

allusion was made to the ordinary furuncle as the mildest form of this affection. In prognosis the same relation holds true. The furuncle is superficial in location, runs its course without fever, and is uniformly followed by rapid recovery, leaving a small cicatrix, which is usually but slightly depressed below the level of the surrounding skin. The prognosis of carbuncle, however, depends upon three factors, viz.: the age and vigor of the patient; the gravity of the constitutional symptoms, the amount of pain, etc., and the degree of interference with the process of alimentation; and the situation and extent of the local disease and the degree to which gangrene of the skin or sloughing of the deeper tissues occurs.

Death may occur from exhaustion, or from the development of secondary abscesses in the vicinity of the original carbuncle, especially if these take a phlegmonous course. A fatal issue also results in some cases from profound depression of the vital powers, apparently due to the absorption of the toxic poison of the disease. Hemorrhage and embolism have also been the cause of death in carbuncle. When the disease is situated on the neck or scalp, septic meningitis has not infrequently been a fatal complication.

When the carbuncle is situated upon the neck it may produce dyspnea by pressure upon the air passages; when it is located upon the chest or abdomen the pleura or peritoneum may become inflamed; when upon the face, distortion of the features may ensue; and when situated upon the scalp it may be followed by meningitis.

TREATMENT.—Carbuncle is believed to arise from an infection of the skin and subjacent tissues by a definite bacillary organism, and is accompanied by a depraved condition of the general health; and therefore the first indication would be to restore as far as possible the normal vigor of the system and to bring about a better nutrition of the body. Some of the most celebrated authorities recommend the employment of active emetics, followed by cathartics, for the purpose of increasing the eliminative function of the digestive canal, and possibly, also, as a means of derivative action upon the seat of the disease by assisting in the removal of the toxins produced by the bacillus. When we consider, however, that the patient with carbuncle is generally already in a state of impaired vigor, any active depletory measures should either be entirely abstained from or should be adopted with great caution, lest they induce a dangerous degree of exhaustion or be followed by sudden collapse.

A careful regulation of the food, in regard both to quality and to quantity, is generally necessary, and at the same time active tonics and stimulants must be administered. The distress is frequently so great as to require the use of anodynes, and often the degree of febrile reaction is an indication for the employment of large doses of quinine. Cod-liver oil has also been found useful. If rapid exhaustion supervenes, the administration of champagne has sometimes been followed by great benefit. When convalescence is established, iron should be given, a generous and strengthening diet should be ordered, and, if possible, sea bathing or a change of climate and surroundings should be advised.

Locally, the treatment must depend much upon the symptoms belonging to each particular case. At times the application of cold is of great service in relieving the pain and modifying the severity of the inflammation, but generally hot and moist applications are most comfortable to the patient. These may consist of simple hot compresses, but the most common mode of treatment is by means of large poultices which should be frequently changed. At times the local abstraction of blood by means of leeches affords temporary relief, but the bleeding is liable to be excessive in amount, and may induce a condition of collapse.

The surgical treatment of carbuncle should have for its object the liberation of the sloughing tissue in the centre of the carbuncle, and the free exposure of all suppurating parts. For this purpose many methods of procedure have been advised, such as the circular incision around the base of the carbuncle; the cauterization of the

summit of the swelling by means of potash or ferrum candens; the crucial incision of the entire carbuncle, the subcutaneous stellar incision through its substance; and the treatment by compression of the entire carbuncle; or of its peripheral portions, by means of firm or elastic bandages.

All operative measures should be carried out with the strictest attention to antiseptic precautions. The seat of the disease should be previously rendered as nearly aseptic as possible.

The treatment by circular incision consists in cutting a channel quite around the base of the carbuncle, so as to divide the skin and the superficial blood-vessels, and has for its object the diminution of the vascular supply, with the result of relieving the tension and reducing the febrile action in the part, and thus modifying the severity of the process and hastening the recovery. It is more especially to be employed in the early stages of the disease before gangrene has occurred, and while the central slough may yet be quite small.

