

**Report to the Surgeon General of the United States Army on the minute anatomy of two cases of cancer / by J. J. Woodward.**

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WAR DEPARTMENT,  
SURGEON GENERAL'S OFFICE,  
APRIL 29, 1872.



REPORT TO THE SURGEON GENERAL OF THE UNITED STATES ARMY

ON THE MINUTE ANATOMY OF

# TWO CASES OF CANCER.



By Assistant Surgeon J. J. WOODWARD, U. S. Army.

WASHINGTON, D. C., 1872.





# REPORT

## ON THE MINUTE ANATOMY OF

# TWO CASES OF CANCER.

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ARMY MEDICAL MUSEUM,

MICROSCOPICAL SECTION,

*April 29, 1872.*

SURGEON GENERAL J. K. BARNES, U. S. ARMY.

GENERAL: Opportunities for the study of the histology of morbid growths frequently occur at the Army Medical Museum. Specimens are sent, not merely by medical officers of the Army, but also by civil practitioners. It is often possible to examine these growths while quite fresh, and thus to make observations which aid in the interpretation of the appearances found in those which are not received until they have been hardened by immersion in alcohol or other reagents. By methods described in former reports, it is possible to preserve thin sections of very many of these growths in a permanent form for examination with the microscope, and a large collection of such preparations has already been formed.

These preparations are frequently studied by medical officers and others who visit the Museum for that purpose, but they would be rendered more generally useful if it were practicable to publish from time to time brief descriptions of the more important cases, accompanied by suitable illustrations.

The usual methods of representing such microscopical preparations by etchings on copper, lithographs or wood-cuts are open to many objections. Especially it may be indicated that the production of the drawings which must serve as the basis of such representations is laborious, and consumes too much valuable time if the investigator himself endeavors to make them, and if the work is intrusted to a professional artist the essential features of the image are very generally imperfectly shown, or altogether misrepresent the original. Even if the microscopist himself has the leisure and the skill to make his own drawings, the finished work will too often represent rather his theoretical views than the severe facts of nature, for in any case the artist finds it impossible to represent all that he sees in the microscope and only attempts to reproduce so much as he conceives to be of importance.

Much more truthful representations can now be made by the process of Photo-micrography as improved by my experiments; but the cost of making silver prints, the fact that they are not permanent, and the circumstance that they require to be mounted on tolerably stiff card board prevent them from being generally available as book illustrations, especially where editions of several hundred copies or more are desired. Under these circumstances I note with pleasure the rapid improvements lately made in the direction of photo-mechanical processes of various kinds, having for their object the reproduction of photographic



negatives in inks of a permanent character. These processes are indeed as yet far from perfect, but several of them have already reached such a degree of excellence as to be very suitable for the reproduction of photographic negatives of microscopical images.

In the United States two such methods may be said to be in successful operation, viz: The Woodbury process, and the Albortype process. A detailed account of these processes would be out of place here, but a few brief remarks are required.

The Woodbury method consists essentially in the production from the negative by the action of light, of a relief surface of gelatine, from which a metal "intaglio" is produced by pressure. In this a series of gelatine films colored by any suitable permanent pigment are formed by mechanical means, and these constitute the prints. Like silver pictures the Woodbury prints require to be mounted on sheets of card board or stiff paper, and this of course adds to the expense. Moreover, if the mount is thick it is ill adapted to binding. Of late, however, films of great flexibility have been produced, which are supported on mounts not much stiffer than ordinary plate paper, and therefore quite suitable for book purposes.

In the United States this process is employed by the American Photo-relief Printing Company, No. 1002, Arch Street, Philadelphia, under the supervision of Mr. John Carbutt, who has reproduced three of my negatives of microscopic objects, viz.: A photograph of a section of ovary magnified 400 diameters, of which five hundred copies were printed, mounted on stiff card board, and used among the illustrations of my report on photographing histological preparations by sunlight; a photograph of *Amphipleura pellucida*, in illustration of a paper published in the "American Naturalist" for April, 1872, and a photograph of two frustules of *Triceratium fimbriatum*, in illustration of a paper published in the Chicago "Lens" for April, 1872. Large editions of the last two prints were struck off for the Journals named. They were mounted on plate paper.

