DISEASES OF THE BREAST

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DISEASES OF THE BREAST

WITH

SPECIAL REFERENCE TO CANCER

BY

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WITH 69 PLATES
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DEDICATION.

TO THE STUDENTS AND ALUMNI
OF THE
FOUR MEDICAL SCHOOLS
IN LOUISVILLE AND PHILADELPHIA
WHOM IT HAS BEEN MY PRIVILEGE
AND PLEASURE TO INSTRUCT
DURING THE PAST TWENTY YEARS
THIS VOLUME
IS AFFECTIONATELY INSCRIBED.

Doctors MacFarland and Kelly, and their assistants have placed me under obligations to them for making microscopical examinations of tissues removed at the time of and subsequent to operation.

Dr. Henry S. Wieder, Demonstrator of Surgical Pathology in the Medico-Chirurgical College is largely responsible for the chapter on Tumors in General and their classification. Dr. George E. Pfahler, Medico-Chirurgical College, has kindly supplied many of the photographs reproduced, and my clinical assistants, Drs. Stilwell C. Burns and Harriet L. Hartley, have rendered valuable assistance in the preparation, operation, and after treatment of my patients.

The Publishers, P. Blakiston's Son & Co., have been most liberal in illustrating the book, and Mr. I. A. Hagy of their staff particularly has been most obliging, suggestive, and helpful throughout.

Mr. Charles F. Bauer has placed me under obligations to him for the illustrations accurately portraying the several steps of operative procedure.

My secretary, Miss M. G. Cline, has greatly assisted me in reading proof and in many other ways.

CONTENTS.

DISEASES OF THE BREAST.

ANATOMY AND PHYSIOLOGY.

A knowledge of the normal structure and relations of the breast is essential for an adequate conception of the mode of development, extent and effects of the neoplasms and other diseases which affect it, as well as for a thorough understanding of the principles upon which their rational surgical treatment depends. Therefore a review of the gross and minute anatomy of the organ will be given, and the functions so far as they bear upon the evolution of morbid processes afterwards discussed.

The breasts occupy the anterior and superior aspect of the thoracic wall, one lying on either side of the sternum, in front of the great pectoral muscles. In shape they are hemispherical, although as the result of repeated child-bearing and nursing they frequently lose their original contour and the firm, elastic consistence with which they are characterized in young women who have not borne children, becoming displaced, pendulous and flabby.

At birth the breasts are very rudimentary, and remain so until puberty, when they increase rapidly in size. The average normal dimensions in the primipara have been given as follows: length 4 to 4½ inches; breadth 5 inches; thickness 2 inches. These figures, however, are by no means constant. It has also been observed that the two breasts are rarely of exactly the same dimensions.

The anterior surface is convex, smooth and regular, presenting in its center a dark ring, the areola, which surrounds the nipple and contains from twelve to twenty sebaceous glands, appearing as minute elevations upon the surface. These are known as the tubercles of Montgomery. Their arrangement is usually irregular.

Not only does the skin of the areola differ in color from that over the rest of the mamma, but it is also characterized by absence of subcutaneous fat, and the presence of a layer of muscle-fibers beneath it, to which the name of subareolar muscle has been given. Most of the fibers are circular, being placed around the base of the nipple, but there are also some radiating fibers crossing the others in various directions. Contraction of this muscle produces erection of the nipple.

This latter structure is an elevation of variable size and shape situated in the center of the areola. It is usually cylindrical or conical in form and ends in a somewhat rounded tip containing the orifices of the galactophorous ducts. Beneath the integument of the nipple transverse and longitudinal muscle-fibers are found, constituting the mammillary muscle. The former compress the galactophorous ducts and also aid the subareolar muscle in protruding the nipple; the latter cause retraction of the nipple.

The posterior surface of the mamma rests upon the great pectoral muscle, from which it is separated by the pectoral fascia. A layer of cellular tissue intervenes between the aponeurosis of the muscle and the superficial fascia with which the gland is intimately connected.

The glandular substance, with the exception of that portion covered by the areola, is completely embedded in fat. The subcutaneous layer of fat splits into two portions, one of which passes behind the gland, lying between it and the superficial fascia, and the other passes in front of it, filling in the depressions between the glandular lobes. The anterior layer is very thick, the posterior thin.

The gland itself, when freed from the superficial structures, appears as a rough irregular mass of a grayish or light brown color consisting of twelve to twenty separate lobes. Elevations alternate with depressions. The anterior mass is covered by a layer of connective tissue which sends prolongations outward to the skin and downward between the lobes of the gland.

In former descriptions of the breast it was usually stated that the glandular substance extended from the second or third rib above to the sixth or seventh below, and laterally from the outer side of the sternum to near the anterior border of the

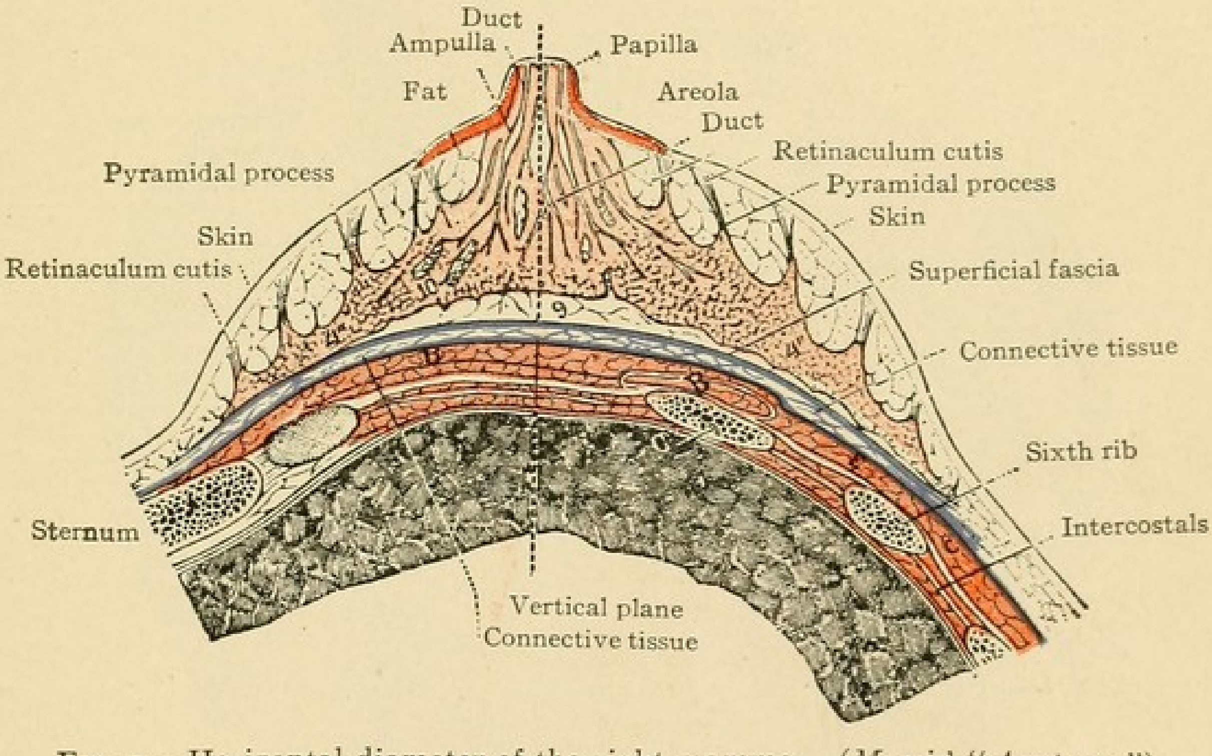


FIG. 1.—Horizontal diameter of the right mamma. (*Morris' "Anatomy."*)

axilla. It is now known, however, that this description by no means always accurately defines the limits of the organ, for it has been shown that prolongations of glandular substance may extend upwards toward the clavicle, downwards towards the external oblique muscle, inwards to the sternum, and outwards into the axilla. The last named prolongation is very common, and is considered normal by some anatomists. Cusps of glandular tissue also sometimes perforate the retromammary fascia and invade the substance of the pectoralis major muscle.

Each lobe in the gland is provided with its own excretory duct, which becomes dilated into a small sac as it approaches the nipple. This dilatation is known as the lactiferous sinus. As the sinuses advance towards the periphery of the nipple

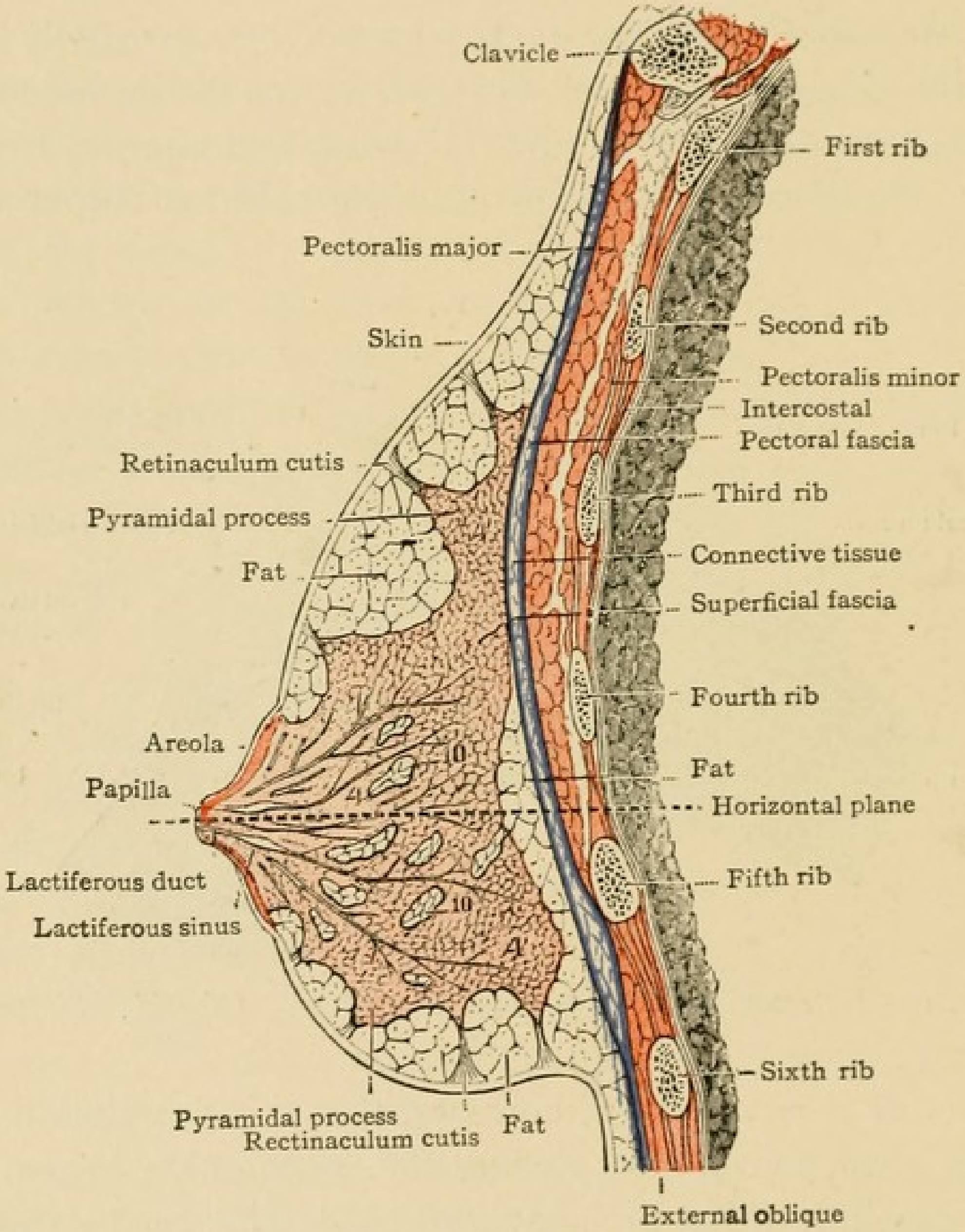


Fig. 2.—Sagittal section of the right mamma of a woman twenty-two years old. (*Morris, after Testut.*)

they become narrowed again and perforate its tip by means of minute openings about 0.5 mm. in width.

