

THE TREATMENT OF WOUNDS AS BASED ON EVOLUTIONARY LAWS

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The Treatment of Wounds as Based on Evolutionary Laws by C. Pitfield Mitchell

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C. PITFIELD MITCHELL

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PREFACE.

THE argument as here submitted to the judgment of my *confrères* was originally intended for contribution to periodical literature. The widely felt interest in the standpoint from which the discussion is conducted, and the pressing necessity for a scientific settlement of the questions involved, are chief among the considerations that have urged me to make the paper obtainable in this form.

C. P. M.

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THE
TREATMENT OF WOUNDS AS BASED
ON EVOLUTIONARY LAWS.

IN a short essay published in the *New York Medical Journal* for September, 1882, I endeavored to find in the Spencerian doctrine of evolution the foundation of a satisfactory theory to guide us in the treatment of such wounds as are inflicted in the more common operations of surgery.

That a further development is needed of this important branch of the surgeon's art is sufficiently attested by the declining popularity of the system introduced by Prof. Lister, and by the daily acceptance and abandonment of "new antiseptics" and "methods."

When there is absent any approach to unanimity either additional data are wanted or a better co-ordination is required of those already ascertained. In the present instance there are adequate reasons for suspecting a want rather of the latter kind. That the only desideratum is an amplification of facts is very improbable of phenomena so common, so accessible to observation, and so obtrusive by their bearing on immediate human interests as those concerned in the healing of wounds. Any attempt, therefore, to bring into relation with one another and with established laws those truths which experience has demonstrated may be approved for its seasonableness.

In the article referred to, I strove to effect in part this

affiliation, and I propose now to take up the argument afresh, for two reasons: the application to practice of the principles advanced is not there considered with that fulness demanded by the general interest and importance of this aspect of the subject; and since the essay was published decisive evidence has appeared supporting its capital conclusions.

Let us begin with a statement of these conclusions, then examine their credentials, and, finally, considering them as guides to practice, suggest a conforming treatment.

Inasmuch as the ensuing discussion will be occupied only with a special class of wounds, and the functional relations of the tissues to the *outer* environment, the reader is asked to carry with him the understanding that the argument at all times refers to cases in which the following conditions are constants:—the vitality of the tissues is normal, and no defect is present in the means for maintaining this vitality, *i. e.*, there is no defect either of quantity or quality of the material exchanges required for life and the function of repair—the *inner* environment is natural. The destruction of anatomical elements is supposed to be limited to the immediate effects of the primary injury—as in the case of a simple incised wound caused by the surgeon's knife. The remaining conditions, hygienic and other—it would be superfluous to specify them—are such as would be customarily considered auspicious for healing by direct union.

It will be recognized that the totality of conditions enumerated above are those obtaining in practice in a large majority of surgically-inflicted wounds.

The laws of natural selection, adaptation, and heredity, enable us to predicate the following categorical truths of the changes of function and structure required for the union of wounds: that such changes are essentially physiological, and adaptations of the organism to its conditions; that wounded tissues open to the external investing forces are naturally adapted to an average atmosphere, if the consecutive physiological processes have not been converted into pathological processes; that such tissues are not naturally adapted to outer

forces of adventitious origin—dirt, chemical and mechanical agents used in surgical practice—hence these forces tend to be perturbative of those co-ordinated chemical and physical actions by which cicatricial tissue is wrought; and, lastly, that the juices exuding in consequence of the solution of continuity are endowed with a specialized function—the protection of the cells they cover from injurious agencies.

The statement that reparative processes are essentially physiological might be taken as conceded, were it not that much modern practice still tacitly asserts the contrary.

The use of exorcising dressings implies a misconception as to the very nature of the vital operations we are considering. This misconception arises from mentally fusing the integrative and disintegrative actions which go on in wounds, and from failing to clearly perceive the causative phenomena—internal in the organism and external in the environment—to which these actions must invariably stand related.

The distinctions are most easily made in the little-complicated cases of incised wounds healing by first intention under normal—not factitious—conditions. The *disintegration* of tissue is here directly caused by the force which divides the histological particles, and ceases with the closure of vessels. With the glazing of the exudative plasma—the wound is open to the atmosphere—the *integrative* stage begins, and, if the surfaces lie in apposition, union results without further functional or structural disorder. It is extremely important to seize the fact thus brought out that, in the absence of perturbations other than the primary mechanical one, the series of changes setting in with the drying of the plasma are a series of *physiological* changes.