In quality these prints were almost fully equal to fine silver prints, which they closely resembled, but the editions were much more uniform than would have been possible had silver prints been used. The cost, moreover, was considerably less than that of silver prints, and the negatives were returned to me wholly uninjured, while they would have been much damaged if not quite destroyed had an equal number of silver prints been made from them.

The Albortype process is employed in New York by the Photo-Plate Printing Company, under the supervision of Mr. E. Bierstadt, No. 932 Broadway. In this process a printing surface (not a relief) is produced on a gelatine film by the action of light, through the negative, on certain chemicals contained in the film. The surface thus produced, when properly inked, yields in the press an impression on paper, in which the details of the original negative are very well preserved. The prints may be made on either plain or enamelled paper; in the latter case they closely resemble silver prints on albumen paper, in the former they are like silver prints on plain paper. In either case they give a clean white margin, and therefore do not require to be mounted as Woodbury prints do, but are at once ready for binding. Moreover, proper descriptive lettering is readily added to the plate. If suitable ink is employed the prints are as permanent as lithographs or other engravings.

Two of my negatives were placed in Mr. Bierstadt's hands for reproduction, and the illustrations of the present paper are the results. These plates very fairly represent the original negatives. One of them is on plain, one on enamelled paper. The latter more closely resembles an albumen print from the negative than the former does, but the enamelled paper has a certain glare, and I observe that it easily cracks if crumpled. It is a question how far these disadvantages counterbalance its advantages. I place the two prints side by side, and should be glad to hear comments on their respective merits.

I may add that the prints of the edition of these two plates are not so uniform as the Woodbury prints above alluded to. Some are much darker, some much lighter than the standard desired. I can not say, however, that this irregularity is as great as is usually the case with silver prints. In cost the Albortype prints, paper included were rather cheaper than the unmounted Woodbury prints.



In selecting a subject for this report, which it is to be hoped may be regarded as the first of a series of short essays on morbid growths, I determined upon a case of multiple carcinoma, consecutive to the ablation of a primary cancer of the female breast. With this I have associated a brief description of a primary mammary tumor of similar structure.

The microscopical anatomy of these growths appeared of interest in connection with the recent study of Koester on the development of carcinoma and sarcoma.\*

Koester has been led to the opinion that carcinomatous growths very frequently have their origin in a proliferation of the endothelium of the lymphatics of the parts involved, and that this transformation plays probably a great part in the development of most cancers and sarcomas. His work, so far as published, is confined to the examination of epithelial cancer of the skin, and alveolar colloid of the stomach (alveolarer Gallertkrebs des Magens), and he has postponed for future parts the detailed examination of other varieties. His views have been received with much favor in various quarters; I may especially mention Rindfleisch, as having given prominence to them in the last edition of his text book.† I shall have occasion to refer further to the views of Koester in the sequel.

The following is briefly the history of the case selected for consideration:

CASE. Martha J. H—, a widow, forty-three years old, who had resided for twenty years in the District of Columbia, most of the time in East and South Washington, where she had frequently suffered from intermittent fever, first noticed a tumor in her right breast in June, 1865. The whole mammary gland was removed November 23, 1866, by Professor Johnson Eliot. The tumor, which had attained the size of a hen's egg, was hard, uneven and somewhat painful. No microscopical examination was made.

The patient speedily recovered from the operation, but never regained full constitutional vigor. In March, 1867, her health began to give way, and during April her strength failed rapidly, so that she was confined to her bed. Loss of appetite and vomiting were prominent symptoms.

After a time there was some temporary improvement, the vomiting ceased and her appetite returned, becoming in fact excessive. A tumor now appeared in the left breast, and the attention of her medical attendant was drawn to a decided enlargement of the spleen. No great pain was complained of, but the patient emaciated constantly, lost strength progressively, and died March 22, 1868, the tumor in the left breast not having yet ulcerated.