The lobes are made up of lobules, which in turn are composed of smaller structures, the alveoli or acini. It is the ducts of these alveoli, very minute passages, which unite to form the larger galactophorous ducts. The alveoli are lined with cubical epithelium, as are also the minute ducts leading from them; the main excretory ducts, however, are lined with columnar cells.

Blood Supply.—The mammary gland receives its blood from the internal mammary, the external mammary or the long thoracic, the superior thoracic, the pectoral branch of the

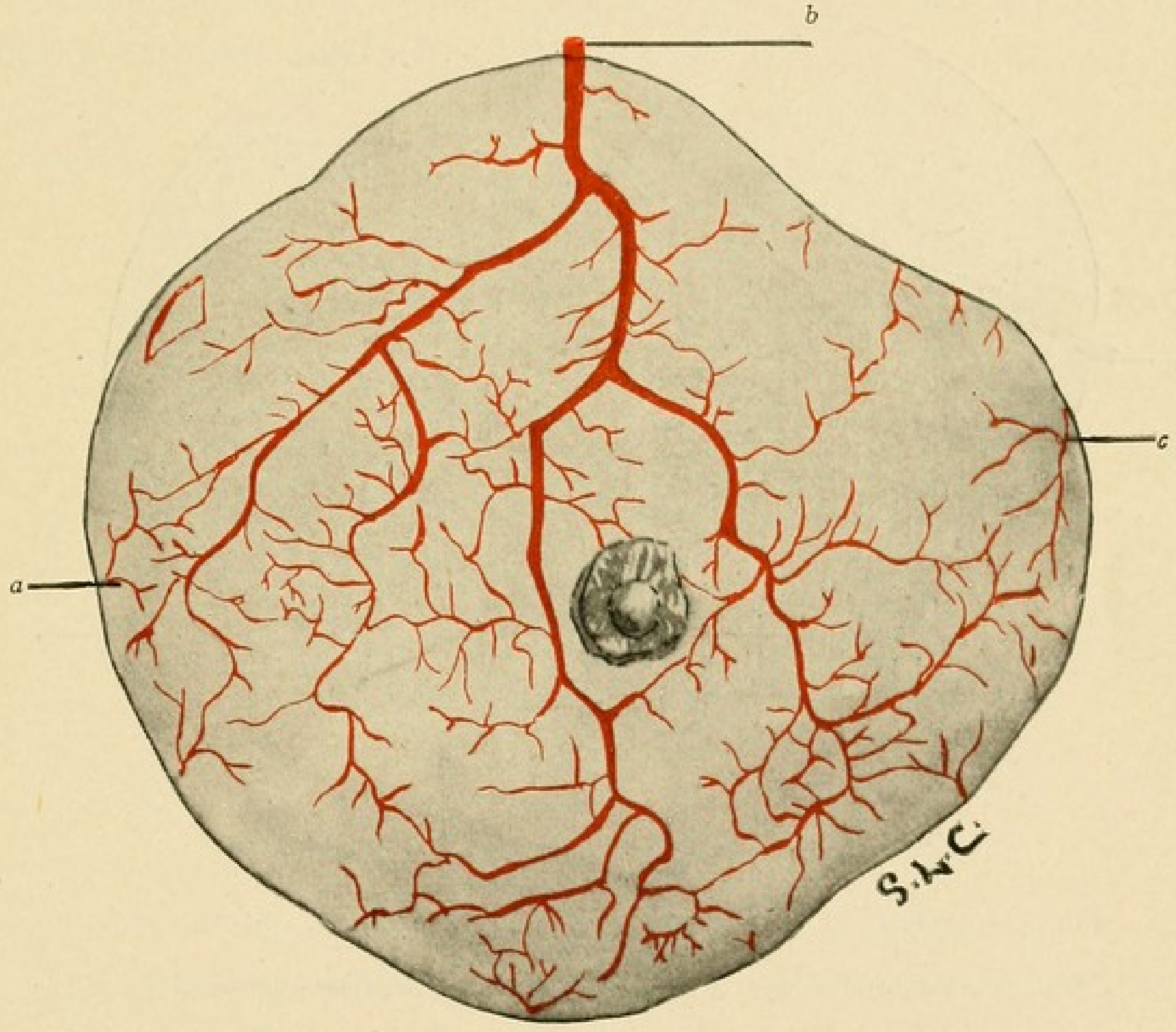


FIG. 3.—Arteries of the anterior surface of the breast. First type. (*Adapted from Piet.*)
a, Secondary artery. *b*, Principal artery. *c*, Secondary artery.

acromio-thoracic, and perforating branches from the aortic intercostals, principally the second, third and fourth.

The principal blood supply comes from the internal mammary through its first, second, third and fourth perforating branches. It has usually been stated that these branches pass directly to the deep surface of the gland, perforating it and sending branches throughout its substance. The recent investigations of Piet, however, show that such is not the case. This anatomist has found that the perforating branches of the internal mammary pierce the great pectoral muscle, enter the superficial fascia, and then become distributed over the *anterior*

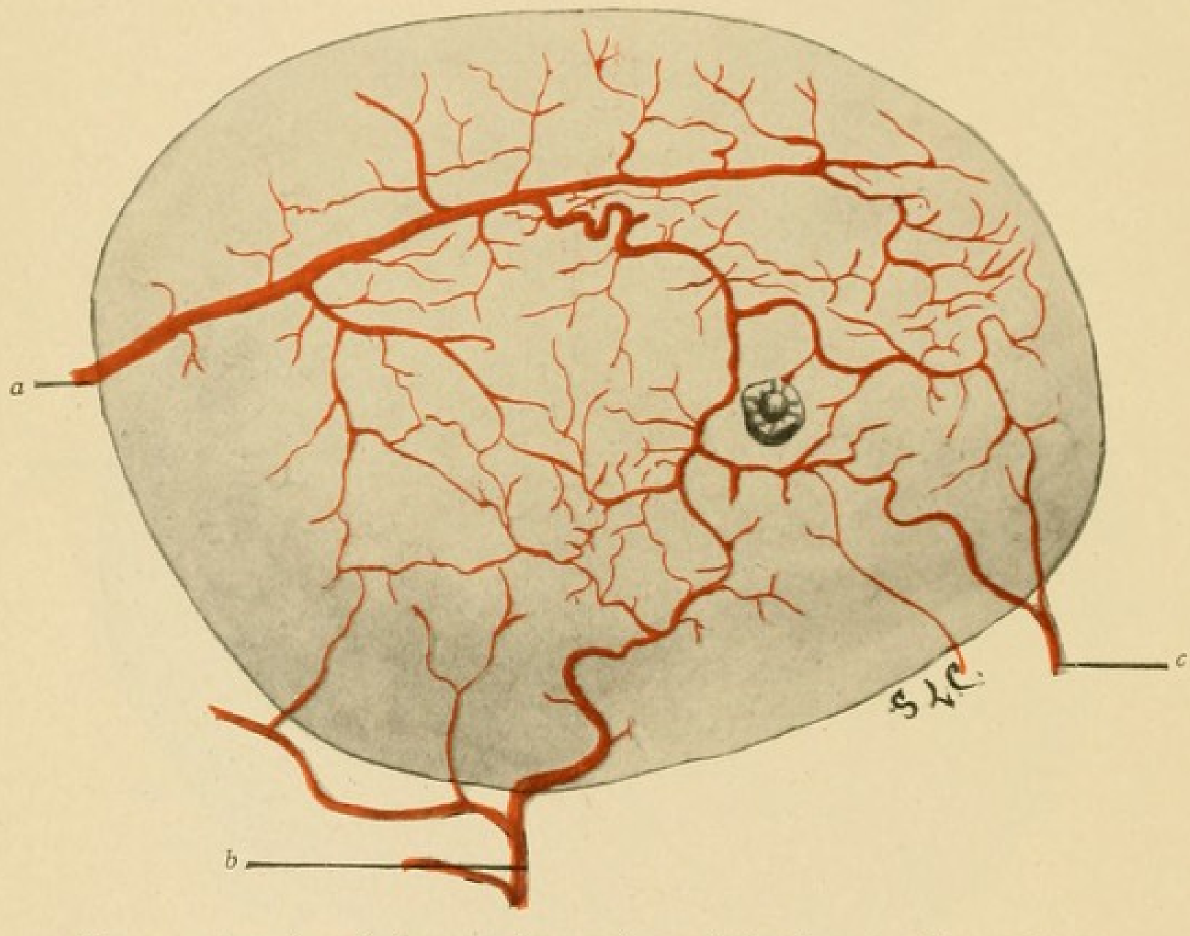


FIG. 4.—Arteries of the anterior surface of the breast. Second type. (*Adapted from Piet.*)
a, Principal artery. *b*, Secondary artery. *c*, Secondary artery.

surface of the gland. One branch, which is constant and larger than the others, he designates as the principal artery of the mamma. There are two distinct types of this vessel, as shown in figures 3 and 4. This vessel gives off five or six branches of considerable size, as well as a number of smaller ones which anastomose with one another to form the plexus above mentioned. Some small branches from this plexus are transmitted to the interior of the gland, although they do not penetrate it deeply.

The external mammary, or long thoracic, sends a few branches around the lower border of the great pectoral muscle just before it terminates in the intercostal muscles. One of these generally passes to the superficial fascia and anastomoses with the vessels of the anterior superficial plexus.

The superior thoracic sometimes sends a few branches to the upper external quadrant of the breast.

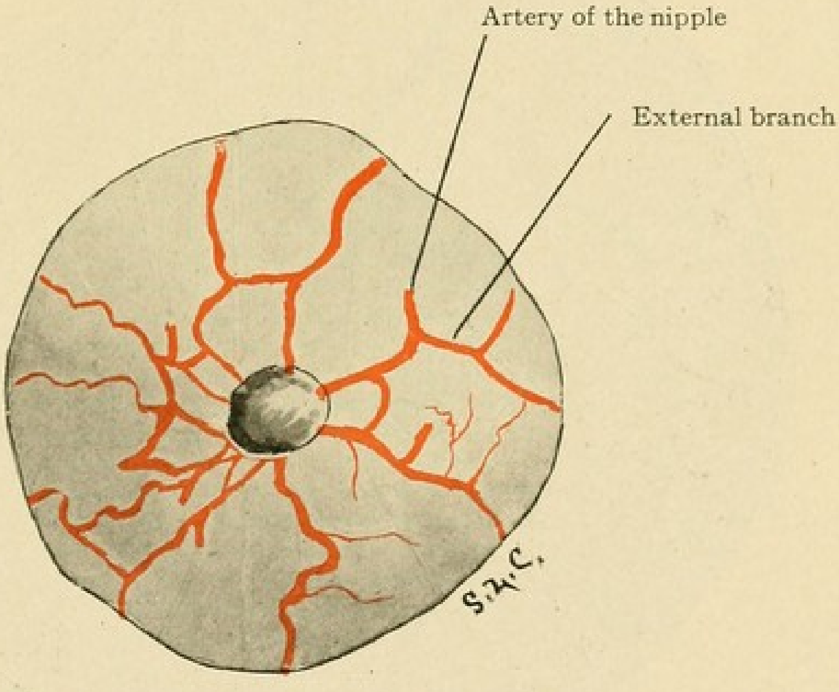


FIG. 5.—Arteries of the areola; posterior aspect.
(*Adapted from Piet.*)

The pectoral branch of the acromio-thoracic, sometimes incorrectly called the short thoracic (a term which is liable to lead to its confusion with the superior thoracic, the first branch of the axillary), sends one or more branches outwards through the pectoralis major to the mamma as it pursues its course between this muscle and the pectoralis minor.

