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THE CLASSIFICATION OF TUMORS

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THE great variety of tumors makes their classification difficult. No method hitherto suggested can be said to meet all the requirements. The division into simple and malignant, for instance, is convenient, for it furnishes a good working rule in practice, where an opinion to be of any value must be dogmatic, but as a classification it cannot be upheld. There is no such thing as a separate class of malignant growths. No hard and fast line can be drawn between them and other growths. Malignancy is an occasional feature of all classes of tumors, even of those that enjoy the best reputation; and it is not uncommon for a tumor, to all appearance non-malignant, to increase slowly in size for years, or even to remain stationary for a time, and then suddenly to change its character and destroy life in the course of a few months. Nor is there any fixed standard of malignancy. It varies in degree even among tumors that appear to be alike. Malignancy is a clinical feature, and clinical features do not provide a good basis for the classification of pathological growths.

Classification by structure promises better. Broad general lines can be drawn and many groups of tumors can be separated from the rest. In other instances, however, the structural details are so varied and complex that general agreement seems to be almost impossible. Classification by origin is better still. Unhappily, however, the basis usually chosen, the three germinal layers of the embryo, is not sufficiently exact. The layers are not all of equal value, and they do not remain distinct from each other, so that it is often impossible to be certain to which of them a particular growth should be assigned.

Tumors, using the word in its ordinary acceptation, are divided into two classes: One is due to the reproductive power that all tissues naturally possess being suddenly roused into action. The other to changes that should take place in the course of development not being

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efficiently carried out. It is not impossible that there is one and the same cause underlying both of these.

I. TUMORS DUE TO THE REPRODUCTIVE POWER OF THE TISSUES

The power of reproducing their like, directly, without assistance from any other source, is the common property of all living things and of all their parts. It belongs to them as their birthright, in the same way as the power of growth, for reproduction is only growth beyond the individual; and it remains with them throughout their lives. The extent to which they make use of this power furnishes the most satisfactory basis for the classification of the tissues and of the tumors that grow from them.

The Division into Germ Cells and Somatic Cells.—In the most primitive forms of life, before there is any division of labor, every part of the organism can give birth to buds capable of growing into organisms like the parent. With the advance of organization different duties have to be assigned to different portions of the body, and because the existence of the race depends upon it, the first to be assigned in this way is the function of reproduction. At a very early period one group of cells is marked off for this special object and becomes the germ organ. Henceforth the whole reproductive power of the organism is centred in this. The cells that compose it are the only ones that give birth to buds capable of growing into perfect organisms like the parent.

The rest of the cells, known as somatic cells, have an entirely different duty. They have to carry out the different kinds of work upon which the life and well-being of the individual depend. They are no longer concerned with reproduction. So long as conditions are normal they are never called upon for this, and as they become specialized for other kinds of work, they gradually lose the capacity of carrying it out. The progressive deterioration of their reproductive power is shown as well in the evolution of the race as in the development of the individual. In the earliest days the somatic cells, like the germ cells, can give birth to buds capable of growing into perfect organisms. In the ova of some of the echinodermata, for example, the somatic cells and the germ cells can be displaced artificially, and each will then undertake the functions of the other. Later the somatic cells are only able to reproduce portions of the body, such as limbs, as in the crustacea, and simple organs. Later still, this is beyond them. The only structures they can reproduce, even in embryonic life, when their powers are so much more active, are tissues like their own, and as specialization advances even this fails them.

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Their power becomes so limited that only the simplest kinds of tissue can be reproduced at all.

This division into germ and somatic cells, founded upon the use they make of their reproductive power, is the primary division of the organism. On it is based the classification of the tissues and of the tumors that grow from them. One class of tumors grows from tissues in which the reproductive power has been raised to the greatest perfection. The other from tissues which originally possessed this power in equal measure, but which never make use of it, so long as conditions remain normal, and therefore gradually lose the capacity of using it.

The characteristic feature of all these tumors, that which distinguishes them from others and from the structures among which they lie, is their independence. They are not able to support themselves, it is true, but their life is distinct from the life of the structure from which they grow. If transplanted to another host, so that they can get supplies equally well, they continue to grow and thrive long after the original parent is dead. They live upon the parent, like a parasite upon its host, drawing all they want from it, doing nothing for it in return, and in certain instances draining it of all its strength until it dies of starvation. These tumors are the offspring of the tissues from which they grow, and belong, not to the same generation, but to the next.

The first beginning of these tumors is in the form of a bud growing out from tissues that are apparently normal. They may develop into organisms almost as perfect as the one from which they grew; or into structures composed of well-formed tissues; or into mere masses of cells heaped together without order or arrangement. Which of these forms the tumor takes (or, in other words, the degree of organization of which the tumor bud is capable) depends upon the stage in the life history of the race that the parent cells had reached at the moment that the bud began to grow. The individual is the epitome of the race. Each cell as it develops passes through all the stages through which its ancestors passed in the course of evolution, and any bud that is given off by the parent cell before it has reached its final form possesses the same powers that the corresponding ancestor possessed in days gone by. The bud that grows from the cells of the early embryo, like those that grow from the tissues of lowly organized forms of animal life, is able to reproduce the organism, more or less perfectly, while that which is given off late in adult life is limited to the production of a growth composed of simple tissues.

The structure of a tumor depends upon that of the parent stem.