Autopsy by Dr. D. S. Lamb. The body was extremely emaciated. There was a small, hard, nodulated tumor of the left breast. The lymphatic glands of the axilla, neck and groin were enlarged and indurated. The thoracic and abdominal cavities were filled with straw-colored serum. The lungs were coated with lymph, but there were no adhesions. The lower lobe of the left lung was congested and somewhat œdematous. There was some little serum in the pericardium. The heart and pericardium, liver, spleen and internal organs of generation were removed, together with the tumor of the breast, and sent to the Army Medical Museum for study, by Dr. George Rice, the attending physician.

These specimens are preserved in the Medical Section. The following is a description of their characters:

No. 955, Medical Section. The left mammary gland, which is transformed into an oval, flat, somewhat nodulated scirrhus tumor, three and a half inches long by two and a half broad, and about an inch thick in the centre.

In thin sections of this tumor individual lacteal alveoli and ducts, stuffed with large cells, derived evidently from the glandular epithelium, were but sparsely scattered, and the greater portion of the gland was replaced by a peculiar scirrhus tissue, in which its scanty atrophied remains were imbedded. This

\* Die Entwicklung der Carcinome und Sarcome, von Dr. Karl Koester, Erste Abtheilung. Würzburg, 1869.

† A Text-book of Pathological Histology. By Dr. Edward Rindfleisch. American translation. Philadelphia, Lindsay & Blakiston, 1872.



peculiar tissue consisted of a firm, delicately fibrillated connective tissue stroma, containing numerous small cells and many fine elastic fibres, and of a plexus of irregular, varicose, nucleated cylinders of protoplasm, corresponding in many respects to the "cell cylinders" of Koester, which intimately interlaced with the connective tissue stroma, filling all its meshes except those occupied by the vessels and the atrophied remainder of the gland. These nucleated cylinders did not appear to be composed of separate cells. They seemed rather to consist of a granular protoplasm, in which innumerable nuclei, 1-2500th to 1-2000th of an inch in long diameter, or even larger, were imbedded side by side, without any evidence of limiting cell-walls separating the protoplasm surrounding each nucleus from that belonging to its neighbors. On scraping or teasing the sections, moreover, the nuclei escaped abundantly into the "juice" in a quite naked condition. Very often, however, some of the nuclei appeared in the "juice" thus obtained surrounded by a more or less irregular mass of protoplasm, resembling thus "the typical cancer cells" of the older writers.

The nucleated cylinders usually varied from the 1-1000th to the 1-500th of an inch in diameter, but in some parts attained still greater dimensions. In places where the section passed transversely through the cylinders they appeared as round or somewhat oval masses of protoplasm, stuffed with nuclei, which might readily pass for the "mother cells" of the books. In glycerine and balsam preparations the protoplasm of the cylinders was often shrunk away from the connective tissue stroma, the margin of which being clear and transparent might almost be taken for a limiting membrane.

The nuclei of the cylinders were transparent or but slightly granular when fresh, and usually contained a single large nucleolus. In the balsam mounted sections they appeared more decidedly granular. Elongated nuclei with two nucleoli and other indications of commencing division were but rarely observed. The nuclei of the connective tissue stroma were generally rather longer than those of the cylinders, but much narrower. Occasionally their position was occupied by little rows of two, four or more nuclei, which might be supposed to be the progeny of the connective tissue nuclei. Such rows were generally surrounded by a small quantity of protoplasm.

Sections taken from the peripheral portions of the tumor generally presented a certain amount of more or less altered adipose tissue. The quantity of the matrix between the fat cells was much increased, so that instead of the individual cells of each fat lobule being apparently in contact, they were separated to a greater or less extent (often the 1-2000th of an inch or more), by a delicately fibrillated matrix, in which were imbedded many oval nuclei which were both larger and more numerous than normal. The connective tissue septæ between the individual fat lobules were also greatly thickened, and in many places contained cell-cylinders quite like those of the body of the growth. (See Microscopical Section, Nos. 4615 to 4631.)