The branches from the intercostals perforate the great pectoral, pass vertically downward between this muscle and the posterior surface of the gland for a distance of two or three centimeters, and then perforate the gland to be distributed to its deep lobes. Some of them probably anastomose with branches from the superficial portion of the gland, although Piet found it difficult to inject them through the principal branch of the internal mammary.

From the anterior plexus four or five branches are given off

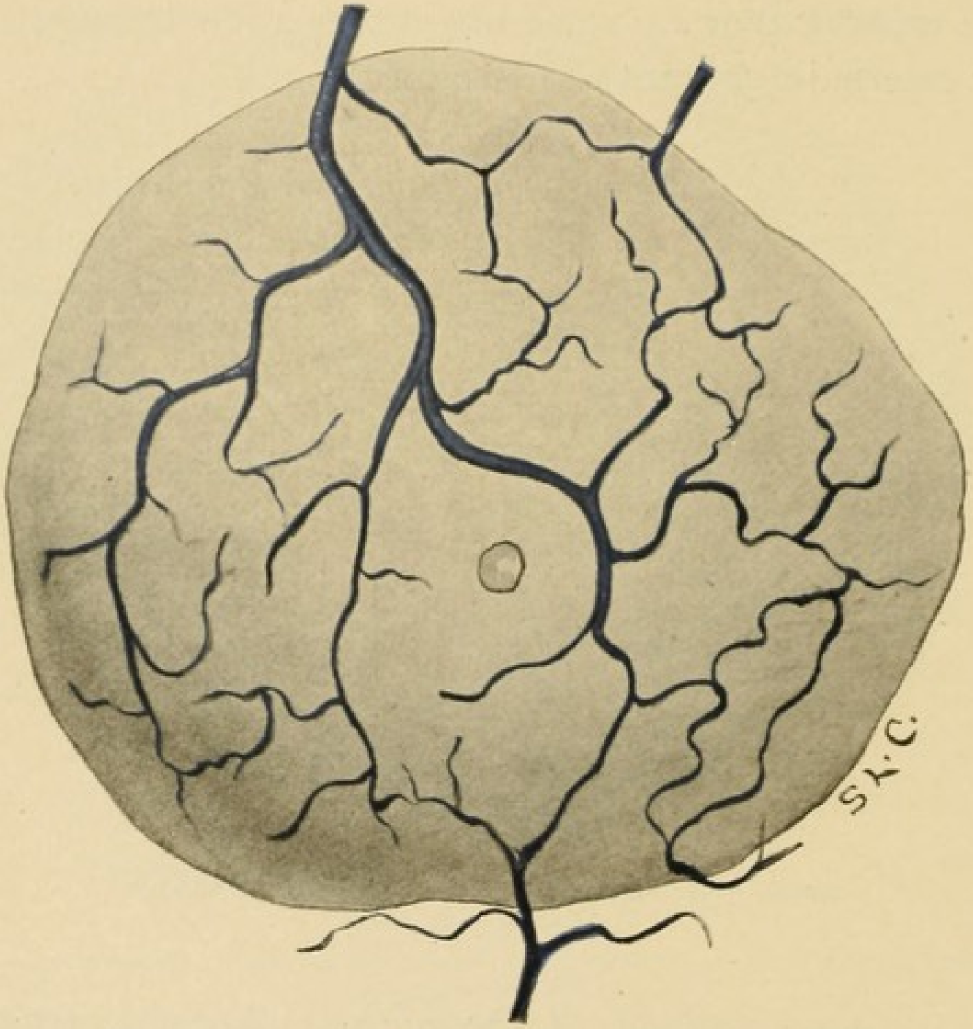


FIG. 6.—Veins on the anterior surface of the mammary gland. (*Adapted from Piet.*)

to supply the nipple and areola. Each of these divides again into two branches, an anterior and a posterior, the former of which anastomose to form a small subplexus and then pass to the extremity of the nipple. The posterior branches are distributed beneath the areola.

The veins correspond in general to the arteries, being superficial and deep; the former set are likewise the most important. There is a principal vein corresponding to the principal artery, and also not uncommonly a second one of equal size which follows the course of the chief lymphatic channel and empties into the axillary vein. The principal vein is a tributary of the internal mammary.

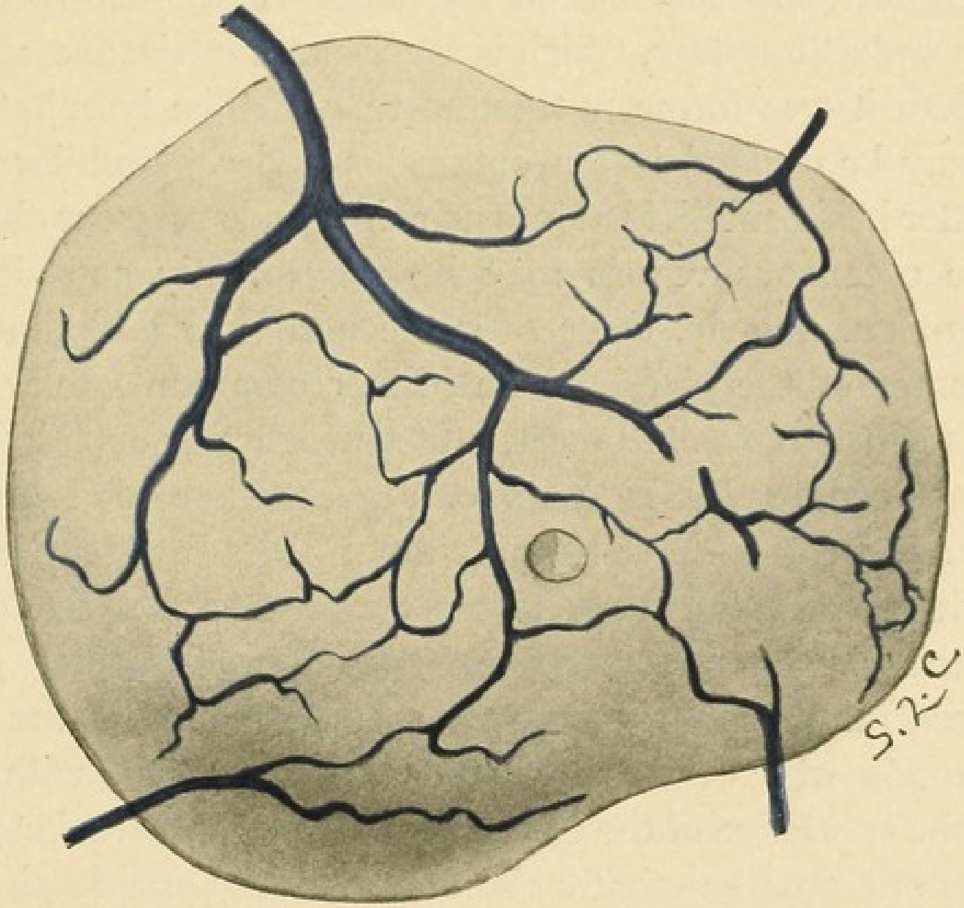


FIG. 7.—Veins on the anterior surface of the breast.
(*Adapted from Piet.*)

In addition to these there are five or six smaller veins which originate in the subcutaneous plexus and empty into the internal and external mammary, the subclavian, and the intercostal veins respectively.

There is an anastomosis of veins around the nipple which is known as the circle of Haller.

The deep veins of the mammary gland are small and few in number in comparison with those over the superficial portion. They anastomose by minute twigs with the superficial veins.

Thus it is seen that the principal blood supply of the gland, both arterial and venous, is superficial. This fact has a practical application in the surgery of the gland and will be referred to again when the operation of plastic resection of the breast for benign growths and cysts is considered.

Lymphatics.—The mammary gland is drained by a complex lymphatic system, which is much more intricate and extensive than it was formerly thought to be. The lymphatic vessels may be divided into a cutaneous and a glandular group, the latter being subdivided into principal and accessory channels.

The cutaneous vessels may be conveniently considered in two groups, namely, those over the periphery and those over the center of the gland. The former communicate with the vessels of the opposite breast, a fact which may explain the occurrence of infection in the second breast when one is diseased. Poirier and Cuneo have recently described a distinct set of vessels which drains the upper part of the breast and passes directly over the clavicle to empty into the supraclavicular glands. The central set form an intricate network around the nipple and areola which sends branches inward to unite with others from the substance of the gland and form the subareolar plexus.

The principal lymphatic channel, the only one described by Sappey, originates in the perilobular sacs, being formed by the confluence of minute channels which pass between the galactophorous ducts towards the nipple and terminate in the subareolar plexus. From this plexus two trunks are given off, an internal and an external, both of which empty into a few glands on the internal wall of the axilla, at its upper portion. The external channel, the smaller of the two, passes directly outwards from the breast to the axilla, receiving in its course a tributary from the superior portion of the gland. The internal channel passes downwards and outwards along the lower border of the pectoralis major muscle, which it crosses at about the level of the third rib to proceed outward and enter the axilla, where it empties into the glands already named.

In addition to this principal channel, three accessory channels are recognized by Poirier and Cuneo. These are the internal mammary, the subclavian, and the axillary. The internal mammary is formed by the confluence of trunks arising from the inner extremity of the mamma; after perforating the greater pectoral and internal intercostal muscles it empties into the glands of the mammary chain. The subclavian channel is given off from the posterior surface of the mamma, and after perforating the pectoralis major runs between this muscle and the pectoralis minor to empty into the subclavian glands. There are several small glands along the course of this channel which, according to Rotter, are enlarged in one-half of all cases of cancer. The accessory axillary channel begins at the inferior portion of the gland by a few small vessels and passes directly to the axilla.

Still another accessory channel has been observed by Oelsner. This investigator has found several small channels at the inferior border of the gland which traverse the great pectoral muscle and then pass into the thorax through the fourth intercostal space. Some of these branches follow the intercostal vessels to the spine, a circumstance which explains those cases of mammary cancer which are ultimately complicated with spinal symptoms, or even paraplegia.

In order thoroughly to understand the possibilities of carcinomatous dissemination through the lymphatic system, it is necessary to understand not only the drainage of the mammary gland by its principal and accessory large channels, but also to possess an adequate conception of the arrangement and distribution of the **fascial lymphatic plexus.** Mr. Handley's description of this great lymphatic investment of the body is so lucid and concise that I cannot do better than quote it.

