

came under my observation; he was conveyed to the rear by the men of his own company, and on his way to the field hospital was shot twice while on the stretcher. It certainly seems more than improbable that any soldier would concentrate his fire on a man already disabled. It is more likely that the two last wounds were made by aimless bullets.

The modern small caliber weapon sends the deadly missile a distance of three miles, and injuries to non-combatants within this range are unavoidable. It must also be remembered that the small Red Cross flag used in the field can not be distinguished with the naked eye for anything like the distance traveled by the modern bullet. No gross violations of any of the articles of the Geneva Convention can be laid at the door of our vanquished enemy. Perhaps one of the best proofs that the Spaniards conducted the war on the most humane principles is to be found in what occurred during the first skirmish after the landing of our troops in Porto Rico. A small Spanish force occupied the summit of one of the foothills, and opened fire. Our troops made a charge in which one of the Pennsylvania regiments took part. A young private of this regiment, in his enthusiasm to drive the Spaniards from their position, advanced far beyond his line. The day was extremely hot, and when he came within a short distance of the brow of the hill he was overcome by the severe exertion and the intense heat and fell unconscious. A Spanish surgeon immediately rushed forward to render first aid, administered stimulants, and had him at once conveyed on a stretcher to our line. I saw this young hero a few days later, in the hospital at Ponce, rapidly recovering from his illness, proud of his military career, and full of gratitude to the one who saved his life on the battlefield. An act like this stands out as a beacon light of the humane side of warfare, and the chief actor deserves the gratitude of our nation, and is worthy of a medal of honor from the country he represented so well.

Another very pleasing evidence of the humane nature of recent warfare came to my notice at Mayaguez, Porto Rico. After a somewhat lively skirmish between our troops and the Spaniards near the suburbs of this prospering little city, the enemy retreated and the wounded from both sides were conveyed to the same hospital. I found the Spaniards on one side of the large room and the Americans on the other, and all of them were under the care of the same nursing sisters of a Spanish order, who, in their ministrations, made no distinction between friend and enemy. To them the uniform the soldier wore made no difference when their services were needed. The Red Cross flag floated over the building that had been temporarily converted into a hospital, and the inmates of both nations received the same kind and considerate treatment. It was interesting to observe how the men, who but a few days before did their utmost to kill or wound each other, were now on the most friendly terms. They exchanged little articles of comfort, such as tobacco, cigarettes, fruits and relics of the war in a manner that did not recall the experiences of a few years ago. They all felt that they had done their duty to their respective countries and now the victors and the vanquished were under the same roof, in care of the same nurses, and were making ties of friendship which, I have no doubt, in many instances will remain permanent. I would cite additional minor observations which would corroborate the above narratives from the late Spanish-American War, and which would confirm the statement that the humane side of warfare was strictly observed on both sides. I can not close without again referring to the

work done by the American Red Cross Association from the beginning to the close of the war. Two ships, chartered for their special use, brought provisions, delicacies, medical supplies and articles of comfort to the coasts of Cuba and Porto Rico at a time when they were sadly needed. The nurses furnished by the Association did excellent service wherever they were sent. The people, regardless of political views or religious convictions, had confidence in the work of the Association and made liberal contributions. I am sure that every soldier who participated in the war, at home or abroad, has some pleasant recollections of its work, and a deep sense of gratitude for those who have made it what it is, the central figure, the most earnest advocate and the most powerful agent of the modern movement to bring civilized warfare on a most humane basis. Let us hope and pray that international arbitration may be instrumental in averting war whenever such a course is compatible with the mission and honor of nations, and that when war is inevitable, it may be characterized by the spirit of the age which breathes humanity, and demands the best and most considerate treatment of the sick and wounded of the belligerent armies, regardless of the uniform they wear or the flag they defend.

A PATHOLOGIC STUDY OF EIGHTY TUMORS OF THE MAMMARY GLAND, WITH SPECIAL REFERENCE TO THE OCCURRENCE OF MALIGNANCY.*

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The frequent occurrence of tumors in the mammary gland, the question of their benignancy or malignancy, and the evils which so commonly arise from the waiting policy in these cases, make requisite a knowledge of the microscopic anatomy, manner and possibilities of growth of these tumors, if a rational treatment is to be carried out. There has long been a general classification of tumors in all parts of the body as benignant and malignant. Whether such a classification is possible in neoplasms of the mammary gland is doubtful, and with this doubt I present a microscopic analysis of eighty tumors of the breast. These tumors are largely from Dr. Nancrede's clinic at the University Hospital, during the years 1892 to 1899. A few were sent to this laboratory, by physicians about the state, for diagnosis. The cases may be classified according to their histologic structure.