No. 958, Medical Section. A portion of the right lobe of the liver. The liver was nearly normal in size, but presented on section numerous little hard whitish nodules, varying from the size of a pin head to that of a pea, or even smaller. These were invariably situated in the course of the portal vessels, *i. e.* in the interlobular spaces. In structure they closely approximated the scirrhus tissue of the breast tumor as above described, simply the meshes of the plexus of nucleated cylinders were less elongated, and in the sections, therefore, these more frequently appeared as round or oval forms (the cylinders having been cut more or less obliquely), and less frequently as continuous cylinders of some length, such as were common in the breast sections. Hence, on superficial observation the sections of these cancer nodules of the liver appeared at first sight as a nucleated connective tissue stroma, in which numerous large, round, oval or elliptical mother cells, containing numerous nuclei, were imbedded. On carefully focussing, however, it was easy to perceive that these apparently separate masses of protoplasm formed in fact portions of a complete network of nucleated cylinders, which had been divided by the section. As in the case of the mammary tumor, the cylinders appeared to consist of a mass of granular protoplasm with numerous nuclei imbedded, actual cell-walls being nowhere distinguishable.



Nowhere did it appear that the hepatic cells had contributed by their multiplication to the formation of the cancer nodules; on the contrary the actual structure seemed quite clearly to contradict any such inference. For some little distance around each little cancer nodule the cut ends of single nucleated cylinders were frequently observed imbedded in the very substance of the hepatic acini. They always occupied however the vascular spaces or the meshes of the network of hepatic cells, and these appeared quite normal except in the immediate vicinity of the cancer nodules, where the chains of hepatic cells were often flattened somewhat, as though by the pressure of the growth. At the margins of the growths, in many places, nearly all the meshes formed by the compressed hepatic cell-chains were occupied by the nucleated cell cylinders of the cancer, the atrophied secreting tissue of the liver here taking a position corresponding to that of the connective tissue stroma of the more central portion of the cancer nodules. The cancer nodules then would appear to have grown by a continuous extension of their nucleated cylinders into the adjacent hepatic parenchyma, the secreting cells of which seem to perish by atrophy without contributing to the substance of the growth. (See Microscopical Section, Nos. 2389 to 2393.)

No. 959, Medical Section. The greatly hypertrophied spleen. The spleen was nine and a half inches long, five and a half broad, by three thick in the middle. It weighed when fresh seventy ounces. Its margins presented several deep fissures (lobulated spleen.) Beneath the peritoneal coat were a number of small cancer nodules. Sections of these cancer nodules showed their structure to be quite similar to that of the cancer nodules of the liver, except that the meshes of the nucleated cylinders were more irregular and the cylinders themselves were in many parts somewhat thicker. The relations of the margins of these nodules to the hypertrophied splenic tissue, so far as it could be made out, was essentially similar to what was observed in the liver. (See Microscopical Section, Nos. 2642 to 2655.)

No. 960, Medical Section. The uterus and its appendages. Each ovary is transformed into an oval somewhat nodulated scirrhus mass, an inch and three quarters in long diameter. In sections no trace of Graafian follicles or ovules could be discerned. The scirrhus mass every where consisted of a tissue very similar to that above described in the breast. Simply the meshes of the nucleated cylinders were longer, so that when the section passed parallel to them they could sometimes be traced running parallel to each other for some distance; moreover the connective tissue stroma was more conspicuously fibrillated than in any of the other growths. (See Microscopical Section, Nos. 2449 to 2467.)

No. 956, Medical Section. The heart. No. 957, Medical Section. A portion of the pericardium. On the surface of the heart and of the parietal pericardium were a number of flat white thickenings which were at first supposed to be carcinomatous. They proved on section to be composed of an imperfectly fibrillated matrix in which numerous small corpuscles were imbedded and probably are to be referred to some previous inflammatory process and not to the carcinomatous disease. (See Microscopical Section, Nos. 4690 to 4693.)