The application of caustic potash or the hot iron to the summit of the carbuncle has the aim to provide a path for the release of the sloughing centre of the diseased part, and at the same time to avoid the unnecessary loss of blood from hemorrhage. The tissue to which the cautery is applied is destroyed without bleeding, and the interior of the carbuncle is rendered accessible to direct treatment. This mode of treatment is not often employed, as it is painful in its action and the resulting benefit is not greater than that from other and less distressing methods. During the last few years the antiseptic treatment has superseded all other forms. In cases of great debility or in aged patients, as well as in mild forms of carbuncle, the use of carbolic acid in dilute solution, either as a lotion or on compresses as a poultice, is of service.

The crucial incision of the entire carbuncle from base to summit is doubtless the most useful and effectual manner of exposing the interior of the swelling to view, and of liberating the sloughing centre in the most rapid manner. When the operation is completed the carbuncle presents four deep incisions radiating from the centre to the periphery. By this means the whole interior of the diseased part is made accessible to direct treatment and the most favorable conditions for rapid and complete recovery are at once established. The incision of the skin over the inflamed part, however, may be attended with a considerable loss of blood, which in the debilitated condition of many of the subjects of this disease is of no small importance. To obviate this, and thus to save the strength of the patient, the method of subcutaneous stellar incision has been adopted in many cases of extensive carbuncle.

This mode of treatment consists in the internal division of the seat of disease into many small sections, and has for its object the rapid and easy evacuation of the sloughing tissues of the centre of the carbuncle and the liberation of purulent matter, with the avoidance of excessive hemorrhage.

In performing this operation the surgeon makes use of a long and narrow knife, which is inserted into the perforated centre of the carbuncle and carried directly to the bottom of the disease. Its point is then directed outward toward the periphery of the carbuncle, and when the external boundary has been reached the edge of the knife is turned toward the skin, and the tissue is carefully cut from below toward the surface. The incision should not be allowed to reach the skin, on account of the bleeding which would ensue, but should comprise all the diseased tissues below the skin. This process should be repeated in all directions until the carbuncle consists of only a superficial covering of sound skin overlying the thoroughly divided and broken-up mass of the carbuncle, which should then be removed by curetting or in some other effective manner. The amount of hemorrhage is usually very slight. If the strength of the patient is not too much reduced, recovery is usually rapid and complete.

Warren maintains that a more radical form of operation should be carried out in many cases. He says: "The most radical treatment consists in total excision of the carbuncle. A circular incision should be made round the edge of the infected portion of the skin, and all the diseased tissues should be removed. The effect is immediate. The fever and delirium disappear and the pain is relieved."

Carbuncle of the lip often causes very grave symptoms. Evacuation of the contents and extirpation of the infected tissues should be carried out, and any simpler mode of treatment is here usually insufficient. This should be done from inside the mouth when possible on account of the diminished scar or deformity thus secured.

The application of heat, preferably by dry or moist compresses, should follow any operative measures. Should the necessity for disinfection arise, this may be accomplished by the use of chlorinated soda, which is preferable to carbolic acid on account of the somewhat greater danger of poisoning by this agent in carbuncle than in ordinary surgery, owing to the more extensive surface for absorption and the age and weakened condition of the patient. If it should become desirable to employ an antiseptic, a solution of mercuric bichloride or some other efficient agent of this nature, of which we now possess a considerable number, may be used in the wound.

The cicatrix following carbuncle is generally more or less depressed, and may at times become so retracted as to produce deformity, and occasionally to interfere with the functional activity of parts or organs (neck, jaw, eyelid, etc.).

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CARCINOMA.—The carcinoma is a tumor which arises from epithelium and is formed of masses of epithelium growing in a connective-tissue stroma. It is further characterized by unlimited local growth and by giving rise to the formation of tumors of a similar structure in other parts of the body. The tumor may arise from the surface epithelium of the exterior of the body, from the epithelium lining the alimentary canal, from that lining the lung, or from the various involutions of epithelium constituting the glands. Tumors having all the characteristics of true carcinoma may also arise in places where no epithelial structures are normally present. Such tumors do not form an exception to the general rule of origin, for they arise from embryonic epithelium which in the course of development has become included in mesodermic tissue and cut off from connection with the epithelial surface. Examples of such tumors are found in carcinoma of the deep tissues of the neck originating from the epithelial remains of the branchial clefts, in carcinoma arising in the walls of dermoid cysts, etc. Tumors having a structure very similar to that of carcinoma may arise from the endothelium of blood and lymphatic vessels. The carcinoma may also arise from the germinal tissue of the ovary and the testicle.