Fifty-six of the number warrant the diagnosis of carcinoma, the diagnosis resting on the definition of an epithelial tumor, whose cells grow loosely in the connective tissue spaces without a basement membrane, growing both by infiltration and metastasis, and therefore the most malignant of tumors.

Carcinoma Medullare.—Of these, ten are of the medullary variety, the cells being in great preponderance over the stroma. The relation of cells and stroma varies markedly in the different cases, and even in the same tumor. The cells lie in small masses with fine strands of connective tissue between them; or, the nests may be very large, the stroma largely consisting of coarse bands from which finer strands extend between the cell masses. One arrangement frequently merges into the other. An alveolar appearance is also presented, the cells having shrunk away from the enclosing bands of stroma. The

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cells vary in size from two to several times that of a leucocyte, there being a relation between the size of the cells and the closeness with which they are packed together. They are polymorphous, the prevailing shape being round or oval. The epithelial type is always preserved, i. e., oval nuclei, granular chromatin, and large proportion of protoplasm. In every case a part of the cells show a granular, swollen protoplasm and fatty degeneration. The fat appears as small globules in the protoplasm. Four cases show a necrosed cheesy condition, and also diffused chromatin, fragmentation of nuclei and cell-bodies; that is, conditions which are the beginning of necrosis. In such cases the small cell infiltration and edema are marked about the areas of necrosis, indicating an inflammatory reaction. A few giant cells are usually present, but these do not show the nuclear division which is so frequently found in the sarcomata.

The stroma consists of a fibrous connective tissue of varying density. Although as a rule it is not the dense tissue of few nuclei found in the scirrhus variety, there are usually small islands of scirrhus present. The stroma is myxomatous in two cases, and these two are also partially necrosed. The myxomatous change probably preceded the necrosis, for in the necrotic areas are found bits of the mucoid tissue. The stroma is usually edematous. The vascular supply of these tumors consists largely of capillaries lying in the connective tissue, being in no case in contact with the cells. The vascularity is in inverse proportion to the density of the stroma. The capillaries are frequently dilated and congested. In the denser part of the stroma there are few larger vessels.

In four of the ten, remnants of the gland ducts—or adenoma—persist; and in three of them the cells can be seen to have proliferated, filling the lumina of the ducts and growing into the lymph-spaces as rods and nests. In such areas it is easy to see that the carcinoma cells are larger than the parent cells, and that the nuclei are hyperchromatic. In one case the lobular arrangement is retained, indicating that the growth had been by a general proliferation of the epithelial cells. Extension into the fat is often shown by small nests and threads of cells growing between fat cells. In such areas the carcinoma cells are frequently very small and scarcely to be distinguished from leucocytes. In the areas of proliferation and extension there is often an inflammatory infiltration and edema. Three of the ten cases present in part also the characteristics of the simplex form. These are, therefore, diagnosed carcinoma simplex et medullare.

Carcinoma Simplex.—Twenty-one cases come within the diagnosis of carcinoma simplex, the occurrence of cells and stroma in relatively equal parts being the essential characteristic. The arrangement of cells and stroma varies. The cell nests are small and the stroma is in fine strands, or the nests are large and the stroma in heavy bands. The cell nests may be round, oval, irregular or in long narrow rods. In one case the parts examined showed the latter arrangements throughout. There is frequently an alveolar arrangement in which the cells have shrunk away from the walls, thus distinguishing from alveolar sarcomata, in which the cells are always adherent to the enclosing bands of stroma. One tumor frequently shows all of these forms. Moreover, in the same tumor the type of growth may vary from medullary to scirrhus. None of these, nor any of the other cases, conforms to a fixed type. Neither from a clinical nor microscopic standpoint is there a distinct difference between the various forms. All that the

names given should mean is that in a given tumor there is a preponderance of the indicated structure. As before stated, three cases were diagnosed carcinoma simplex et medullare.

The stroma consists of fibrous tissue which is soft and rich in nuclei, or dense and scar-like. In half of the cases the stroma has undergone a mucous degeneration, which in one case is so far advanced that the diagnosis of carcinoma simplex myxomatous is given. The cells have the same characteristics as in the medullary form, often showing more marked degenerative changes. In one case there is an early stage of mucous degeneration of the cell nests. The same tumor is partially necrosed. In the areas of necrosis may be found bits of the mucoid substance, which indicates that the myxomatous change preceded the necrosis. In three other cases there is necrosis, one showing calcareous deposits in the caseous areas. Around these areas there is a marked small cell infiltration.