On reviewing this case we cannot fail to be struck first with the great similarity of the minute structure of all the morbid growths, although seated in quite diverse organs. Every where the normal tissue characteristic of the part affected appeared to be replaced by the morbid product, which was every where similar in texture.

This similarity of texture has long since been frequently observed in multiple carcinomatous growths and is the anatomical basis of the doctrine of a cancerous dyscrasis regarded as the constitutional cause of the local affections. It will readily be understood that if we could believe in a special modification of the blood giving rise to peculiar organizable exudations we should expect the tissues thence derived to be every where characterized by some common structural features the consequence of their common origin. Such a view as that of Koester however would equally well explain the circumstance referred to. For if the nucleated cylinders are, every where, transformed lymphatics they must be expected to have very many features in common, combined with some minor differences in the calibre of the cylinders, the size of their meshes, etc., consequent upon the local variations in the character of the finer lymphatic nets.



Koester describes the network of cylinders in epithelial cancer as "cell cylinders" and was able by silver imbibition to map out cell-walls and to trace the continuity of the cancer cylinders with normal lymphatics lined by their characteristic epithelium. At the time the foregoing case was investigated his monograph had not yet reached me; since reading it I have caused sections of several other carcinomatous tumors to be treated with silver, by Dr. E. M. Schaeffer, one of the assistants at the Museum. In several instances results were obtained approximating those described by Koester, but they have not yet been sufficiently complete to justify me in forming a definite opinion. I hope to make this matter the subject of a future report. In the mean time however I can not but admit the close correspondence between the outlines of the plexus of nucleated cylinders and the network obtained when the lymphatic capillaries are injected. And I may add that the general features of the morbid growths above described, viz.:—a network of nucleated cylinders interlacing with a connective tissue stroma, are to be observed in quite a number of the sections of carcinomatous growths preserved in the Museum. In none of these cases, however, have I as yet been able to satisfy myself with Koester of the existence of a lumen in the central part of the nucleated cylinders, nor am I convinced that the normal lymphatic capillaries lined by an epithelium, are alone capable of being transformed into the cancer cylinders. Much more probable does it appear to me that all the lymphatic spaces of the connective tissue are susceptible of this transformation, which would at once account for the voluminous character of the pathological network.

The presence or absence of cell walls in the protoplasm through which the nuclei of the cancer cylinders are distributed, does not appear to me an essential point. Marked cell walls can be observed in the cylinders of several epithelial cancers in the Museum collection. On the other hand, Koester himself mentions that at times he found cylinders in which the nuclei were imbedded in a granular protoplasm in which no cell walls could be observed.

In the present state of our knowledge we may perhaps regard the cell wall as an indication of a comparatively advanced stage in the history of the individual cell, which at first consists merely of a nucleus surrounded by a mass of protoplasm. There seems then no difficulty in agreeing with Koester to regard such nucleated cylinders as I have described above as composed of cells too young to be possessed of walls, and placed in such close juxtaposition that no line of demarkation can be observed between the protoplasm of the several elements.

As to the mode in which the cells of these cancer cylinders arise, however, I find greater difficulties. I am not satisfied either by my own examinations or by the study of Koester's paper that they can be justly considered the progeny of the lymphatic endothelium. A view which should regard them as transformed white corpuscles accumulated in the lymphatic passages, appears to me if any thing a more probable interpretation. This would harmonize with the general absence of any demonstrable lumen, as well as of demonstrable cell walls for the separate elements, at least in the earlier period of the history of individual cylinders; it would also harmonize with the close agreement generally observed between the elements of the youngest cylinders, *i. e.* those in the most peripheral parts of the growth, and ordinary granulation tissue.

I am not willing, however, to commit myself very warmly at present to the advocacy of any detailed views as to the mode of origin of the cancer cylinders. I desire simply to call attention to the probability, now almost a certainty, that they are conditioned in their form and direction by the pre-existing lymphatic passages, and am disposed to postpone any opinion as to their genesis till further facts have been accumulated.