It has long been known that all epithelial surfaces are not equally liable to carcinoma. In general, we find that the tumor is more likely to form about the orifices of the body where skin and mucous membrane come in contact, as in the lips and anus, or where the course of embryonic differentiation has been complicated, as in the lower third of the oesophagus. Carcinoma arising from the glands is particularly apt to occur in those glands which are generally inactive but which have the power of extreme proliferation and functional activity, as the mammary gland and the uterus. In certain places the occurrence of carcinoma is probably to be explained by the action of repeated traumatic stimuli, but the influence of trauma in producing carcinoma as well as other tumors, has probably been greatly overestimated.

On microscopic examination the carcinoma is found to be composed of two kinds of tissue: first, epithelial cells arranged in masses which vary in size and form, and which are enclosed in spaces called alveoli; secondly, connective tissue which surrounds the alveoli and bears the blood-vessels for the nutrition of the cells in the alveoli. This connective tissue is called the stroma. Neither stroma nor blood-vessels penetrate the epithelial masses. Normal epithelial structures show a similar arrangement of tissue, epithelial cells growing in the closest juxta-



FIG. 1117.—Small Carcinoma of Forehead Showing Network of Epithelial Cell Masses Surrounded by Connective-Tissue Stroma. (No. 3 Leitz, without eyepiece.)

position with connective tissue, but the latter never penetrating between the cells. Whether we consider the covering epithelium or the glandular epithelium the arrangement of the tissue is the same.

If, in the normal epithelial structures, the cells at some point begin to multiply and penetrate into the adjoining connective tissue, the structure of carcinoma is produced. The mere proliferation of the epithelium does not produce the carcinoma. Epithelial tissues are the most active of any tissues of the body. Both the covering and the glandular epithelium are constantly used up in the course of their physiological activity, and the loss is as constantly repaired by the formation of new epithelial cells. This power of regeneration is sufficient not only for the ordinary wear and tear of the tissues, but also for the repair of even extensive losses. Furthermore, the epithelium may be excited to greater activity by various means, and large masses of tissue composed principally of epithelium may be produced. Such a growth of epithelium is constantly accompanied by a growth of young connective tissue bearing blood-vessels. An epithelial growth of this character repeats in a general way the structure of the normal tissue and is called typical, but there is no normal prototype for the structure of the carcinoma. The penetration of the connective tissue by the epithelium is atypical. It is possible, however, to have such an atypical growth of epithelium giving the general structure of the carcinoma without the other characteristics which constitute the tumor. When the proliferating epithelium comes in contact with a loose cellular connective tissue, such as is produced by chronic irritative conditions, it may grow down into it, thus constituting an atypical growth. Such conditions are found around the edges of chronic ulcers of the skin and in other conditions. The growth of the epithelium may be very active, but it will extend only to the limits of the altered connective tissue.

When we compare the epithelium in different parts of

the body we find differences in the size and form of the epithelial cells and in their arrangement. These differences are to a certain extent apparent in the carcinomata which arise in different parts, and from the histological examination of the tumor we can say with considerable accuracy from what epithelial tissue it has arisen. From

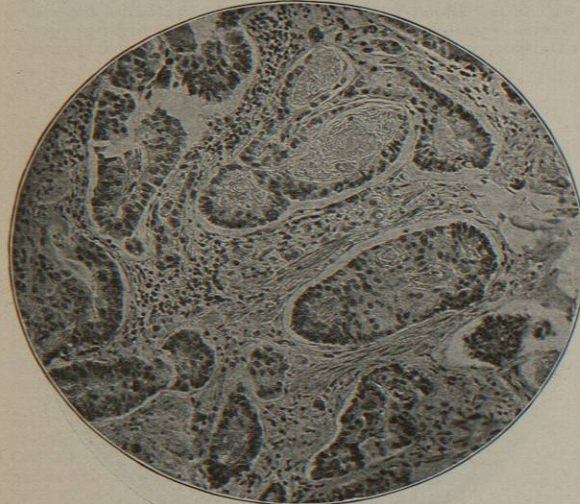


FIG. 1118.—Carcinoma of Stomach, Involving the Submucosa, and Showing Masses of Cells Lying in Spaces Lined with Flat Cells. (8 mm. Zeiss.)