In one case fatty degeneration of the cells, granular and swollen protoplasm, a myxomatous stroma, diffused chromatin, and necrosis indicate the steps in the retrograde process. The vascularity of these cases varies with the density of the stroma. In those tumors whose stroma is soft and rich in nuclei, there is a rich capillary supply in the strands of tissue; while in cases with a dense fibrous stroma there are but few blood-vessels. In other words, as the stroma develops from a soft to a hard tissue, the increasing density cuts off the blood-vessels, as it does in any other tissue which becomes scirrhus. In the denser parts of these tumors are found a few larger vessels with very thick, and often hyaline walls, indicating an obliterating endarteritis or phlebitis.

In one case which retains a lobular arrangement the blood-vessels are those of a normal gland, but much dilated and congested. This case also shows an invasion of the vessels by the carcinoma cells, giving the appearance of emboli. Whether it is a case of embolism, or infiltration through the vessel wall, could not be determined. In either case the malignancy is much increased by the danger of hematogenous metastasis. In nine of the twenty-two cases there is a marked small cell infiltration and edema. This is found oftenest at the advancing border, or surrounding a necrosed area. Neither of these conditions may be present. In six specimens there remain parts of the normal gland or adenoma, and in these cases may be seen a proliferation of the epithelial cells both into the lumina of the ducts and the surrounding lymph spaces. Several times the infiltration of the fat is shown, as mentioned above. In two cases the subjacent pectoral muscle shows infiltration by the cancer cells. The muscle substance is destroyed by the ingrowth, even at some distance from the actual infiltration, the muscle fibers showing atrophy, cloudy swelling and Zenker's necrosis. This suggests that there may be a toxin elaborated by the cancer, which has a poisonous effect on the surrounding tissues. In two cases the tumor has a lobular arrangement, suggesting that the growth had occurred by a diffuse proliferation of the gland cells. One typical carcinoma simplex shows tuberculous changes with epithelioid and giant-cell tubercles in the tumor mass.

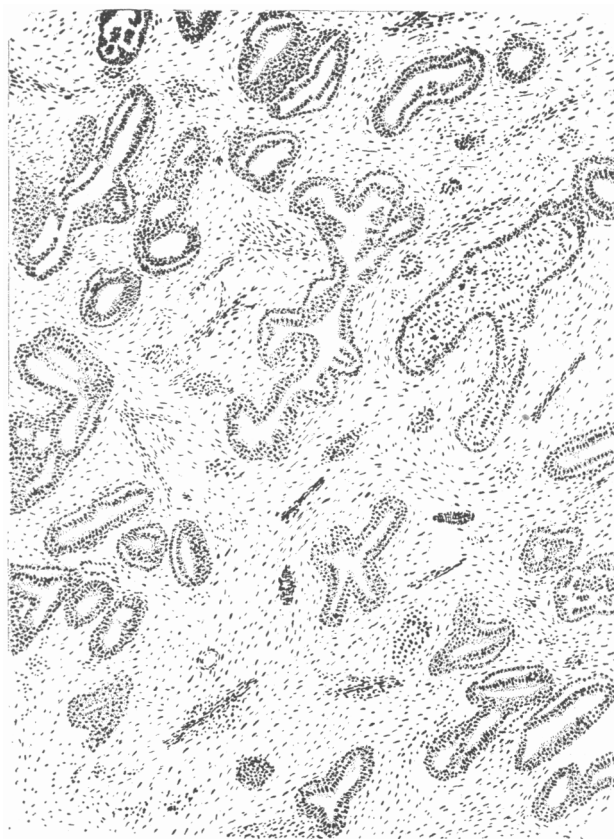
Carcinoma Colloides.—Five cases, diagnosed colloid carcinoma, are characterized by a mucous degeneration of the cells, commonly accompanied by a similar degeneration in the stroma. In every one the proportion of cells and stroma is about equal, which indicates that these cases, before the mucoid changes occurred, would have presented the characteristics of carcinoma simplex. The

first case shows an early stage in the process. Many of the cell nests show no mucous change, but the other degenerations mentioned previously. Other nests show, about the borders, a change to a stringy, granular substance, while others are completely replaced by this material. Parts of the gland structure remain, and these show the development of the cancer by the cell proliferation. This case indicates the series of steps by which the colloid carcinoma is developed. The remaining four show intermediate degrees between the first case and one in which the cells have completely changed to a granular, stringy substance which stains a deep blue with hematoxylin. The stroma is also changed to a similar material of the same staining reaction. The degeneration of the cells may begin either at the periphery of a nest, or at the center. In one case the latter change had largely taken place, giving the nests a cylindric appearance. In one of these cases carcinoma-cell nests were found in several of the blood-vessels. These may be emboli. In three cases there is an inflammatory infiltration of small cells, in one necrosis of large areas.