In the case which has been described the primary growth was not received by me for investigation. I have therefore added a short account of a primary tumor of the breast, in which the structure was very similar to that observed in the secondary cancer of the breast in the case above described.

No. 5905, Surgical Section, is a scirrhus tumor of the female breast removed by a surgical operation in the spring of 1870. No particulars are recorded, and the subsequent history of the patient has not been reported.



A section through the piece shows that the mammary gland is represented by a small somewhat pyramidal mass, the apex of which terminates in the retracted nipple. The borders of the mass extend irregularly into the surrounding adipose tissue which constitutes the bulk of the specimen.

The case represents that very common variety of scirrhous in which the mammary gland is transformed into a small irregular cancerous mass, while the surrounding adipose tissue remains normal in bulk or even may actually increase in quantity. Nos. 3489, 3490, and Nos. 4616 to 4623, Microscopical Series, are sections of this tumor.

In these sections, as in the secondary mammary tumor in the former case, more or less modified gland lobules were but rarely encountered, and the greater part of the carcinomatous tissue appeared to consist simply of a network of nucleated cylinders imbedded in a connective tissue stroma. In this case, however, the cancerous mass was imbedded in a more bulky mass of adipose tissue, the peripheral parts of which were quite normal. The separate fat cells were much larger than in the first case, being from .002 to .004 inches in diameter, while in the first case the limits were .001 to .002 inches. This would appear to depend simply upon the degree of emaciation which existed in the first case at the time of death. At all events the anatomy of that part of the adipose tissue which adjoined the morbid growth was essentially the same in both cases. Extension of the cancer cylinders into the connective tissue septæ between the fat lobules, and the development of a more or less abundant nucleated matrix between the individual fat cells of those lobules nearest the scirrhous tissue, were characteristic conditions in both cases.

The first of the plates which illustrate this paper represents a portion of preparation, No. 3489, Microscopical Section, which is taken from this second case, magnified 400 diameters. It exhibits a side view of a part of the network of nucleated cylinders. The granular character of the protoplasm, the imbedded nuclei and the manner in which the nucleated cylinders interlace with the connective tissue stroma, are faithfully represented. The nuclei of the connective tissue stroma are not so obvious, but few of them lying in the optical plane selected for representation.

The second plate represents a portion of one of the liver nodules in the first case. It is copied from preparation No. 2393, Microscopical Section, magnified 400 diameters. The section divides several of the nucleated cylinders in a direction nearly perpendicular to their course, and they appear hence, as above described not unlike so many multi-nucleated or mother cells.

Both photographs were made from carmine stained preparations, mounted in balsam, and in both, therefore, the nucleated cylinders appear shrunk away from the connective tissue stroma in which they are imbedded.

In conclusion, I must refer briefly to another interpretation of the nature and origin of such nucleated or cell-cylinders as I have above described, which has been received with great favor for some few years.

Thiersch in his work on epithelial cancer explains the cell cylinders in that form of carcinoma, especially of the skin, as outgrowths from the lower layer of the epidermis and from the epithelium of the glandular apparatus.\* Such an interpretation implies, of course, the possibility of demonstrating that the cell cylinders are continuous with the epithelial structures from which they are supposed to have budded forth. Such a continuity Thiersch believes himself to have observed in many of his sections. He admits, however, that it is often impossible to make it out, and explains this by supposing the connection to have originally existed but subsequently to have disappeared, pointing, in justification of the hypothesis, to the history of the normal development of the embryo as affording many examples of epithelial formations, which proceed originally from the epithelium of the surface, but become disconnected with it at a later period of their growth. Thiersch did not fail to observe the fact of the frequent anastomoses of the cell-cylinders, which he has very well figured in fig. 1, Taf. IX, but this circumstance did not shake his confidence in the view he had propounded.

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\* *Der Epithelial-Krebs.* Von Dr. Carl Thiersch. Leipzig, 1865. p. 58.