this it is possible to divide the carcinomata into three great classes, originating respectively from squamous, from cylindrical, and from cuboidal glandular epithelium.

To explain the growth of the carcinoma it is necessary to consider the structure of the connective tissue. This is formed of fibres between which there are cells. It carries in it the blood-vessels and lymphatics. The cells lie in spaces in the tissue which communicate with adjoining spaces, and from the enlargement and coalescence of these spaces the lymphatics arise. If the carcinoma begin by the proliferation of epithelium, the new cells not passing to the surface as in a typical growth but into the connective tissue, they must at once enter into this system of communicating spaces and continue to grow in them. Every mass of epithelial cells is within a lymph space in the tissue. It is easy to show this in various ways. The epithelial masses follow the general direction of the lymphatics. In a carcinoma of the skin the most superficial epithelial masses have a general direction perpendicular to the surface, while those lower down are horizontal, corresponding to the course of the lymphatics. By staining the fresh tissue with nitrate of silver and washing out the cells, a lining of endothelial cells similar to that lining the lymphatics can be shown in the alveoli. In hardened sections the cell mass often shrinks away from the wall, and the flat nuclei of the lining cells can be demonstrated.

It will scarcely be possible to give any general description of the epithelial cells constituting the main mass of the tumor. Their resemblance to the normal epithelium from which they have arisen is much more apparent when they are examined in mass than when the single cells are compared. Both the protoplasmic body of the cell and the nuclei are, in general, larger. There is enormous variation in shape due to the pressure to which they have been subjected. Degenerative processes of various kinds are apparent in the protoplasm. Vacuoles filled with fat, or hyaline droplets, are often seen. Various cells, such as polynuclear leucocytes or lymphoid or plasma cells, and even red blood corpuscles, are fre-

quently found enclosed within them. The enclosed cells lie in vacuoles and may be so well preserved that their character may be recognized, or they are only represented by degenerated fragments. There is a marked difference in the character of the nucleus as compared with the normal. It is larger, stains more actively, and is rich in chromatin. The cells often contain several nuclei and may approach the character of giant cells. Occasionally single cells of great size and irregularity of form, containing a single immense nucleus, may be found. If the process of cell division as shown by the nuclear figures be studied the same irregularity is seen. In the place of the simple division into two nuclei the most complicated nuclear figures, showing simultaneous division of the nucleus into a great number of daughter nuclei, may be found. The examination of the single cells shows almost as great a departure from the normal type as does the tumor considered as a whole. All the changes found in the cells are indicative of very active growth. This is necessarily accompanied by degenerations of all sorts, for the closely packed masses of cells cannot obtain sufficient nutrition.

The examination of the masses of epithelium lying in the alveoli shows great variation in size and shape. Serial sections of young tumors, especially those of the skin, show that the epithelium for the most part forms a solid mass ramifying in the connective tissue. In the periphery small epithelial masses may be found which have no connection with the main mass. In the glandular carcinomata the connection between different parts of the epithelial mass exists to some extent, but is not so evident as in the small carcinomata of the skin. Generally there is a sharp separation between the epithelium and the surrounding stroma, but in places it may be difficult to make it out. When the stroma is rich in cells some of these may be very similar to the epithelium, and it is difficult to distinguish the limits of the epithelium when growing into such a cell mass. It is often impossible to distinguish single epithelial cells separated from the main mass and growing between the cells of the stroma. When the growing carcinoma invades a loose connective tissue, the cells penetrate in all directions, growing