"This great plexus is divisible by the median plane of the body and by two horizontal planes passing through the clavicle and through the umbilicus respectively, into six catchment areas, three on either side, draining as the case may be into the cervical, the axillary, or the inguinal glands. The line, or rather zone, separating any two adjacent areas, may be called the lymphatic water-parting, and is anatomically a zone of nar-

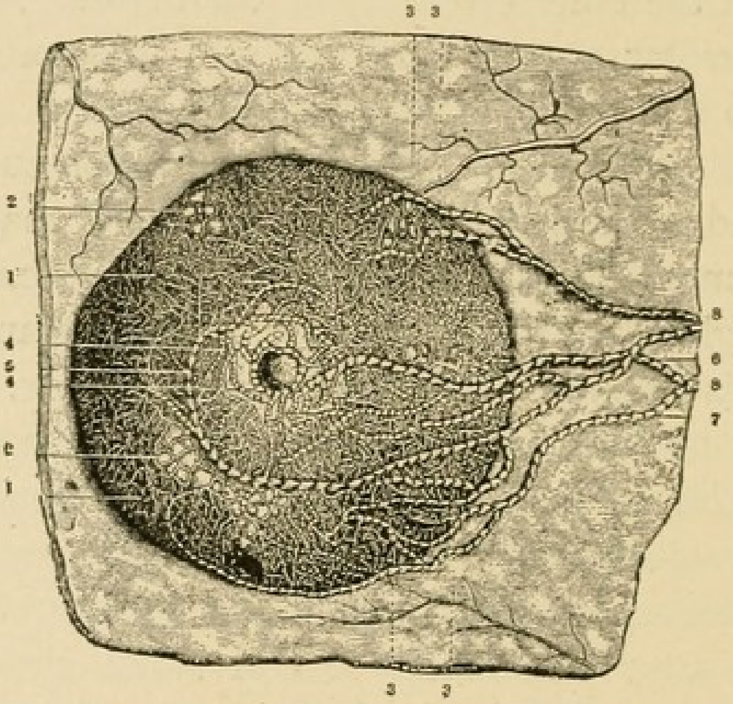


FIG. 8.—Lymphatic vessels of the anterior surface of the breast; the subareolar plexus and the trunks which run from it (Sappey). 1, 1. Lymphatic network of the anterior surface of the mammary gland. 2, 2. Lobules of the gland, the peripheral network of which has not been injected in order that the circumlobular network which encircles it may be seen. 3, 3, 3, 3. Trunks which arise from the upper and lower parts of the gland. 4, 4. Subareolar lymphatic plexus. 5. Lymphatic vessel which arises from the inner part of this plexus. 6. Vessel arising from the inner part of the same plexus. 7. Vessel coming from the lower part of the gland; after a long course it unites with the preceding to form one of two trunks in which all the others end. 8, 8. The two principal lymphatic trunks which extend transversely from the mamma to the axillary glands. ("*The Lymphatics*," *C. H. Leaf.*)

row tortuous channels, nowhere traversed by trunk lymphatics, a region, consequently, where the lymph stream is at its feeblest, and where even very fine particles are liable to be arrested.

"The general idea then, which we have obtained of the parietal lymphatic system is that of a vast horizontal network of fine channels, co-extensive with the surface of the body, and receiving above numberless fine vertical tributaries, which convey to it the lymph from the skin and its appendages. Among the latter we must include the breast. On its deep aspect the plexus receives tributaries from the subjacent tissues. From

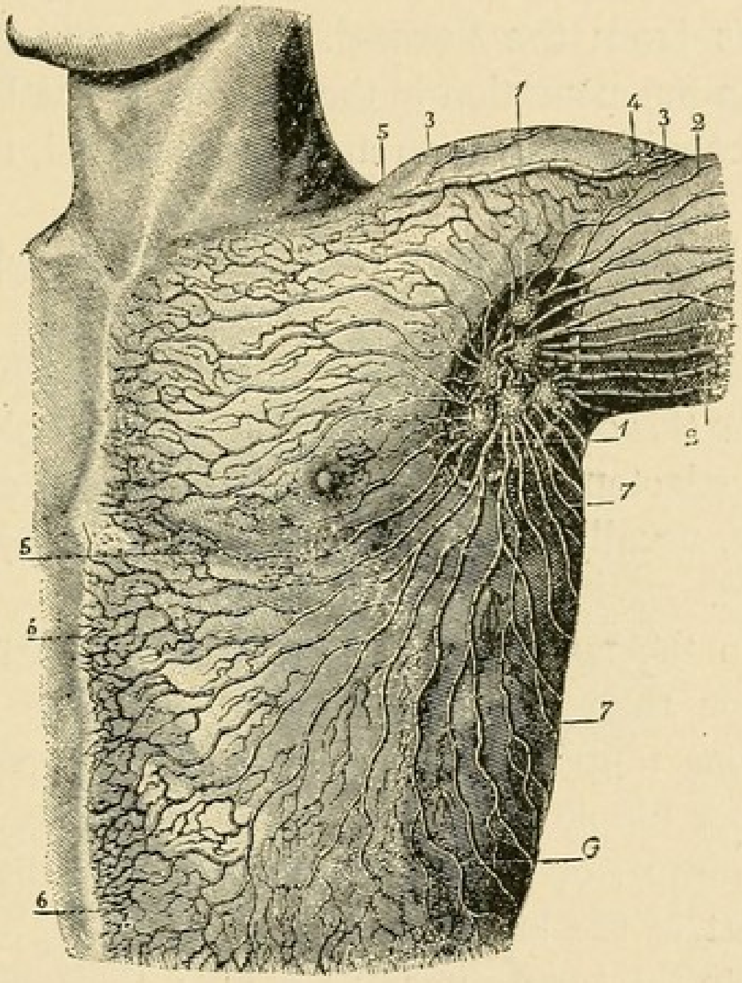


FIG. 9.—Lymphatic vessels of the antero-lateral portions of the thorax (Sappey). 1, 1. Axillary glands. 2, 2. Superficial lymphatic trunks of the upper limb. 3, 3. Large trunks which also come from the integuments of the upper limb, but which instead of ending in the glands of the axilla, run in the space between the deltoid and pectoralis major, and terminate in a subclavicular gland. 4. A gland which is sometimes seen in the course of this trunk. 5, 5. Lymphatic vessels of the anterior superior part of the thorax. 6, 6, 7, 7. Lymphatic vessels which start from the integuments of the thorax. (*"The Lymphatics,"* *C. H. Leaf.*)

this great plexus, which lies in the subcutaneous fat upon the deep fascia, the lymph is conveyed by six sets of lymphatic trunks, each draining a definite area, to the cervical, the axillary, or the inguinal glands."

Nerves.—The nerves of the mammary gland are derived from the intercostals, from the supraclavicular branch of the cervical plexus, and from thoracic branches of the brachial plexus. They are distributed to the skin over the gland, to the muscular fibers of the areola, to the blood-vessels, and to the glandular substance itself.

Variations from the Normal.—There may be either a reduction or an augmentation in the number of the breasts. To the former condition the term amazia is applied, to the latter, polymastia.

Congenital absence of both breasts is exceedingly rare, and unilateral absence is by no means common.

Absence of the nipple is another abnormality which requires mention. To this condition the term athelia is applied. When it exists the galactophorous ducts make their exit at the center of the areola, usually in a slight depression occupying the site of the nipple.

Increase in the number of breasts, or polymastia, is much more common than amazia. Polythelia, or the presence of more than one nipple, is also comparatively frequent. The supernumerary nipple may be situated on the areola, close to the normal nipple, or it may be located some distance away from this part of the breast.

In regard to the supernumerary breasts, their size and location is most variable. It is interesting to note, however, that they are most commonly found on those portions of the body where breasts normally occur in certain animals. Thus they are often found in the axilla or upon the borders above or below the normal breast, on the lower portion of the thoracic wall, and also on the abdominal wall. Their occurrence on the abdomen, however, is much rarer than on the portion of the body previously named.

They have also been found on the back, the shoulders, and various parts of the thigh.

As regards their numerical occurrence, not more than one or two are present, as a rule, although three sometimes occur, and there are isolated cases on record in which six or eight have been present. In most cases probably there is only one.

Polymastia occurs in men as well as women, and by some anatomists has been considered equally as common among them as among the latter sex. Recent statistics, however, show that it is more frequent among women. Of two hundred

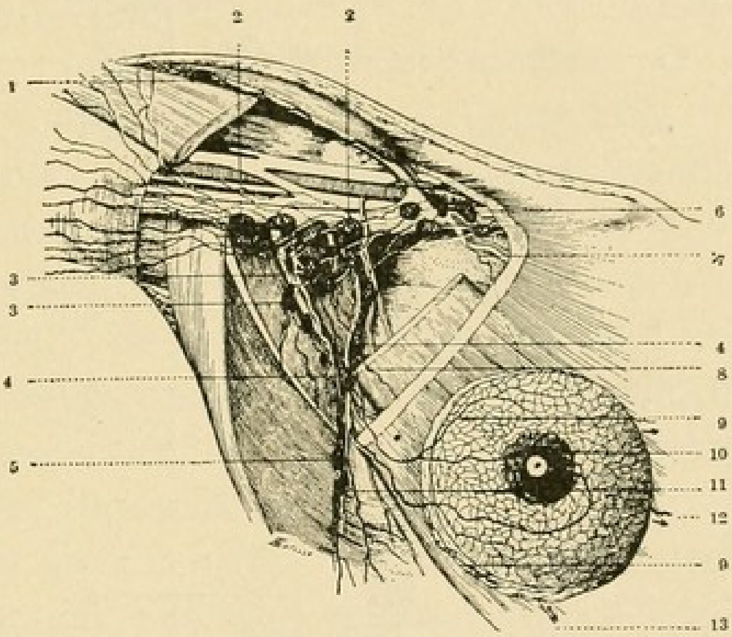


FIG. 10.—Lymphatics of the breast and axillary glands (semidiagrammatic). 1. Delto-pectoral gland. 2, 2. Glands of the humeral chain. 3, 3. Glands of the central group and the scapular chain. 4, 4. Glands of the thoracic chain (supero-internal group). 5. Gland of the thoracic chain (infero-external group). 6. Subclavian glands. 7. Mammary lymphatic ending in the subclavian glands (inconstant). 8, 9. Mammary collecting trunks, ending in glands of the thoracic chain. 10. Subareolar plexus. 11. Cutaneous collecting trunk of the lateral walls of the thorax. 12, 13. Mammary collecting trunks about to end in the internal mammary glands. ("*The Lymphatics*," *C. H. Leaf*.)

and sixty-two cases collected by Hanseman only a small percentage were in men.

Heredity is supposed to play a role in its occurrence. These breasts are seldom functionally perfect.

The Male Breast.—In the adult male the mammary gland is perfectly developed. At birth, however, it is of about the same dimensions as in the female. At puberty signs of evolution sometimes appear, the gland enlarging somewhat and becoming slightly painful. These signs of activity soon subside and the gland returns to its original size.

Its structure is practically the same as that of the female organ with the exception that a typical areola is not found. The galactophorous ducts are also rudimentary.