Carcinoma Scirrhus.—Ten cases are scirrhus, the stroma being in greater proportion than the cells. This arrangement prevails, but in each there are areas which conform to the definition of adenocarcinoma and of the medullary and simplex forms. The cells are scattered in the stroma in large or small irregular nests. The stroma consists of fibrous connective tissue of different degrees of density. It may be comparatively soft and rich in nuclei, or very hard and scar-like. The softer portions are in the newer tissue, that is, in areas of proliferation and extension. The stroma is frequently edematous. In two cases it had undergone a diffuse mucous degeneration, and these, therefore, are called myxomatous scirrhus. The cells are like those described in the other forms, showing the same retrograde changes and areas of necrosis. As before, the blood-supply is scanty in the denser tissue, while in the areas of extension may be seen capillaries lying in the cell masses, in every case surrounded by connective tissue. In three cases portions of the gland ducts, or adenoma, remain. These show proliferation of the cells into the lumina of the ducts, and also into the lymph-spaces. Five cases show invasion of the fat by the tumor cells, and in such areas the growth is medullary, from which there is seen a transition to the simplex and scirrhus types. Such cases seem to show the origin of the scirrhus type. In areas showing active infiltration of the fat the tumor cells are often very small, with hyperchromatic nuclei, and scarcely to be distinguished from leucocytes. In one of the ten there were calcareous deposits in the ducts. In two there is a marked inflammatory exudate at the advancing border.

Adenocarcinoma.—Nine tumors show the general plan of the gland, whose epithelial cells have proliferated, i. e., the cells have grown away from the basement membrane into the lumina of the ducts and lymph-spaces. Among these are ducts of which it can not be said whether they belong to adenomata or to the normal gland; while others show areas which correspond to the normal gland, and also areas in which the gland is replaced by enlarged and dilated ducts and new growth of connective tissue. These two conditions merge one into the other. The nine have, in common, an abnormal growth of the epithelial cells. In one case there is a diffuse proliferation of the cells, which have grown into the ducts without much extension into the surrounding tissue. In other cases this is not so marked, the rods of cells extending into the lymph-spaces and

the formation of small nests being the striking point. Two cases have so far developed that areas of the simplex type are seen. The stroma is never of the scar-density found in the scirrhus form. In four cases the connective tissue is myxomatous. In two cases there is a marked edema. In the tumors showing the distinctly adenomatous type with an increase in the connective tissue, it is probable that the development of the carcinoma was secondary to that of an adenofibroma. One case especially shows this change. The epithelium of a distinct adenofibroma shows a malignant proliferation, and the diagnosis might properly be carcinomatous adenofibroma; one case shows the beginning of an intracanalicular growth. The cells lining the ducts in all of these cases are similar to the normal gland cells. When these cells have left the basement membrane they preserve their epithelial nature, but are as a rule larger, polymorphous, and show marked degenerative changes. The nuclei are hyperchromatic.



Carcinoma in the guise of Adenofibroma, showing atypical gland spaces, but no infiltration of the lymph spaces. (Camera lucida drawing. Leitz Oc. No. 2, Obj. No. 3.)

In those tumors whose structure is not widely different from the gland, the blood-supply is that of the normal gland, the vessels being usually congested. In one case there are small areas of hemorrhage into the tissue. In three blocks taken from one case the conditions are respectively: normal gland with no visible changes, adenofibroma with beginning epithelial cell proliferation, and carcinoma simplex. From this instance may be gained an idea of the origin of the growth, and of the different phases which one case may present. It also shows how impossible a correct clinical diagnosis of such cases is, and how dangerous a pathologic diagnosis may be when based upon a limited examination. Two of these cases are tuberculous also. Epithelioid, giant-cell,

and caseating tubercles were found in the tumor mass. In one case there is a small abscess, in the walls of which there are the histologic evidences of tuberculosis, which are verified by the finding of the bacilli, by means of the carbol-fuchsin method. The existence of the carcinomatous and tubercular processes together is important. One of these and the other case of tuberculosis mentioned have been reported by Dr. Warthin.¹