The vital forces by which this union is accomplished may, as elsewhere shown,* be usefully regarded as extrinsic functions of the injured parts, made permanent in the course of evolution, and mainly physical consequences of the newly-imposed conditions.

* An Evolution Aspect of the Healing of Wounds, New York Medical Journal, September, 1882.

In wounds where the sequence of changes thus outlined is broken by purulent discharges, sloughing, and the formation of granulations, there is in every case a corresponding break in the sequence of incident forces. These correspondences we shall discuss particularly later on. The object now is to clarify ideas as to the nature of the changes thus determined. In this endeavor we shall be aided by conceiving them as fulfillments of the laws of organic evolution and dissolution.

The first law formulates the progressive integration, the passage from homogeneity to heterogeneity, from simplicity to complexity, and from generality to speciality of function and structure.

The second law expresses the reverse process, the disintegration of function and structure, the passage from heterogeneity to homogeneity, from complexity to simplicity, and from speciality to generality. Though not co-extensive, the changes in the one case are physiological, in the other pathological.

Plainly, reparative processes in wounds conform to the law of evolution, beginning with an effusion of simple, undifferentiated, generalized plasma, there are developed indifferent cells, and finally relatively complex and specialized vascular, granulation, and connective tissues and functions and structures are reintegrated.*

The law of dissolution † is exemplified in sloughing and supuration; the specialized, complex, multiform cells constituting combined structures, are converted, under the influence of disorganizing forces, to relatively general, simple, uniform pus or slough, and structures and functions are disintegrated. Doubtless from the frequent co-existence in wounds of these

* In the organization of cicatricial tissue the exudative plasma appears to serve a mechanical purpose; the embryonic vessels and connective tissue cells are said to develop in its fibrinous meshes like plants upon a trellis. On Sponge Grafting, by D. J. Hamilton, M.B., F. R.S.E., *Edinburgh Medical Journal*, November, 1881.

† Other illustrations from pathology of the law of dissolution may be found in *Diseases of the Nervous System*, by James Ross, M.D., vols. i. and ii., in the writings of Dr. Hughlings-Jackson, and in an article reprinted from the *Medical Times and Gazette* in the *Popular Science Monthly*, March, 1883.

two orders of changes, we have come to regard them as in some way co-operative. But by no sort of modification can an analytical process be concurrent with a synthetical process; to the extent that there is suppuration there is either arrest of normal function—in the present case reparative action—or, the functional derangement being carried further, disintegration and death of tissue; and if there is subsequent restoration of function and structure, the forces concerned reside in the uninjured parts.*

Thus rendered, the foregoing laws help, I think, to give definiteness to our views of the particular changes engaging our attention. That they state, in a very generalized form, real phases of these changes might be further shown by expanding the illustrations dynamically. It might be made evident, on the one hand, that with the integration of matter—development of tissue—there is a concomitant dissipation of motion; and, on the other hand, that with the disintegration of matter—dissolution of tissue—there is a concomitant absorption of motion; † organic evolution displaying an increase in the relative movements of wholes and a decrease in the relative movements of parts, and dissolution the reverse; a retrocession “from the motions of large masses to the motions of smaller masses, and from the motions of smaller masses to the motions of compound molecules, and from the motions of compound molecules to the motions of simple molecules.” But expatiation beyond this—not necessary for us—would imperil the coherence of our argument. We may, however, pause for a moment to mark that when the sequent phenomena formulated as the law of organic dissolution are taken as a *revolution* of the sequences formulated as the law of organic

* A study of the intimate phenomena of inflammation leads Dr. Burdon Sanderson to insist “that the resolution of an inflammation means either that the temporarily arrested processes of normal life simply go on again, or, if the process have proceeded to its ultimate issue—death of the affected part—and what has been destroyed has to be repaired, not (as we used to think) by a continuation of the morbid process, but simply by the restitution of the normal condition.” Lumleian Lectures on Inflammation, 1883.

† See Spencer's First Principles.