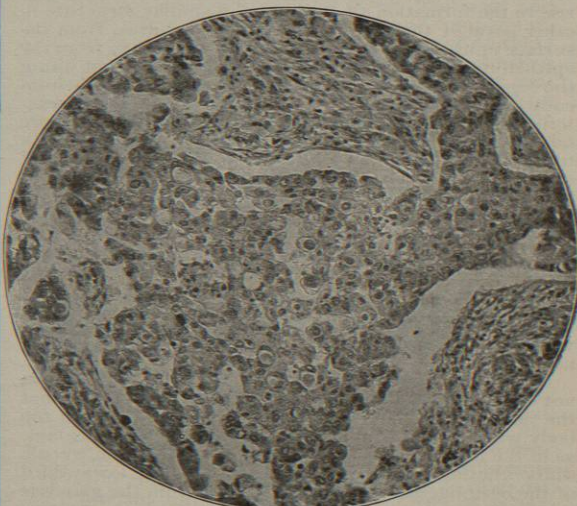


FIG. 1119.—Large Alveolus from a Carcinoma of the Breast with Numerous Cell Inclusions. These inclusions are not to be confounded with the supposed parasites described by Plummer and others. (8 mm. Zeiss.)

without any regularity, and the arrangement into cell masses and stroma may be lost. This is seen in the invasion of muscle. The epithelial cells grow in the

most irregular manner in long rows between the muscular fibres and in the loose connective-tissue septa. It is also seen to a less degree in the invasion of fat, the cells at first growing in the connective-tissue frame-

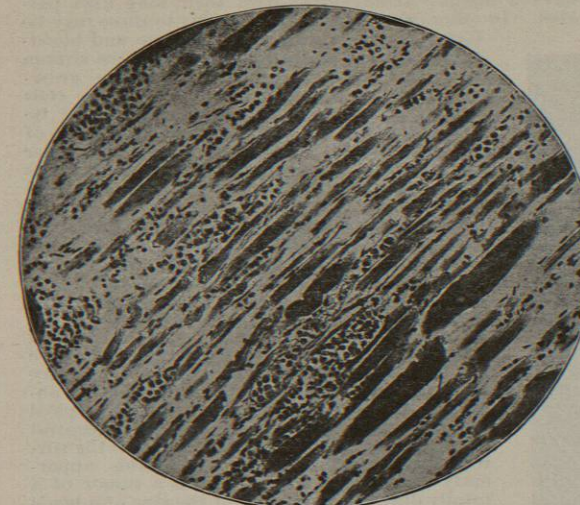


FIG. 1120.—Longitudinal Section of Pectoral Muscle Invaded by Carcinoma of Breast, Showing the Masses of Epithelial Cells Partly Between and Partly Within the Muscular Fibres. The muscular fibres are atrophied and some of them necrotic. (8 mm. Zeiss.)

work between the fat cells and afterward filling up the spaces. The cells of a skin carcinoma have a much greater tendency to adhere together, and there is a much sharper separation into cell masses and stroma, than is the case in the glandular carcinoma. The cell masses vary greatly in size; in some cases they are large with

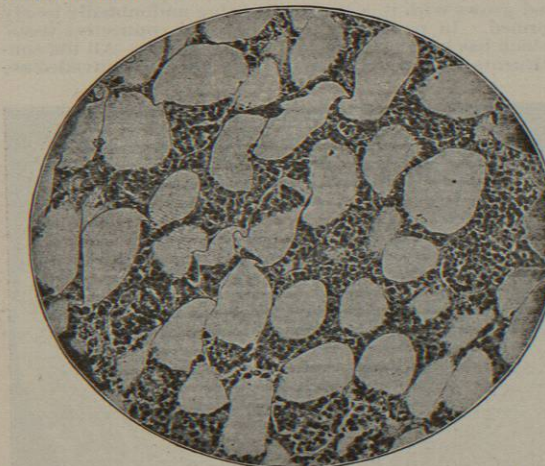


FIG. 1121.