Fibroma.—Eighteen cases are fibromata, but in none is the growth a pure fibroma, each showing some modification. There is in every instance some evidence of gland structure. The fibrous tissue varies from a soft tissue rich in cells—which have been called fibrosarcomata—to a hard one of few nuclei. A stroma of the density of scar tissue was not found. With but few exceptions the stroma shows myxomatous degeneration. The blood-supply is scanty, consisting of few thick-walled vessels in the denser parts, and small capillaries in the softer tissues. Three of the eighteen are adenofibromata, consisting of ducts more or less resembling the gland structure, and a fibrous stroma which in one case is in great preponderance, in another about equal parts, and in the third there is a larger proportion of ducts. The gland-like structures may vary from the size of mammary acini to large, irregular, dilated ducts. In one case the stroma around the ducts is richer in nuclei, which indicates the origin by pericanalicular growth. One case shows a tendency to extend blunt papillæ into the duct spaces, that is, it is the beginning of an intracanalicular fibroma. In one there is a slight malignant proliferation of the epithelial cells. Two tumors, in addition to these characteristics, show around the gland and adenoma ducts a proliferating connective tissue. This tissue becomes poorer in nuclei and denser the greater the distance from the ducts. These are, therefore, diagnosed pericanalicular adenofibromata.

Five of the eighteen show an intracanalicular growth. These tumors are characterized by blunt papillæ which grow into the dilated ducts, as a rule entirely occluding them. In three of these the structure of adenofibroma is also present, and these may be called intracanalicular adenofibromata. Calcareous deposits were found in the ducts of one. The other two show no remains of gland structure except the epithelium lining the large spaces and covering the papillæ. These are intracanalicular fibromata. As mentioned, one case of adenocarcinoma and one of adenofibroma show a beginning of this intracanalicular growth.

Eight of the fibromata are further characterized by greatly dilated ducts which form cysts of varying size. One case is simply adenocystofibroma, its structure varying only from an adenofibroma by the presence of the cysts. Four show papillæ growing into the cysts. These papillæ are slender, leaf-like outgrowths not resembling those in the intracanalicular tumors. These are papilliferous adenocystofibromata, and from their papilliferous nature are more malignant than the other forms, because of their greater tendency to become carcinomatous. The papillæ may be considered as an early stage of the atypical growth of the carcinoma which is likely to arise. One of the four merits a separate description. It is very cystic. The spaces are of many shapes and sizes, some of them being very large, filled with a mucous substance. The smaller cysts especially show the tendency to become papilliferous. The connective tissue is dense, with relatively few nuclei. Surrounding some of the larger cysts is a thin border of a hyaline deposit which stains a deep pink with eosin. The stroma is edematous and

in a large part myxomatous. Around the smaller spaces the connective tissue is rich in nuclei, indicating a pericanalicular proliferation. Throughout, and especially in the smaller cysts, there is a beginning carcinomatous change. It is to be noted that the smaller cysts also show more papillæ. The proliferation of the cells is chiefly into the lumina, irregular rods growing away from the basement membrane and forming masses of cells in the spaces. The cells present marked differences from the parent-cells. They are larger and polymorphous. The protoplasm is vacuolated, granular and stringy. The nuclei are hyperchromatic. Where these changes have occurred there is a marked inflammatory infiltration. Two of the eight cystic tumors show a pericanalicular proliferation of the connective tissue, and may be called pericanalicular adenocystofibromata. One of these shows, in the adenomatous portions, carcinomatous change. The remaining one of the fibromata is, in part, typical intracanalicular adenofibroma with all degrees of growth of papillæ into the cystic spaces. In this tumor also the epithelial cells have grown away from the basement membrane. The diagnosis is carcinomatous intracanalicular adenocystofibroma.