Physiologically the breast is a secreting organ appurtenant to the reproductive system, and characterized particularly

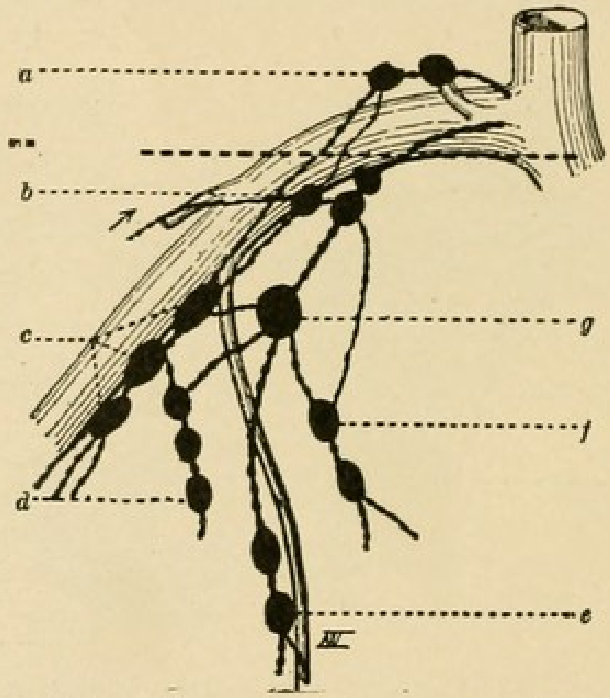


FIG. 11.—Scheme of the axillary glands. 2. Supraclavicular glands. *b.* Subclavian glands. *c.* Humeral chain. *d.* Scapular chain. *e.* Infero-external portion of the thoracic chain. *f.* Supero-internal portion of the thoracic chain. *g.* Central group. The dark dotted line indicates the situation of the clvicale. ("*The Lymphatics,*" *C. H. Leaf.*)

by periodical phases of activity, which are most pronounced during the era of active sexual life.

The secreting power of the gland, however, often manifests itself shortly after birth, inasmuch as a small quantity of milk is discharged from the nipple.

That this secretion is a true lactation has been proved by De Sinéty (Arch. de Physiologie, 1875) and also by Variot, Kölliker, Barfurth and others.

This activity soon subsides, as a rule, and the gland remains quiescent until puberty, when its dormant vitality is first markedly aroused and it undergoes a series of changes in common with the other organs constituting the reproductive system.

A few cases of **persistent lactation** in the new-born have been recorded. Thus Mr. Sheild mentions one occurring in a female child aged sixteen days. A more remarkable case is one recently reported by Mr. Murray (Lancet, Jan. 7, 1905) occurring in a male child aged three and one-half months. Both breasts, which were enlarged to about the size of a billiard ball, were firm with palpable gland substance; the nipples were also enlarged and oozed fluid resembling milk. The mother said the child's breasts began to enlarge when he was five weeks old, and had gradually increased in size. The child died from congenital heart disease three weeks after admission to the Hospital. Section showed both breasts to be lactating. The gland substance was healthy, the ducts enlarged and irregular. Microscopically the secretion resembled milk, although the fat content appeared low.

At puberty there is a rapid growth of the organ, which soon attains the normal size, form and consistence that characterizes it in the adult female who has never borne children. It does not reach its highest degree of development until pregnancy, parturition and lactation have taken place. Thus, although the increase in the size of the breast occurring at puberty is accompanied by formation and partial development of alveoli, which are the physiological units of the organ, these structures are not completely developed until the first pregnancy has terminated and lactation begun. At puberty they develop only at the periphery of the gland.

The structural transformation which the breast undergoes at puberty is accompanied by manifestations of functional awakening; and just here it may not be amiss to state that structure and function are inseparably connected, that when the potential specific activity existing in the organ from the establishment of puberty to the incidence of the climacteric becomes actually manifest, certain alterations in the structure of the alveoli, the physiological units, are observed to take place. These are particularly marked during the period of lactation, and will be described in detail when this subject is discussed.

In reference to the functional manifestations which occur at puberty, it has been observed that pain is frequently complained of, that the breasts are tender to touch, and that slight swelling of the lymphatic glands which receive the lymph from the mamma sometimes occurs.

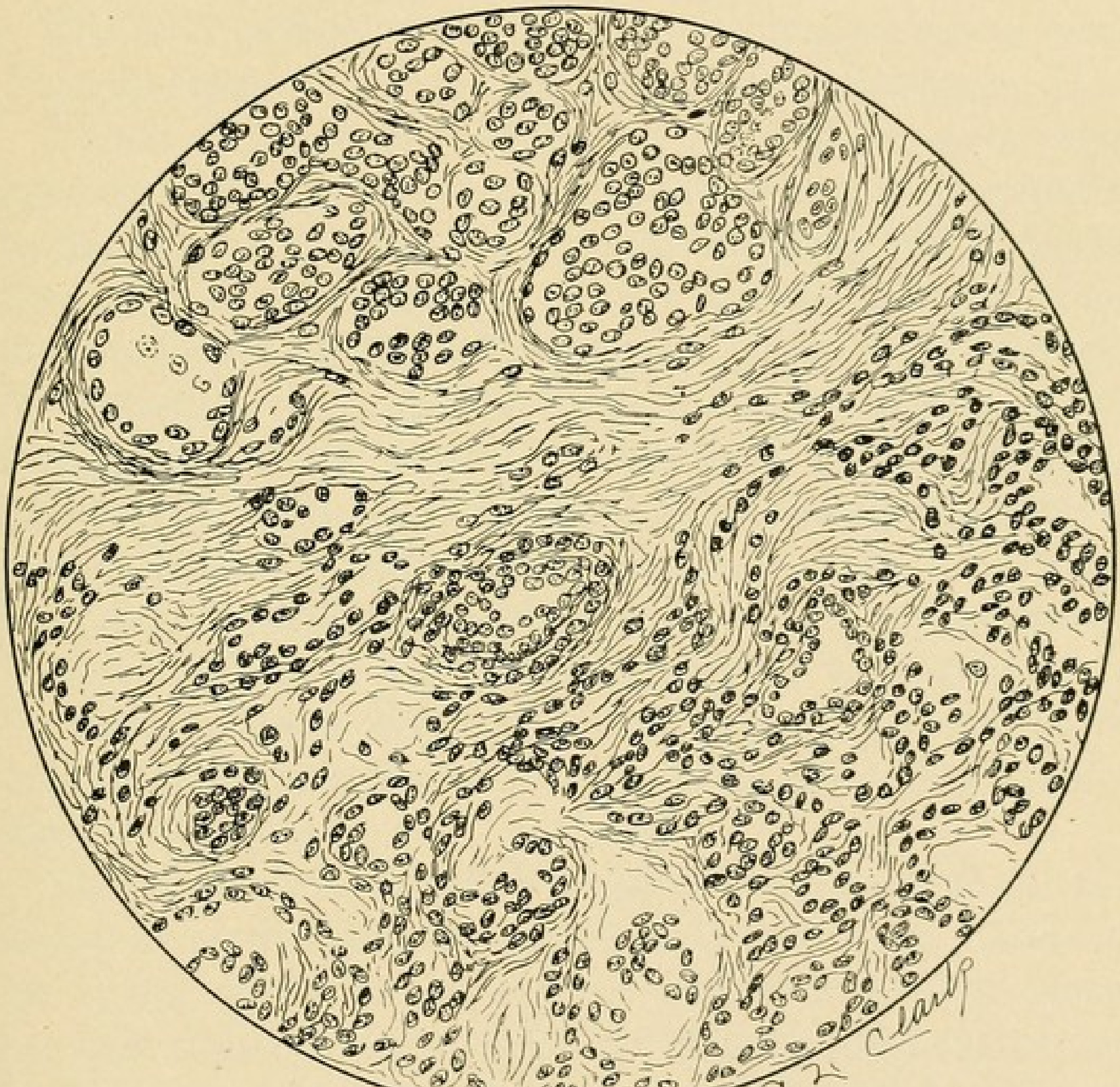
After the establishment of puberty the gland becomes quiescent until pregnancy occurs, when it undergoes decided changes. At about the eighth week after conception the breasts begin to increase in size and continue to enlarge until the termination of pregnancy, and for some days thereafter. There is an increase in all the constituent structures. The alveoli become larger and more numerous, the blood-vessels distended, the superficial veins prominent, the areola larger and darker in color, and the nipples swollen and sore. The secondary areola is also formed at this time. The tubercles of Montgomery enlarge, and striæ form in the skin owing to the pressure exerted upon it by the distended gland.

If the alveoli be examined microscopically at this period, it will be found that they are in reality solid cylinders composed of cells. Toward the close of pregnancy, or soon after delivery, some of these cells are cast off, leaving a single mosaic layer to line the walls of the alveoli.

All these changes are wrought in anticipation of and preparation for the specific function of lactation, which begins shortly after the occurrence of parturition.

For the first day or two after delivery the breasts secrete a substance known as colostrum, a yellowish-white fluid containing cast off cells which have undergone fatty degeneration and which are known as colostrum corpuscles. It is supposed

PLATE I.



Section from a non-lactating breast.

that these cells are derived from the interior of the alveoli, that they do not possess the secreting power peculiar to those which line the alveolar walls and that they are therefore cast off. The destruction of these cells creates a lumen within the alveoli which was not present during pregnancy. Thus receptacles are formed for the milk before it begins to be secreted.

The fluid portion of the colostrum is merely a serous transudate and in no wise a specific secretion of the mammary gland.

Usually on the second or third day after delivery milk begins to be secreted. Its appearance is not uncommonly accompanied by slight local and constitutional disturbances, which are the expression of the increased cellular metabolism upon which the production of the milk depends. Thus slight elevation of temperature, as well as soreness and swelling of the breasts, sometimes occurs. Enlargement of the lymphatic glands in the axilla and above the clavicle has also been known to take place. These changes are due entirely to increased functional activity of the gland, and not to any extraneous causes. Perhaps it may be absorption of waste-products of the cells, products which are elaborated and cast off as the result of the increased work going on in the gland, that produces these phenomena.

That the secretion of milk is governed by the nervous system is shown by experimentation and clinical observation. Although the results of the former are not entirely in accord, enough has been demonstrated to show that there is a decided nervous influence presiding over the function of lactation. Stimulation of the mammary nerve in a bitch was followed by secretion of milk (Laffont). Irritation of the sensory nerves in the nipple also results in a more profuse flow of milk. Thus it is well-known among parturient women that putting the child to the breast stimulates the secretory power of the gland. Remarkable cases have been reported in which the male breast was stimulated to secretion in this manner.

The influence of fright and anxiety is well-known; it is not at all unusual for complete temporary arrest of secretion to occur in women who are subject to either of these emotions.

