilage, not unfrequently becomes acute from accidental causes, and leading to ulceration quickly disorganizes the joint. Both ulceration and absorption may here be seen to operate. In some parts may be seen the membrane adhering to the cartilage or to the denuded bone, in various degrees of activity or vascularity, according as its office is completed or in progress; and in others, a total loss of the cartilage may be observed without the development of a membrane. It is not unusual for one half of a knee joint to be losing its cartilage by absorption, while, by a process of inflammation subsequently excited, the other is in a state of active ulceration. On one side the cartilage is furnished with the absorbing membrane,

which sometimes spreads over the whole of that side of the cavity, and protects it from the devastating process of ulceration that is at work on the other side of the joint, which is filled with pus and the remains of the disorganized cartilage. In persons who have become extremely irritable and weak, the ulcerative action is so determined, that the membrane itself is sometimes found in a state of ulceration.

The same process of degeneration may be also observed in the chronic affection of the semilunar cartilages of the knee joint, especially when they happen to be the incipient seat of disease. The softening of the fibro-cartilaginous texture and its gradual conversion into a puriform mass may be observed in every stage. I have seen instances of this form of disease in which the action appeared for a long time to be confined to one of the articular cartilages, which was breaking up; while chronic inflammation was gradually extending to the neighbouring parts of the joint, and the vascular membrane could be seen beautifully extending itself on the adjoining cartilage of the condyle of the femur, for the purpose of defending it from the dangers of threatening ulceration.

Another form of inflammation that is attended with the primary ulceration of cartilage, is that which occurs in very cachectic subjects, and assumes the character of acute rheumatism. It often supervenes on subacute abscesses in different parts of the body, and is therefore most usually met with in those whose

systems have been kept in a state of continued excitement, and whose constitutions have been reduced by excesses. It attacks more than one joint, and is to be distinguished from common rheumatic inflammation by the peculiar state of the patient's constitution, and the disposition to degeneration of tissue evinced in the previous occurrence of several successive abscesses. The joint is much swollen and distended with fluid, exquisitely sensitive when touched, and sometimes opens by ulceration and discharges its contents. Or if the action does not proceed so far, the cavity is found on examination to be filled with an opaque synovial fluid, and the cartilage presents one or more spots of ulceration.

In stating my view of the two modes in which articular cartilage is removed under disease, I have advanced doctrines opposed to those of Mr. Hunter, and in some points at variance with the opinions of Sir Benjamin Brodie. To differ from so high an authority as the one, and so distinguished a pathologist as the other, will naturally subject my opinions to all the severity of criticism, and to a suspicion, perhaps, of their unsoundness. I have stated, however, nothing but what a long course of observation joined to ample opportunities has forced on my attention; whether they are the true exposition of the processes of nature, time, the only test of truth, will decide.