Billroth maintains similar views to those of Thiersch, not merely for cancer of the skin but also for mammary cancers, and in fact for cancer generally.\* In the last edition of his lectures he mentions the view of Koester as "enticing," but thinks that "all his evidence in favor of this view is not tenable."†

I would call attention, however, to the fact that the manner in which the cell-cylinders anastomose in at least many mammary cancers, points rather to the lymphatics than to the mammary gland tissue. Moreover, when a mammary cancer returns after extirpation, or when secondary growths develop in distant organs, as in the case reported in this paper, the new formations are generally constructed upon the same structural plan as the original growth. To reconcile these facts with Billroth's views, we must resort to far more complicated and improbable hypotheses than those of Koester.

Billroth was well acquainted with the anastomosing cell-cylinders in certain forms of mammary cancer. He describes such growths as the "tubular form." According to him, mammary cancer in general almost always begins "with a coincident enlargement of the small, round, epithelial cells in the acini and with small celled infiltration of the connective tissue around them." He admits that it is "difficult to make out the further fate of the glandular acini," yet he has no doubt that in the tubular form "the acini do not maintain their form, but grow into the connective tissue as very thin cell-cylinders, while it becomes infiltrated with cells." I mention with interest that fig. 144, page 643 of his work, (*loc. cit.*) agrees precisely, so far as a wood-cut can represent the microscopical appearances of a morbid growth, with portions of some of the sections of the two cancerous breasts described in this paper. In it, as in them, certain figures which undoubtedly represent more or less modified gland acini and ducts, lie side by side with the cell-cylinders, which are variously shaped in accordance with their relation to the plane of the section. Both are imbedded in the same connective tissue stroma, but in his figure, as in the Museum preparations, no anatomical connection between the two is shown. They are separated always by connective tissue.

Nevertheless I am not prepared to deny that transformations of the true gland tissue of the parts involved, play a certain role in producing the texture of cancerous growths. But just how far they are atrophied and perish, how far at times a formative activity may lead to their transformation, are matters as to which it is difficult at present to form a judgment, and to which I hope to return at some future time.

Meanwhile I cannot avoid calling attention to two more of Billroth's wood-cuts: Fig. 148, page 648, and Fig. 150, page 651, (*loc. cit.*) the first representing the "extension of cancerous tumor into the fatty tissue about a lymphatic gland," the second "cellular infiltration of the fatty tissue in the periphery of a hard cancer of the breast." Either figure might have been drawn from the altered fat in the sections of the two breasts described in this paper, and the appearances are such that as Billroth well remarks, "we can scarcely avoid thinking that in these cases also, white blood-cells escaping from the vessels, cause the cellular infiltration." With this suggestion I heartily agree, but the real and difficult point in the analysis of cancerous tumors, as of so many pathological transformations, is to define with precision the exact part which the emigration of white blood-cells plays in the process, how far it is the principal, how far merely the accessory alteration. This report is offered as a preliminary contribution to the study of this question, now become so important in reforming our pathological doctrines.

I may mention in conclusion, that the microscopical sections referred to were all made by Dr. E. M. Schaeffer, and that they are permanently preserved in the Microscopical Section of the Museum, where they may be examined by any one interested in the subject.

Very respectfully,

Your obedient servant,

J. J. WOODWARD,

*Assistant Surgeon, U. S. Army.*

\* General Surgical Pathology and Therapeutics. By Theodor Billroth. Translated by Charles E. Hackley, M. D. New York, 1871.

† *Loc. cit.* p., 631.



PLATE I. Section of Mammary Cancer. Magnified 400 diameters.

PLATE II. Section of Cancer of the Liver. Magnified 400 diameters.









**SECTION OF MAMMARY CANCER**

Magnified 400 Diameters.