Sarcoma.—Six cases are sarcomata, following the definition of a mesoblastic tumor with a preponderance of cells and the presence of a fine fibrillar stroma between the cells. The blood-vessels are capillaries of thin walls, a single layer of endothelial cells, and of wide lumina. They lie in direct contact with the sarcoma cells, and the blood elements are often found outside the vessels. In two cases there is marked hemorrhage into the tissue. Three of the six are polymorphous sarcomata, so-called because of the varied form and size of the cells. The greater part of the cells are round or oval, from a little larger to many times the size of a leucocyte. There are also spindle and giant cells. The nuclei are granular, taking the stain to a lesser degree than the leucocytes. Many nuclei show karyokinetic figures. The giant cells especially have fragmented and mitotic nuclei. In one case the fat is infiltrated and replaced by the tumor cells. In this case, at the advancing border, and in one other, there is a marked small cell infiltration. One case shows myxomatous degeneration, necrosis and caseation of the cells. One tumor contains large bands of connective tissue. These are doubtless remnants of the gland tissue. One case has an alveolar arrangement, the cells having disappeared at the center of the spaces, but adherent at the margins. The fourth case is a small round cell sarcoma, consisting largely of small round cells, with few oval, spindle and giant cells. In this tumor there is evidence of hematogenous metastasis. The tumor consists of large masses of the sarcoma structure and fibrous connective tissue, in which are small foci of round cells around or in the vicinity of the blood-vessels. A large proportion of the mass is a fibrous connective tissue which suggests that either a fibromatous change had preceded the sarcoma development, or, that it is a change from a so-called embryonic to a mature tissue. Two cases are spindle cell sarcomata, one characterized by small, and the other by large spindle cells. There are fewer giant cells in the spindle cell sarcomata than in the other forms examined. In none of the sarcomata is there any evidence of glandular structure. Sarcoma apparently does not grow between the ducts, to any extent, but destroys them in the progress of its development. Many of the older writers speak of adenosarcoma, meaning a tumor composed of adenomatous and sarcomatous structure. This error probably arose by mistaking the soft stroma sometimes

¹ Am. Jour. of the Medical Sciences, July, 1899.

found in adenofibroma, for sarcoma. The stroma of fibromata is often very rich in nuclei and the mistake would not be unnatural at a time when even carcinomata and sarcomata were often confused. The chief diagnostic point of sarcoma is the growth rather by expansion than infiltration, so that the gland ducts are destroyed early. There has never been presented in this laboratory a sarcoma of the breast which does not show destruction of the ducts, except at the periphery of the growth.

The relative occurrence of the different varieties of the eighty cases is as follows: Carcinoma, 70—carcinoma medullare, 12.5; carcinoma simplex, 27.5; carcinoma colloidales, 6.25; carcinoma scirrhus, 12.5; adenocarcinoma, 11.25—adenofibroma, 12.5; adenocystofibroma, 10; sarcoma, 7.5, and tuberculosis, 3.75 per cent. Five per cent. not classified as carcinomata show carcinomatous proliferation. The per cent. of cases of tuberculosis is higher than has previously been reported. This is doubtless due to many cases of tuberculosis being diagnosed simply as malignant, or as cysts.

Of the series, 82 per cent. show undoubted evidences of malignancy, not including the cases of tuberculosis. It will be instructive to compare these cases with others reported.

S. W. Gross reported 637 cases, of which 83.2 per cent. were carcinomatous.

Butlin reported 65 cases of cystic tumors, as follows: carcinoma, 13.8; adenoma, 1.5; sarcoma, 38.4; fibroma, 27.6; adenofibroma, 9.2; mixed connective tissue tumors, 10.7 per cent. The high proportion of sarcomata suggests that there was confusion between sarcomata and the soft fibromata: 52.5 per cent. were malignant.

Williams reported 2430 cases, as follows: cancer, 77.3; sarcoma, 3.9; myxoma, .16; fibroadenoma, 15.3; papilloma, .10; cystoma, 2.6 per cent.; 81.2 per cent. were considered malignant, including only the cases of cancer and sarcoma.

White reports 80 per cent. of mammary tumors as carcinomatous.

Senn reported 440 cases, of which 95 per cent. were malignant.

Gross quotes 481 cases of Bryant's, of which 83.16 per cent. were carcinomatous, and 440 cases of Billroth's, of which 85 per cent. were carcinomata.