FIGS. 1121 AND 1122.—The Invasion of Fat by Carcinoma of Breast. In Fig. 1121 the Epithelial Cell Masses are Chiefly Between the Fat Cells. In Fig. 1122 the fat has largely disappeared and the spaces are filled by the epithelial cells. (8 mm. Zeiss.)

but little stroma between them, in others they may be reduced to simple rows of cells in a dense stroma. These two forms are known as medullary and scirrhous carcinoma. We may commonly find both types in the same tumor, one or the other predominating. Prolifera-

tion takes place almost exclusively in the cells on the outside of the mass. These cells are in contact with the stroma carrying the blood-vessels for their nutrition, and are larger, and the nuclei richer in chromatin, than the



FIG. 1123.—Section Through the Periphery of a Carcinoma of the Breast, Showing the Medullary Type of Tumor. There are large epithelial masses and a small amount of stroma. (8 mm. Zeiss.)

cells in the interior. By the increase of the mass in size, the cells in the interior are removed further from the source of nutrition and degenerate. Very often the interior of the mass is a cavity filled with degenerated and necrotic cells. The forms of the cells may be preserved or they may soften and the individual cells can then no longer be recognized. In such cases the softened material usually contains great numbers of polynuclear leucocytes. The softening may extend to the periphery, and

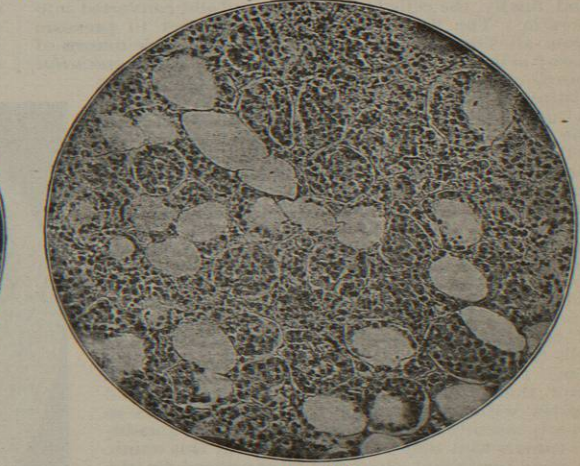


FIG. 1122.

not only leucocytes but connective-tissue-forming cells may enter the mass and a process of organization take place leading to the absorption of the necrotic tissue which is replaced by young connective tissue. When this is the case a mass of growing connective tissue may

be found within the alveolus surrounded by epithelium. Occasionally single blood-vessels surrounded by a small amount of connective tissue may push their way from the stroma into the mass of epithelium.

The epithelial cells of the tumor retain to a marked degree the physiological properties of the cells from which

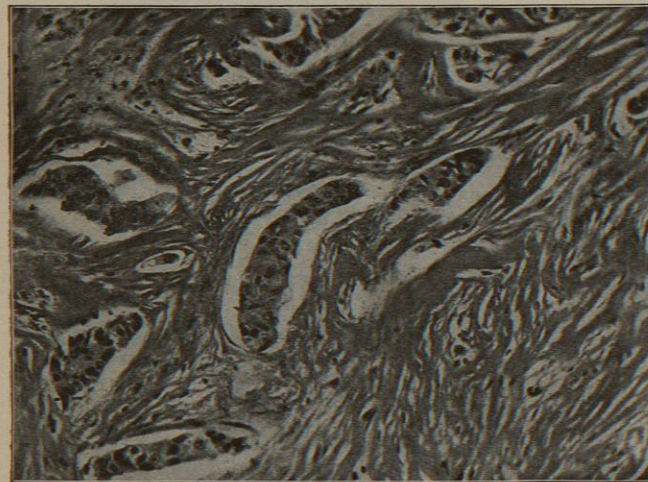


FIG. 1124.—Section from Centre of Same Tumor Showing Scirrhus Type. There are small masses of epithelial cells which are to a large extent degenerated, separated by a dense hyaline connective tissue stroma which contains few cells.