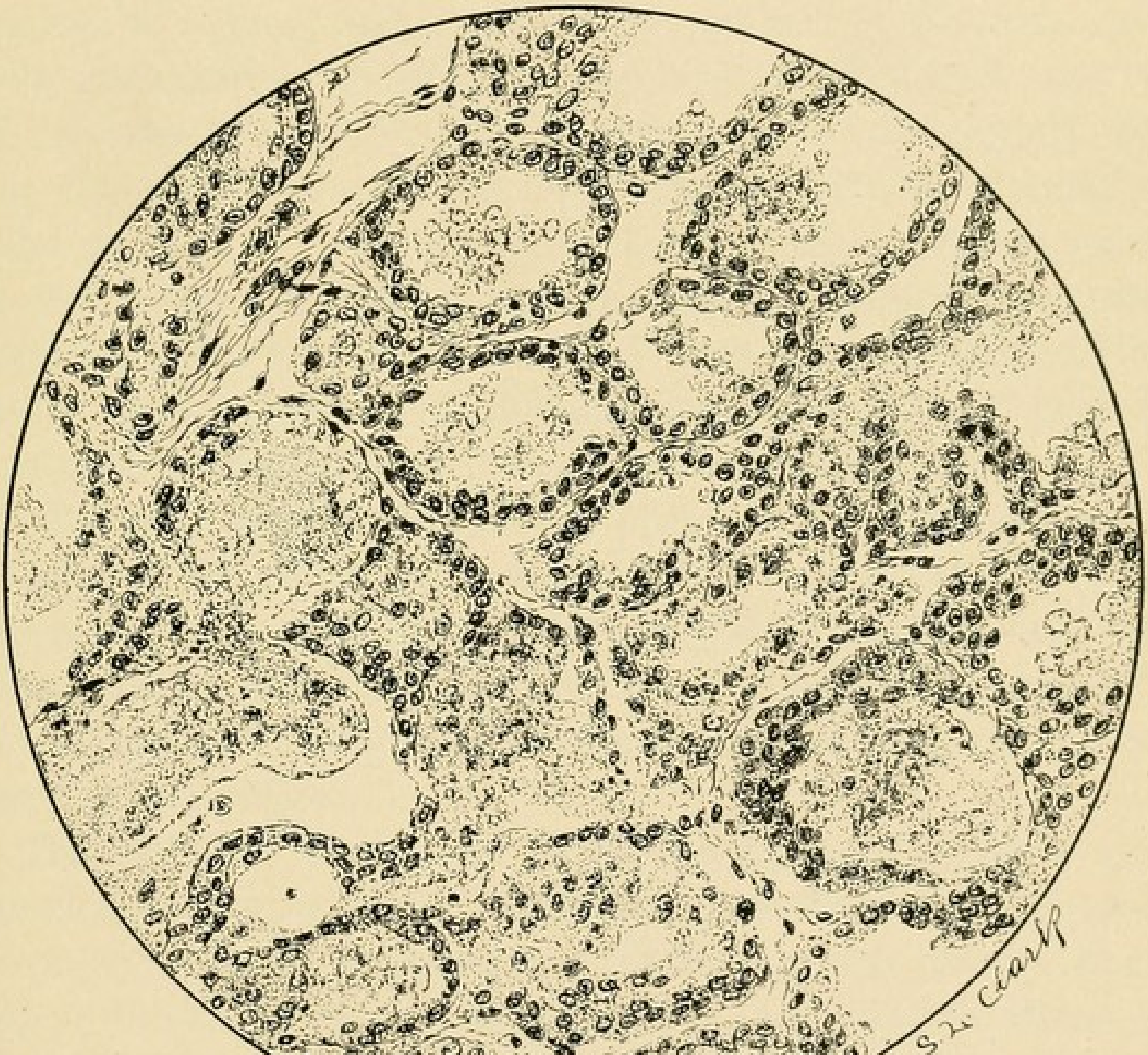
We have already seen that the mammary gland develops simultaneously with the organs properly constituting the reproductive system. Its intimate relation with these organs is again manifested not only during pregnancy, when it attains a high degree of development, but also during the period of lactation. Thus it has been observed that the uterus sometimes fails to undergo normal involution when milk fails to be secreted, a circumstance which may be attributed to the absence of uterine contractions produced by the stimulation of suckling.

If now we come to study the alveoli, the functionating portion of the breast, during the period of lactation, not only will their condition be found different than it is before and during pregnancy, but variations will be observed according as they are examined when actively functionating or at rest. To these conditions Michael Foster has applied the terms loaded phase and discharged phase respectively. He describes them as follows:

"In the discharged phase the alveolus is lined by a layer of low cubical or even flattened cells, so that the relatively large area of the alveolus is almost wholly occupied by the lumen in which some of the constituents of the milk may still be retained. Each cell consists of granular cell-substance in which is placed a rounded or oval nucleus; sometimes the free edge of the cell is jagged and uneven as if a portion of the border had been torn away.

"In a fully loaded phase the appearances are very different. The alveolus is now lined with a layer of tall columnar cells projecting unevenly into the lumen, the outline of which is correspondingly irregular and the area of which is much reduced. While the broader base of each cell rests on the basement membrane, the other end, the conical or irregular, stretches

PLATE II.



Section from a lactating breast.

towards the center of the lumen. Instead of one nucleus two or more are now present, one, well-formed and normal, being placed near the base, and the others, often showing signs of breaking up or degeneration, nearer the free end. Some of the cell, including one or more of the nuclei, is apparently being separated from the basal portion in which the remaining nucleus is lodged, and occasionally portions or fragments of cells, nucleated or nucleusless, may be seen lying in the cavity of the alveolus. In the cell-substance, especially toward the free border of the cell, are numerous oil-globules of various sizes, as well as granules or particles of other nature; some of the larger oil-globules may be seen projecting from the surface as if about to be extruded from the cell; and in the cavity of the alveolus oil-globules with a thinner or thicker coating of cell-substance are frequently present.

"Between such a fully loaded phase, and a completely discharged phase, various intermediate conditions may be observed, the cells being of greater or less height, containing one nucleus only or more than one, the cell-substance occupied with few or many oil-globules and other granules, and the free border more or less jagged."

This detailed description of the physiological unit of the mamma during the stage of its greatest activity has been quoted in order better to contrast the condition which obtains in it during the subsidence of lactation and the period in which it is restored to its previous condition. The microscopic appearance of the non-lactating and lactating breast is shown in Plates I and II respectively.

The term **involution** is applied to the process by which the breast is rehabilitated.

If a section of the mamma be examined during the period of involution, the alveoli will be found to be much smaller than they were during lactation. The cells lining their walls are much reduced in number and are also smaller in size, and their protoplasm has disappeared, leaving the nuclei unsurrounded. As the process of involution progresses the alveoli become converted into spherical spaces containing the nuclei of the cells which lined their walls during the period of lactation. These contracted alveoli are not surrounded by minute blood-vessels as they are when the gland is at the height of its activity, although some are still seen ramifying in various directions.

The contraction of the alveoli is uniform throughout the lobule, as a result of which the various lobules become reduced in size, spaces being formed between them.

In addition to the alterations in the alveoli, changes also occur in the other portions of the gland. Thus there is an increase in the fibrous tissue between the lobules and in the fat surrounding the gland.

When another pregnancy occurs the same process of evolution previously described is gone through and the functionating power of the gland again raised to its highest degree during the ensuing period of lactation.

It is evident that these phases of evolution and involution of the breast are accompanied by much tissue formation and tissue destruction, and it is not unreasonable to suppose that deviations from the normal method of metamorphosis furnish a basis for the development of some of the morbid processes to which the organ is subject. Reference to this matter will be made again when considering the pathology of tumors.

During the climacteric the mammary gland atrophies and becomes much decreased in size.

INFLAMMATORY DISEASES OF THE BREAST.

Under this heading will be considered congestion and engorgement, acute mastitis, acute abscess, chronic mastitis, and chronic abscess.

With the exception of chronic mastitis these affections are most common in the puerperium, and, indeed, engorgement of the milk-ducts occurs at no other time.

The terms congestion and engorgement are commonly applied to the same condition, namely, distention of the galactophorous ducts with milk. The inflammation or congestion of the breast occurring in the new-born and at puberty has already been mentioned. In the former it is more likely to develop if attempts are made to press the secretion out through the nipple.

If infection takes place, as not uncommonly happens, suppuration may ensue.

Usually these affections are readily relieved by simple hot applications. Sometimes, however, suppuration ensues and then incision is required. The subsequent cicatrization may interfere with the development of the breast. The pressure resulting from distention of the breast with milk gives rise to irritation and swelling of the affected parts, which most commonly are the lower and external portions.

These local manifestations of interference with the normal function of lactation are accompanied by signs of constitutional disturbance which, however, are slight unless an infective process be superimposed upon the one already present. Thus a slight rise of temperature and moderate headache, together with a general feeling of ill-being, are not infrequently present.

It has been observed that the incidence of this affection is most common on the third or fourth day after delivery. It may occur at any time, however, particularly if nursing be suddenly interrupted, as for example, by the death of the child, or because of soreness of the nipple so severe as to prevent suckling.

The therapeutic indications are to empty the breasts, relieve congestion, and afford proper support.

They are met by gentle massage, properly supporting bandages, hot moist applications, and the administration of saline cathartics.

The breast may be gently rubbed with warm sterilized olive-oil, or with a mixture composed of lanoline one part and benzoated lard seven parts, the mixture being liquefied and sterilized in a water-bath each time it is used. The use of a fatty substance in conjunction with massage seems to be of real benefit as well as being decidedly grateful to the patient.

Hot moist applications may be used in the intervals. A flannel wrung out of hot normal saline solution or a saturated solution of boric acid may be applied to the breast and covered with oiled silk, being changed as soon as it begins to get cold. Such applications may be kept up constantly if a nurse is in attendance, otherwise they are to be made for periods for one-half hour, three or four times a day.

As already stated properly supporting bandages are to be applied. As the engorgement subsides compression may be increased by putting cotton or wool beneath the bandage and binding it firmly to the skin.

In regard to the purgatives Epsom or Rochelle salts answer every purpose.

It was formerly held that engorgement of the breast was the cause of mastitis and abscess. It is now known, however, that such is not the case, although it is still admitted that engorgement acts as a predisposing cause.

The essential cause of inflammation of the breast, whether simple or suppurative, is infection with microörganisms, principally the staphylococcus pyogenes aureus. Streptococcic infection may also occur, and is of a particularly virulent form, giving rise to suppuration and severe constitutional disturbances.

Infection usually, though not always, takes place through an abrasion on the nipple, areola, or skin on some other portion of the breast.

It is theoretically possible, and no doubt sometimes actually happens, that germs already present in the gland are aroused to renewed activity during the period of lactation, with the result that inflammatory processes are lighted up. It is evident that the congestion incident to engorgement of the gland would afford a favorable soil for the growth of any organisms present, for example, those left dormant after the subsidence of a previous attack of suppurative inflammation.

The occurrence of mammary abscesses during the course of pyemia or as a complication or sequel of erysipelas furnishes a good example of infection by way of the blood current.

In the vast majority of instances, however, careful examination will reveal a solution of continuity in some part of the integument, usually on that covering the nipple or areola.

The infection may be conveyed through the mouth of the child, by the hands of a dirty nurse or a careless physician, or by the mother herself.

Three varieties of inflammation are distinguished, namely, **superficial or subcutaneous, deep or parenchymatous,** and **retromammary.**

In the **superficial form** the infective microörganisms are conveyed by the lymphatics to the tissues just beneath the areola, or occasionally for a short distance beyond, where they set up an inflammatory process. The affected area becomes reddened, sore, and swollen.

The inflammation is prone to extend superficially, especially if it goes on to suppuration, advancing towards the skin rather than laterally. This circumstance is due to the fact that lateral extension is limited by the superficial processes of fibrous tissue extending from the interlobular septa to the skin.