With the exception of Senn's series, the number of malignant cases corresponds to mine, that is, cases in which there is good evidence of malignancy. But this series is important because it plainly shows that the idea on which the conception of malignancy has been based is not broad enough, showing as it does the relationship which exists between the various forms and the frequency with which the character changes from a so-called benign tumor to a malignant one. In the carcinomata is easily traced the development from a beginning proliferation of the epithelial cells of the normal gland acini—or adenoma ducts—through the forms of adenocarcinoma, carcinoma medullare, carcinoma simplex and scirrhus. A majority of these changes may be seen in one tumor, showing the gradual transition from one form to another, and in the study of the series the steps of the development are everywhere plainly indicated. As stated, typical adenofibroma, adenocystofibroma, papilliferous adenocystofibroma and pericanalicular adenocystofibroma were found to present carcinomatous changes. An adenocarcinoma, an adenofibroma and an adenocystofibroma show intracanalicular papillæ. An adenofibroma and an adenocystofibroma plainly show their origin by pericanalicular proliferation of the con-

nective tissue. Considering these points there is but one opinion tenable concerning the benignancy of the mammary tumors of the types described.

Many pathologists and physicians hold that all tumors of the breast should be removed. Balloch, among them, says: "Adenomata are not the harmless growths many believe them to be as there is great probability that they may and do become carcinomatous." And Carr writes: "It seems quite probable that in all, or nearly all, cases there is at least a brief period in the development of the carcinomata, when they have neither the clinical nor microscopical appearances of malignancy, nor the tendency to return after removal. . . . We should urgently advise removal at once of every tumor of the breast, no matter how small or innocent it may appear, and invariably have it examined by a competent microscopist." Carr operated on 11 cases supposed to be benign, all of which proved to be carcinomatous; all had passed the three-year limit without recurrence. On the other hand, Johnson says: "The clinical history of cancer is usually opposed to the view that the growth began in a pre-existing simple tumor. The presence of cancer and adenoma in one breast is no evidence that the cancer in question had its origin in the adenoma." This view has no sound pathologic basis. In practically every case which presents both the picture of adenoma and carcinoma can be traced the development of the carcinoma from the adenoma, as I have described. The coexistence of cancer and adenoma is sure evidence that the cancer had its origin in the adenoma.

It is impossible, in many cases, to diagnose a malignant—in the usual sense—tumor clinically, and the microscopic examination is likely to be deceptive. It is the custom in this laboratory to examine all parts of the tumor. When a case is at once proved to be malignant, this is not necessary, but in all others every part must be examined, before a diagnosis is given. Two cases well illustrate this point. One was sent to the laboratory by Dr. Dodge, of Big Rapids, Mich. The tumor presented the picture of typical adenofibroma, yet the axillary glands were infiltrated with cancer. Atypical epithelial proliferation must have occurred in some portion of the tumor, but that area could not be discovered. In the other case only a very small area of carcinoma was found, after careful search. The axillary glands were likewise involved. A number of other cases have been examined at this laboratory, in which the mass of the new growth showed the structure of an adenofibroma, but contained small areas of typical carcinoma structure. When a case presents characteristics of adenofibroma with active proliferation—not cancerous—it can not be diagnosed benign. Such a diagnosis is obviously unsafe, for there is no certainty that such a growth will not, sooner or later, become cystic, papilliferous, carcinomatous, or change to other forms from which we have seen carcinomata may develop. It is much better to call such a tumor a malignant adenoma. Many of the German pathologists now use the term "carcinoma in the guise of adenofibroma." Hanseman, among them, says: "The malignant adenoma is that form of carcinoma which is most similar, in its structure, to the mammary gland. At times the stroma is strongly developed, and then the picture is exactly that of fibroadenoma. It has happened that I have considered, from the microscopic examination of an excised portion, such a tumor, from a girl 22 years old, as entirely benign; and the tumor was simply enucleated. Unfortunately the pathologic picture was deceptive. In a short time there was a recidivation and the young patient died of a general carcino-

matosis. . . . Very often the stroma is exactly that of the normal mamma, and there is no small cell infiltration." The accompanying drawing is from a like case. The gland ducts show atypical proliferation, but no evidence of cancer. Nevertheless such a case must be considered malignant, for further search will doubtless show carcinoma, as it did in this instance. The designation, "carcinoma in the guise of adenofibroma," is most fitting for such cases.

Had all the cases which have heretofore been reported been diagnosed only after a microscopic examination, and the diagnosis rested on the present pathologic knowledge, the per cent. of malignant tumors would doubtless be much higher. That the proportion is so small in this series is due to the fact that the cases are largely from surgeons who believe in early removal of all tumors.

The clinical diagnosis of breast tumors is neither reliable nor important, and should not be taken as an operative guide. In a large proportion of cases it is not possible to distinguish the different forms. In nearly every case which has been diagnosed clinically, the microscopic examination has proved the diagnosis incorrect. The difficulty is obvious when the variety of pictures which one case may present is considered.