they are derived. In a carcinoma of the skin the cells around the outside of the alveolus have the properties of the Malpighian layer, and the central cells represent the horny layer. Proceeding from the periphery of the alveolus to the centre the eleidin granules begin to appear, and, finally, the cells become flattened and converted into keratin. The flat, horny cells are subject to pressure from all sides, and in consequence concentric masses of horny cells are formed which have been called *epithelial pearls* or *onion bodies*, and which form one of the distinguishing features of carcinoma of the skin. A more interesting example of this tendency to the physiological type is seen in the cylindrical-cell carcinoma, which forms one of the most common tumors of the lower alimentary canal. In these tumors the epithelium rarely forms solid masses filling the alveolus. When these cells enter into a lymph space in the tissue they tend to grow in the same manner as in the normal structure—that is, in close contact along their long axes. In consequence of this the spaces become lined with cylindrical cells simulating a normal gland structure with a lumen in the centre. In consequence of the continued active proliferation groups of cells retaining their form and mode of growth become forced into the centre of the space, and grow there, forming complicated loops or round masses with a central cavity. These tumors so greatly resemble the adenomatous or true glandular tumors that they are often called by this name, or their malignant character is expressed by the term adeno-carcinoma or malignant adenoma. They do not differ from the carcinoma in other situations save in the character and the arrangement of their cells. The same tendency to a normal arrangement of cells may be seen in such a typical carcinoma as that arising in the mammary gland. Within the single alveoli of this, peculiar round spaces are often seen among the cells (Fig. 1123). These are generally interpreted as being

formed by the degeneration and absorption of certain cells. No remains of such cells are found within the spaces, nor can the steps in their formation be followed. The cells on the outside of the small cavity have a definite arrangement with their long axes parallel. In other cases spaces very similar to these may be found containing connective tissue and blood-vessels, which represent strands of the stroma that have become surrounded by the growing epithelium, and thus included in the cells mass. It is probable that cavities may be formed by the degeneration and absorption of such masses of connective tissue. In other cases careful examination will show that the epithelial cells within the alveolus are arranged in rows with their long axes in contact, though the rows of cells are distorted from pressure. Most of the cavities and the arrangement of the cells in rows and columns are due to a tendency of the cells to follow their physiological mode of growth. Such tendencies are more especially seen in those tumors in which the growth is slower; in these the newly formed cells keep up their nutrition longer and have time to attempt a typical arrangement. It may be found in one part of the tumor and be absent in another part. I have seen a typical scirrhus carcinoma of the breast with central degeneration and diffuse extension into the surrounding tissue. On one side of this, apparently growing out from it, was a tumor of a totally different character, of the size of a hen's egg. This tumor was softer, more homogeneous, and more vascular than the scirrhus. It was sharply circumscribed and did not infiltrate the surrounding tissue. On section it was found to be composed of large alveoli filled with well-preserved cells. There were numer-

ous large, round, and oval spaces in each alveolus. The metastases in the axillary lymph nodes were of the scirrhus type.

The character of the stroma varies nearly as much as does that of the cell masses. It forms a part of the tumor and grows with it, a large part being undoubtedly newly formed. In part, it represents the old connective tissue which has been invaded by the epithelium. All the constituents of the normal tissue which have been invaded are

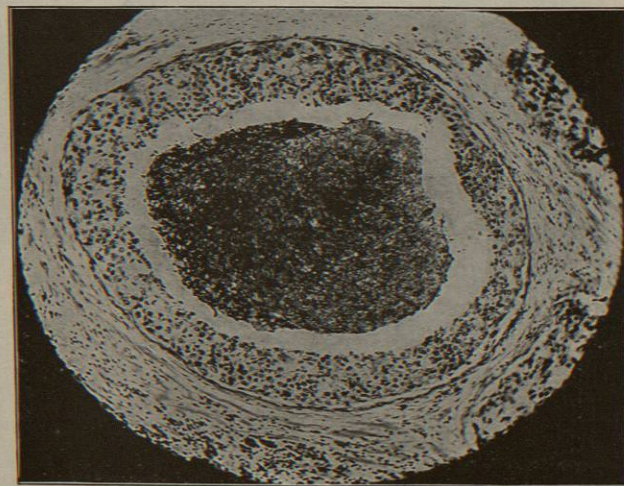


FIG. 1125.—Large Alveolus from Carcinoma of Breast with Central Mass of Degenerated Cells. There are large numbers of leucocytes in the necrotic mass. (8 mm. Zeiss.)

EXPLANATION OF
PLATE XX.