It may, however, invade the deeper portions of the gland, extending along the interlobular septa and thus giving rise to the **parenchymatous form.** The septa between contiguous

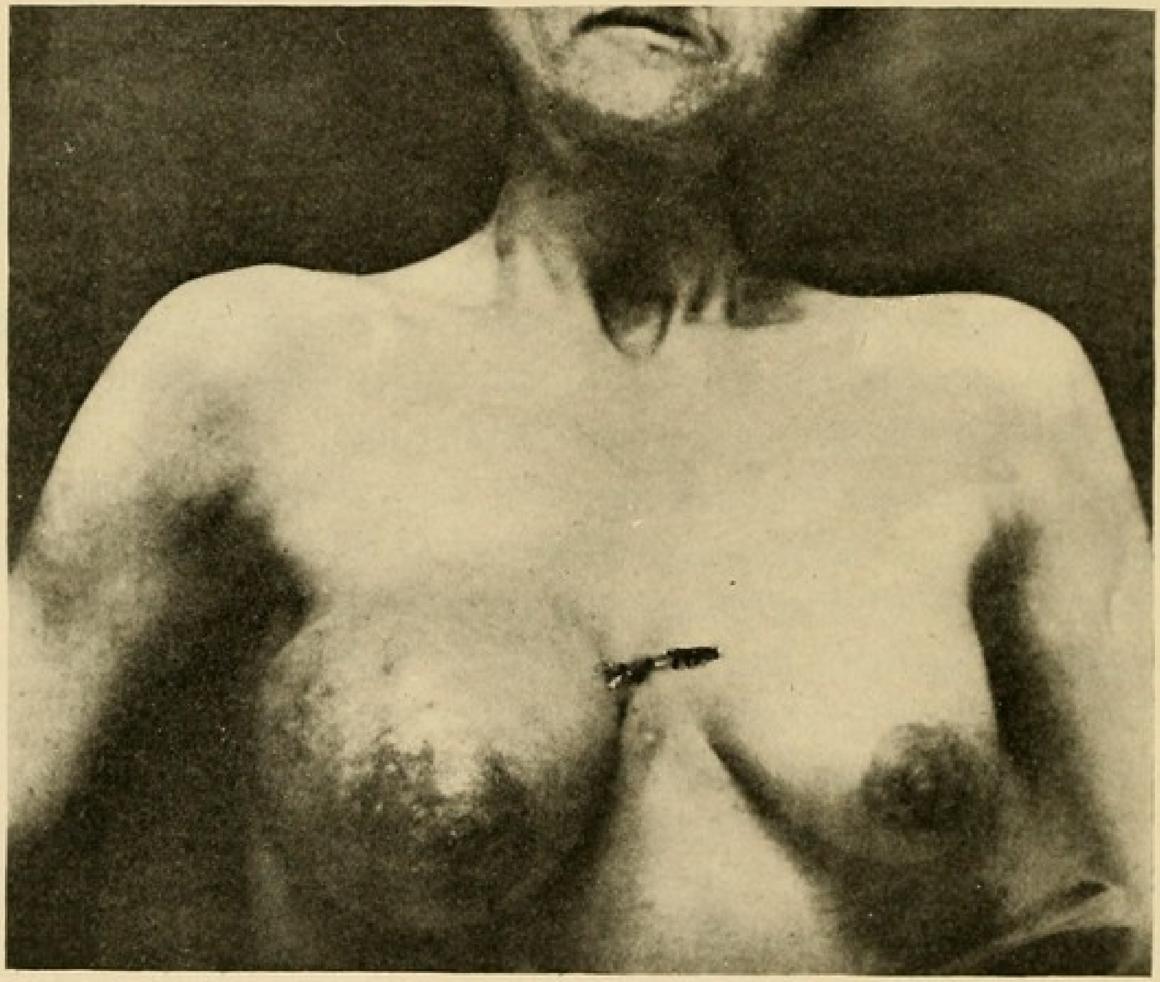


FIG. 12.—Acute mastitis.

lobules may be broken down and the breast become honeycombed, or the pus may extend along an interlobular septum to the tissues behind the gland and lead to the formation of a **retromammary abscess.** In the latter instance a considerable accumulation of pus may result, so that the breast becomes elevated and pushed forward from the thoracic wall. The pus may even work its way into the axilla, extending along the anterior border of the pectoralis major muscle and perforating the dense fascia forming the floor of this space. There is almost always enlargement of the axillary glands even though the suppurative process itself does not invade the axilla. Difficulty in moving the arm is also experienced. The pain, which is most severe, is deep seated, owing to the location of the morbid process; it also gains some of its intensity no doubt from the resistance to its extension offered by the surrounding structures.

Thus the absorption of pus is increased, with the result that the manifestations of sepsis are intensified.

Finally, in this form of the disease, it is noteworthy that the skin over the anterior surface of the breast is not reddened as it is in the superficial and parenchymatous forms.

These retromammary abscesses are not very common.

In regard to the symptoms and signs of mastitis, it has already been stated that superficial infection produces redness, swelling and soreness of the affected parts. There is, moreover, slight constitutional disturbance.

If the morbid process is not arrested in this stage, but advances to suppuration, both local and constitutional phenomena become greatly intensified. The swelling of the breast increases, great discoloration of the part takes place, and as destruction of tissue goes on and one or more areas of fluctuation form, violent throbbing pain, chills and fever, and a greater or less degree of prostration are experienced. The pulse becomes accelerated, the tongue coated, and the skin hot and dry. Profuse sweats sometimes break out. In a word, the clinical picture is one of septic infection, presenting different degrees of intensity in accordance with the virulence of the infecting microörganisms and the extent of the destructive process which they produce.

Streptococcic infection is most severe, causing all the symptoms and signs of acute sepsis.

The diagnosis is not difficult as a rule, although in the early stages of parenchymatous mastitis it is difficult or even may be impossible to determine whether pus has formed. As the process advances, however, all doubt will be dispelled. Both the local and constitutional manifestations above mentioned will become so pronounced as to make the nature of the trouble clear. Fluctuation is the crucial test.

In superficial abscess or suppuration of the glands of Montgomery the diagnosis is readily made.

Retromammary abscess will be recognized by the symptoms and signs already enumerated.

Treatment.—The treatment varies according as the case is seen before or after suppuration has occurred.

Prophylaxis is of the utmost importance, and will be discussed before treatment is considered.

If scrupulous cleanliness of the nipple and breast is observed before and especially during lactation, if measures be taken to prevent the formation of fissures of the nipple, and prompt and careful treatment given to any which may form despite the precautions employed, the occurrence of mastitis and mammary abscess can be much diminished.

During pregnancy small retracted nipples should be regularly drawn out, although great gentleness must be employed in this manipulation, as otherwise injury may be inflicted and thus the very danger we are trying to obviate be increased.

Any abrasions or fissures which may be detected should be promptly treated by healing or slightly astringent applications, such as boric acid ointment or weak glycerite of tannin.

After labor it is well to wash the breasts and nipples with castile soap and warm sterilized water, and then apply a saturated solution of boric acid. The use of bichloride of mercury solution does not seem necessary to me, although it has been recommended by many competent obstetricians.

A proper supporting bandage should also be applied to the breasts for the purpose of preventing engorgement.

Each time before the child is put to the breast its mouth should be gently washed with the saturated solution of boric acid, and the nipple should be cleansed with the same solution both before and after nursing. If the nipple becomes sore despite these precautions, a shield should be used and the antiseptic wash continued. Oftentimes an ointment composed of boric acid, 15 grains; lanoline, two drams; and benzoated lard, six drams, will heal abrasions and beginning fissures. The breast-pump must be used if nursing is so painful as to be intolerable.

The treatment of mastitis itself consists in the application of evaporating solutions, such as lead-water and laudanum or a two percent solution aluminum acetate; the maintenance of proper support; free purgation with saline cathartics, and the discontinuation of nursing. Ice applied to the inflamed parts is often of benefit, but patients very commonly complain of its being painful. The breast-pump is to be used when nursing is stopped. If these measures do not succeed in arresting the inflammation, and particularly if the process be severe, it is good surgery to make a free incision into the affected parts, even before pus can be detected. This will often obviate the formation of abscesses.

In regard to the treatment of suppurative disease, whether superficial or deep, free incision and drainage is of course the only measure to be considered. All abscesses are to be opened at once.

The incision or incisions should radiate from the nipple so as not to divide the galactophorous ducts. In superficial abscesses it will suffice to effect a free opening and provide drainage after the contents are evacuated. In deep abscesses where much destruction of tissue has occurred it often becomes necessary to make counter-openings and institute through and through drainage by means of rubber tubes. Cases in which the purulent collections have been evacuated spontaneously, with the result that sinuses have been left behind, require careful and most thorough attention. Free incisions must be made, the walls of the sinuses scraped, and the partly closed abscess cavities likewise curetted. In such cases it is well to irrigate with bichloride of mercury solution 1–4000. Drainage is also to be practised.

In retromammary abscess the breast is to be lifted up and a free opening made at the mammary-thoracic fold. If there is suppuration in the axilla, a free opening must be made and the space drained. In these cases it may become necessary to turn the breast up as in the operation of plastic resection of benign growths and lay abscess cavities freely open, thoroughly breaking down any septa or remains of septa which may be present between the different parts.

In suppuration the danger consists not in doing too much, but in doing too little. Early and free opening of the affected parts will invariably give satisfactory results, whereas delay, procrastination, and loathness to use the scalpel freely when it is employed will be followed by extensive destruction of tissue. It is especially in the neglected cases that extensive procedures are demanded, and it is certainly true that timely interference would almost invariably have been conservative of the mammary tissues and, moreover, have saved the patient much suffering.

After the breast has been opened it must always be supported by a suitable bandage in addition to the usual surgical dressings. It is well to bandage the arm to the side.

The drainage tubes are withdrawn gradually as healing takes place. For cleansing the wounds probably nothing is better than hot normal saline solution, although in cases of virulent infection, one or two irrigations with weak bichloride (1–5000) may be employed. As the wounds begin to grow healthy the formation of granulation tissue may be stimulated by balsam of Peru. Tonics and a generous diet should be given to maintain the patient's strength.

The treatment of abscess complicated with sinuses has already been alluded to. In obstinate cases, in which the breast has been so riddled that very little healthy tissue remains, it has been necessary to perform amputation. This is a very radical procedure and should be employed only as a last resort.

If there be only one or two sinuses which have persisted, the excision of a wedge-shaped piece of tissue surrounding the sinus, after the method practised by A. Marmaduke Sheild, will often effect a cure.

The treatment of suppurating hematoma differs in no wise from that of simple abscess. Cure is rapid after evacuation of the pus, blood and clot.

Chronic Mastitis.

The term **chronic mastitis,** as understood here, is applied to a chronic inflammatory process affecting the mammary gland and characterized by the formation of fibrous tissue, which results in compression of the acini and ducts, thus leading to atrophy, and sometimes to obliteration of these structures. Another change which not uncommonly occurs is cyst-formation in the ducts, due to the occlusion of a certain portion of their lumen and consequent dilatation of the remaining portion.

It is also certain that changes in the epithelium take place in a certain number of cases, according to Warren in about one-half.

The process may be localized or diffuse.

In regard to the **etiology** of this affection, it is positively known that acute inflammation and abscess may be followed by the formation of fibrous tissues and cicatricial contraction. Cases of acute mastitis in which the inflammatory process did not advance to suppuration frequently fail to undergo complete resolution, areas of induration persisting indefinitely, or sometimes undergoing gradual involution until they finally disappear. So, too, there is a formation of fibrous connective tissue to replace the destruction of normal mammary tissue incident to suppurative disease. In like manner injury may also give rise to the same tissue changes, blows and bruises setting up congestive and inflammatory processes which are followed by the formation of new tissue and a certain degree of contraction, whereas open wounds result in more pronounced though similar changes as healing occurs.