It seems justifiable to conclude from the microscopic examination only of these eighty cases, that there is no strictly benign tumor of the breast, and that the only rational treatment is complete removal as soon as discovered.

BIBLIOGRAPHY.

- Gross: Medical News, Phila., 1887, 613-616.
 Gross: Tumors of the Mammary Gland.
 Butlin: Lancet, London, 1884, ii, 54.
 Williams: British Med. Jour., 1892, ii, 576.
 White: Med. News, Phila., 1881, 647-650.
 Senn: Pathology and Surgical Treatment of Tumors.
 Carr: Am. Jour. of Obstetrics, September, 1899.
 Johnson: Lancet, London, 1894, 1485.
 Hanseman: Die Mikroskopische Diagnose der bösartigen Geschwülste.

OBSERVATIONS IN LARYNGOTOMY; TRACHEOTOMY; INTUBATIONS; BASED ON CLINICAL AND EXPERIMENTAL EVIDENCE.

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The animals were all reduced to full surgical anesthesia by ether before the experiments were begun, and were killed before recovery therefrom. Respiratory tracings were obtained by means of a rubber tambour, attached to a canvas band, encircling three-fourths of the circumference of the animal's chest. This energized a writing style attached to an organ-key mechanism. Respiratory tracings were obtained very accurately. Blood-pressure was recorded by means of a mercury manometer. The drums were revolved by a mechanism so made as to be capable of a variety of movements, ranging from one revolution in thirty minutes to eighteen per minute, so that any phase of any given tracing might be duly recorded. The following is a part of a rather extended research, which enabled us to estimate the reliable reduction with comparatively few experiments.

Surgeons have not infrequently encountered, in performing a laryngotomy, sudden collapse at the moment when the incision was made through the larynx, and the margins of this incision were kept apart for the introduction of the tube. Even death has occurred not infrequently at this time. Such results have been often encountered in hasty operations, and these latter for

admitting air into the tract have usually been laryngotomies. In the history of tracheotomies, collapse or death, at the particular stage referred to above, has been rarely observed.

The experimental and clinical evidence set forth in the preceding subject includes all the principles involved in such results in laryngotomy. The larynx having been reached in the dissection, an incision is usually made boldly through it, and the margins of this incision held apart, a procedure in which there is a mechanical irritation of the dangerous area of the larynx. This area, as has been shown experimentally, occupies the middle and upper portion of the larynx. It is well, then, if a laryngotomy must be made, to bear in mind this "inhibition" area in the larynx. It would add greatly to the safety of the operation if the incision were first made through the cricothyroid space, then a swab of cocain passed through this incision and applied to the laryngeal mucosa. This having been well done, no amount of manipulation could cause any reflex phenomena. Likewise, in the introduction of the tube in the high laryngotomy, there would be almost certain interference with the inhibition area and the production of the usual symptoms. Even though artificial respirations may be supplied, it must be remembered that the heart may be inhibited as well. The cocain is an almost certain preventive of this cardiac inhibition, yet it would be safer to administer a hypodermic injection of atropin before beginning the operation.

What has been said on this subject under intubations may be said for the treatment of like conditions in this operation.

TRACHEOTOMY.

Preliminary Remarks.—I am unaware of instances of sudden collapse or death in the technique for tracheotomy due to other causes than the obstruction for which the operation was performed—that is to say, the collapse and death which occasionally followed intubation and laryngotomy do not follow the performance of tracheotomy.

Experimental.—Animals under surgical anesthesia were subjected to the following experiments: The trachea was submitted to dilatation to different degrees, ranging from gentle dilatation to a sufficient force to rupture that organ, and in not a single instance was there noted any marked change in either the respiration or the circulation. All portions of the trachea from the larynx down were tested, and in all the cases the results were similar. The only variations observed were, in some cases, an increased respiratory rhythm with an increase in the amplitude of the respirations, and in some instances there was slight increase in blood-pressure, without any alterations in the character of the cardiac action. In several instances there was a slight decline in blood-pressure. It appeared that these minor alterations in this and in the respiration were due to mechanical stimulation of sensory tissue having a direct connection with the inhibitory apparatus of either the respiratory or the cardiac apparatus. From an experimental standpoint it would seem to be impossible to produce sudden death in any such manner as it may be produced in operations involving the larynx and certain portions of the pharynx. The experiments on the trachea were made in animals on which experiments were being made for other purposes, and consequently they are not recorded separately.

Practical Applications.—The results of these experiments is of practical importance mainly in point-