It is never so perfect but there is always a general resemblance. The character of the tumor, whether it is malignant or not, depends upon the maturity of the parent cell at the moment the bud began to grow. These tumors may assume many different forms—a form that grows fast, or a form that grows slowly; a form that remains circumscribed and limited, or a form that retains its embryonic characteristics, spreads in all directions and invades other organs. If the parent cell when it gives off the bud is still in the actively growing embryonic stage, the bud will be embryonic too. If it has already reached adult age, the bud will increase in size with proportionate slowness, and push surrounding structures to one side instead of invading them. Every organ and every tissue has its own kind of tumor which resembles it in structure more or less, but which according to the degree of maturity attained by the parent cell, at the moment of its birth, may be benign or malignant, or benign first and malignant afterward, or so evenly balanced between the two that it is impossible to say whether it is one or the other. There is no separate class of malignant tumors; rapidly growing malignant forms occur in all classes.

(a) *Tumors of the Germ Organ and Its Derivatives.*—Nearly all of these spring from the germ organ or the ovary. They rarely grow from the testis, at any rate after the sperm cells are developed, probably because of the high degree of specialization they have attained. It is not possible to arrange these tumors in classes. They form a series almost without a break, ranging from included foetus at one end to ovarian adenomata, mere heaped-up masses of epithelial cells, at the other.

Included foetus: In the earliest days of existence the reproductive power of the germ cells is only paralleled by that of the most primitive organisms. Like these the germ cells can give off buds capable of growing into organisms almost as elaborate as the parent one. Tumors of this kind are known as included foetus. They grow from the germ cells before the generative organs are differentiated and occur therefore in both sexes. As a rule, they are met with in the genital area. They may, however, occur in distant parts of the body and then they are due either to the accidental displacement of some of the cells of the germ organ in the course of development, or to the fact that some of the somatic cells have been stimulated into excessive action before their latent reproductive power has lost any of its primitive vigor.

Internal teratomata: As the power of direct reproduction diminishes in the course of racial evolution, leaving traces of what it once could

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do here and there (as where, for instance, generations of certain insects are produced for a time asexually), so too it diminishes in the course of the evolution of the individual. Buds given off by the germ cells in the earliest moments of individual existence grow into structures almost as perfect as the parent. Those formed later, known as internal teratomata, are far less complete. They may be made up of organs presenting a general resemblance to those of the parent, but their structure is imperfect; there is no order in their arrangement, and they are quite unlike anything else in shape and outline.

Ovarian dermoids and ovarian adenomata: No hard and fast line can be drawn between internal teratomata and these, which undoubtedly originate from the reproductive power of unfertilized ova, roused into action by some stimulus. There is one long unbroken series of tumors, arising by direct reproduction, first from the germ organ and then from the ovary, ranging from the most complex, produced in the earliest moments of individual existence, to the simplest, which often do not make their appearance until old age.

(b) *Tumors that Grow from Somatic Cells.*—There is no difference between germ and somatic cells at first. Their power of direct reproduction is practically equal. In certain circumstances one group can be made to replace the other and undertake all its duties, and it is possible that some of the complex tumors met with in distant parts of the body, which are usually said to arise from displaced cells of the primitive germ organ, are really due to the still intact reproductive power of somatic cells. The direct reproductive power of the somatic cells, however, very soon falls away as they devote themselves to other duties, and with the possible exception of those I have just mentioned, no tumor bud that grows from somatic cells ever attains a high standard of organization. They may be formed of tissues, more or less well developed, heaped together with a certain amount of order or arrangement, but they are never made up of structures such as organs.

The classification of the tumors that grow from the somatic cells depends upon the classification that is adopted for the tissues themselves. Every tissue has its own kind of tumor, just as it has its own kind of structure. However much one tumor resembles others in general arrangement, it differs from them just as the parent organ differs from the rest. Under the term adenoma, for example, are included all tumors built up on the lines of glandular tissue; but those that grow from the parotid gland are as different from those that grow from the mammary gland as one organ is from the other. So it is with fibromata, lipomata, epitheliomata, and many others. They have

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certain general features in common, like the cells from which they grow; but those that grow in one part of the body behave quite differently from those that grow in another, even though we may not be able to detect any difference in their structure; and tumors that grow from such organs as the thyroid and prostate are so different from all others, that they can scarcely be brought into the same scheme of classification. Every organ and every tissue has its own kind of tumor.

2. TUMORS DUE TO ERRORS OF DEVELOPMENT

These differ from the tumors caused by the sudden awakening of the reproductive power of the tissues in that they do not possess an independent existence, and that they belong to the same generation as the structure from which they grow, and not to the next.

Irregularities of development may lead to tumors of various kinds, such as inclusion dermoids, but the most important are those that result from its premature arrest.

Development implies not only the progressive advance of tissues that are of use, but also the recession and disappearance of those that have ceased to be of use. It involves not only evolutionary changes, but involutionary ones too. Arrest of either of these may lead to the formation of tumors.

The ordinary meningocele is an instance of the former. The medullary groove fails to close at the proper time, leaving an unprotected place on what will become the outer wall of the organism. As size increases and the tissue pressure with it, this weak place is forced to yield, and the body covering is gradually pushed out farther and farther until at last it forms a cystic tumor the covering of which is the everted floor of the medullary groove.

Instances of the latter are more common. There are many organs present in early life, of which no trace is to be found in later years, and many more of which some small portion only persists because it has been possible to adapt it to other purposes. Disappearance of structures that are no longer of use is part of the normal development of the body. If development is arrested these structures persist. Sometimes they remain stationary and do no harm; but they may continue to increase in size in proportion as the body increases, and to work after a fashion, and then they may grow into the most formidable tumors. Cysts developed from the remains of the hyolingual duct or the Wolffian or Mullerian ducts may not be serious, but those developed in the coccygeal region, in connection with the postanal gut, often lead to the gravest consequences.