Photographed at the Army Medical Museum

By

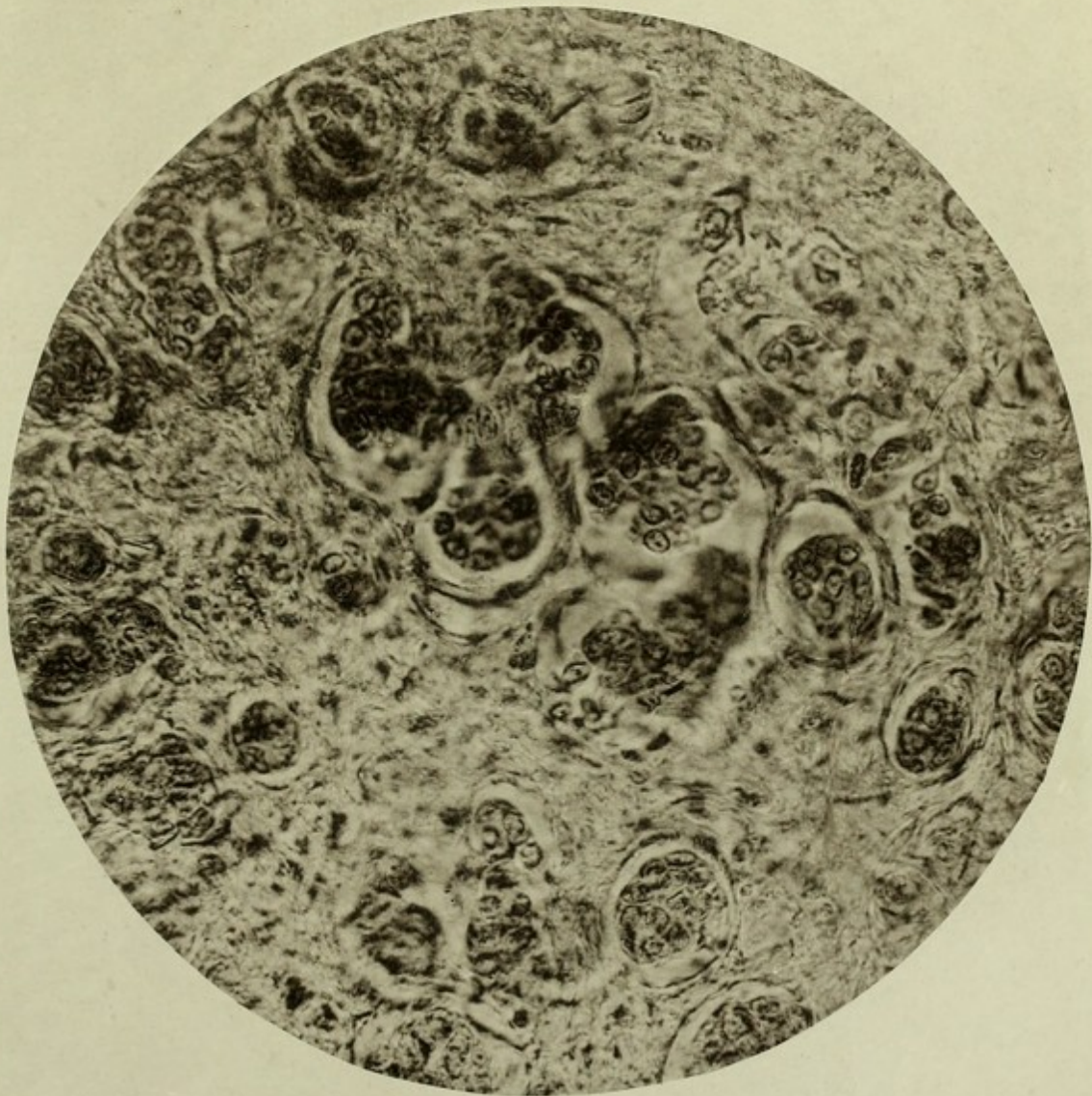
Dr. J. J. WOODWARD, U.S.A.

THE ARMY MEDICAL MUSEUM  
WASHINGTON, D.C.  
BUREAU OF ANATOMY









SECTION OF CANCER OF THE LIVER.

Magnified 400 Diameters.

Photographed at the Army Medical Museum

BY

DR. J. J. WOODWARD, U. S. A.