Chronic inflammation of the breast developing as the result of any of these causes is not at all difficult to understand, inasmuch as it represents the usual sequel of acute inflammation and suppuration. Quite different, however, are those cases in which there are no distinct antecedent etiological factors such as have been enumerated above.

First of all it is necessary to admit that we are not in possession of complete knowledge in regard to the formation of fibrous tissue in the various organs of the body. Thus, for example, the exact manner of development of chronic contracting kidney and cirrhosis of the liver is not absolutely clear; the same is true of the formation of those tumors containing much fibrous tissue.

As regards certain cases of the affection under consideration even less is known than concerning the conditions above cited. Although comparatively little has been written relative to a class of cases to which Franz König applied the term diffuse interstitial mastitis, the most varied opinions have been expressed about its causes, nature, and mode of development. A similar diversity of opinion has prevailed in regard to the localized form of the disease occurring irrespective of any well-defined causes. Reference to these matters will be made again.

It is well-known to all surgeons who have had much experience with diseases of the mammary gland, that it is not unusual for women of different ages, but particularly those who are near the menopause, to present themselves with the statement, that they have either discovered one or more hard and perhaps tender areas in their breast, or that the entire breast has become swollen, indurated, and more or less painful. Careful inquiry fails to elicit any adequate cause for the supervention of such a condition. There may or may not be a history of pregnancy and lactation or a recollection of previous injury to the breast.

As regards the relative frequency of these conditions in the married and unmarried, I am of the opinion that it is rather more common in the former class, and I believe that this view is sustained by the experience of other observers.

Upon what can these conditions depend? What are the factors leading to the production of tissue metamorphosis?

In answer to these questions I will state that I believe the structural changes are associated with and represent variations from the normal function of the gland. When considering the physiology of the breast attention was directed to the destruction and reproduction of tissue incident to lactation, and also to the intimate relation existing between the mammary gland and the reproductive organs. Moreover, it was stated that function and structure are inseparable, that variations of the former depend upon alterations in the latter.

Irrespective of the acute diseases to which the breast is subjected during lactation, certain conditions which may obtain in it during the periods of involution and evolution, particularly if they be frequently repeated, seem to me to be especially conducive to the development of the affection under consideration. Thus, failure of complete rehabilitation throughout the entire gland may very likely lead to an undue proliferation of cells resulting in the production of connective tissue. It is not improbable that the effect of rapidly repeated pregnancies, necessitating evolutionary changes in the gland before a period of repose can be had after its recent involution, might act as a stimulus to aberrations of tissue formation.

These views, although largely speculative, seem to be worthy of consideration, as they are based upon well-established principles of physiology and pathology.

In regard to those cases occurring in women who have never been pregnant nor borne children, it may be assumed that the very deprivation of normal function to which the gland has been subjected may have stimulated the glandular structures to compensatory though abortive efforts to functionate, with the result that tissue changes are set up which lead to the same alterations in structure as have been supposed to be produced by the excessive stimulation incident to frequently occurring periods of involution and evolution.

Another factor to which I believe not enough importance has been attached, and one to which, so far as I am aware, no writers have called attention, is the interruption of pregnancy, with the consequent sudden arrest of evolutionary changes in the breast and the establishment of involutionary changes before the period of evolution and lactation has been completed. It seems probable that such a departure from the normal cycle of changes through which the mammary tissues pass during pregnancy and lactation might well give rise to disturbances of their rehabilitation, or lead to an abnormal proliferation of cells capable of giving rise to this morbid process. I have seen women who aborted during the fourth and fifth months of pregnancy suffer considerably with swelling and soreness of the breast. This is certainly indicative of disturbed function.

Many cases of abortion, particularly those which are criminally induced in illegitimate pregnancies, are scrupulously concealed, so that no history whatsoever can be obtained. Under such circumstances the most that can be done is to infer the previous existence and interruption of pregnancy, if the general aspect of the breasts lead one to suspect that it has occurred. This, however, is not of great help, as the majority of abortions are induced before pregnancy has advanced far enough to leave its permanent signs upon the breasts.

It is questionable whether some cases in which diffuse chronic mastitis is supposed to exist are not merely cases in which the senile atrophy of the breast has taken place more rapidly than usual or began to develop at an earlier age. The frequent occurrence of this condition in women who are at the menopause, a period during which the mammary tissues are most unstable, is certainly suggestive of involuntary changes. I believe this is a matter worthy of the most serious consideration and one to which observation and investigation may well be directed.

The cases occurring in young girls shortly after puberty also point strongly to a deviation from the normal process of evolution through which the gland goes at this epoch of life.

From what has been stated it is evident that the etiology of chronic mastitis is far from being thoroughly understood, and that it is a subject fit for further study. The theories which I advance relative to the causation of some of the cases of obscure origin seem to me to be at least plausible, if not indeed affording a reasonable explanation of their development.

Pathology.—The predominant alteration in structure is an increase in fibrous tissue. Two views have been entertained in regard to the origin of this tissue; some have held that the changes begin in the glandular elements, while others hold that the interstitial connective tissue is primarily affected. König, who formerly favored the latter view, has now come to regard the former as correct and accordingly has discarded the term *interstitial* which he employed in referring to chronic diffuse mastitis.

If a section from such a mammary gland be examined microscopically, a plentiful distribution of fibrous tissue around the ducts will be seen, and furthermore it will be observed that the masses of fat in the interstitial tissue are completely surrounded by the fibrous tissue, being encapsulated, so to speak. The new tissue appears in various stages of development. It is frequently infiltrated with leucocytes in its earlier stages.

Allusion has already been made to the changes occurring in the galactophorous ducts. The cysts which are formed are due to obliteration of the lumen of the ducts with consequent dilatation of the portion remaining patent. They are, therefore, retention cysts, pure and simple. They vary in size, some being very minute and others fairly large. In the small ones healthy epithelium is seen, whereas in those of larger size degenerated cells are sometimes observed. The contents of these cysts also varies both as to color and consistency, being thin and clear in some instances and viscid and dark colored in others. The former condition is the more common.

It not infrequently happens that a portion of the duct becomes completely obliterated and atrophied, being converted into a small, dense, fibrous cord.

In those cases of chronic mastitis following acute inflammation or injury, and in which the disease is localized rather than diffuse, the fibrous tissue seems to form more rapidly, so that obliteration of the ducts without cyst-formation is the rule. Macroscopically such breasts present dense areas of fibrous tissue situated in different parts of the gland, their location of course depending upon the site of the primary disease. Carcinomatous degeneration may take place in a breast thus affected; when such change occurs the altered glandular tissue will be found imbedded in the dense fibrous tissue everywhere present in the section. They may follow the line of the minute lymphatics of the breast, as in a case described by Whitney.

The **symptoms and course** of chronic mastitis are variable. Sometimes it begins suddenly with pain and swelling of the breast, while at others its onset is gradual. During the menstrual periods the symptoms become intensified. Occasionally the symptoms subside after a few months, but as a rule the disease is progressive. In the localized form pain and uneasiness in the indurated areas are the only symptoms, and even these may be absent.

In the diffuse form the disease may be mistaken for beginning scirrhus carcinoma, particularly if the onset has been insidious. In the absence of a clear history large isolated nodules may also lead to confusion with the same form of malignant disease.

Treatment is unsatisfactory, especially in cases developing without any well-defined cause. When inflammation and induration remain after acute processes, compression and the use of iodine and belladonna ointments in equal parts sometimes seems to favor resolution. Ichthyol ointment (30 percent) may be used instead if preferred.

Chronic Abscess.

If an indurated area which is formed during or shortly after the puerperium undergoes softening after a period of several weeks, instead of continuing to subside, a **chronic abscess** results. Such an indurated area may undergo partial though not complete resolution, remain stationary for a long time, and then for some unknown reason advance to suppuration. In such cases it is not improbable that the virulence of the microörganisms becomes attenuated, so that they lie dormant until some exciting cause arouses them to renewed activity. Another explanation for the development of these slow suppurative processes is afforded by the supposition, that microörganisms transmitted through the blood lodge in the tissues of the mammary gland, the vitality of which has been impaired by previous disease, and set up a low form of inflammation.

Whatever the origin of these chronic abscesses, whether they are residual processes of acute inflammation or develop from causes which are indeterminable, an essential fact to remember is that they merely represent a slow form of suppuration.

Sometimes an injury may be followed after the lapse of weeks or months by the formation of an abscess, which in all probability is due to the lowered power of resistance in the tissue caused directly by the injury, the changed condition resulting therefrom being favorable to the growth of micro-örganisms.

The development and duration of these abscesses is most variable.

Klotz has reported a case in a woman, twenty years of age, who had suffered two years before with an acute mastitis, from which, however, she apparently had completely recovered. A hard nodule appeared in her breast, slowly increased in size, and finally began to soften. This mass was incised and proved to be a sack filled with pus. Even more remarkable than this is a case reported by Reclus. In this case a nodule which developed shortly after delivery remained stationary for six years and then suppurated.

These abscesses vary in size, although as a rule they do not become larger than a hen's egg. They may be irregular in form or round and well defined. The skin may or may not become adherent. In either case the abscess is movable with the rest of the gland. Tenderness to pressure is a constant symptom, and enlargement of the axillary glands is also very common.

A chronic abscess has been mistaken for malignant disease, particularly sarcoma. The slower development, the associated pain and enlargement of the axillary glands, together with the history of the case will serve to distinguish it from sarcoma. Abscess is differentiated from carcinoma by its more rapid development, the earlier involvement of the axillary glands, and the invariable tenderness to pressure.

Treatment consists, of course, in free incision and drainage.

TUBERCULOSIS.

Although Virchow in his treatise on the Pathology of Tumors included the mammary gland among the organs not subject to tuberculosis, reference to scrofulous affections of the breast had been made long before by Sir Astley Cooper, and Velpeau had also discussed tuberculous tumors in a vague and indefinite manner, recognizing, however, three forms, which he called disseminated tumor, lymphatic tumor, and lymphatic degeneration. Other surgeons also reported a case now and then, but it was not until 1881 that Dubar made the first scientific study of the disease. To him belongs the credit of first demonstrating the tubercle bacillus in the mammary tissues. Ten years later Roux called attention to intramammary cold abscess.

Although rare, tuberculosis of the breast is probably more common than it has been considered to be. In more than fifteen hundred cases of disease of the mammary gland admitted to St. Bartholomew's Hospital, London, Sidney R. Scott found 1.5 percent to be tuberculosis. While it is true that the number of cases occurring in literature which have been verified by finding tubercle bacilli or tubercles in the tissues examined is small—Schley having found only sixty-five up to 1903—it is probable that more careful observations will prove the disease to be commoner than it has usually been thought to be.

As in other organs, so in the mammary gland, tuberculosis may be **primary** or **secondary.** Although it is true that the disease cannot positively be stated to be primary unless an autopsy be held and the presence of a concealed tuberculous focus excluded, still for practical purposes those cases in which there are no other demonstrable foci may be regarded as primary.

In this form the infection no doubt takes place through the blood current or results from direct infection from without. The latter mode is no doubt rare. That tubercle bacilli might gain access to the mammary gland through an open wound or an abrasion is, of course, not to be disputed, and that there is a possibility of their gaining entrance through the galactophorous ducts is likewise not to be denied. Indeed the latter mode of entry has been strongly upheld by Verneuil. So far as I have been able to determine, however, the lesions are more pronounced in the alveoli than in the ducts, and, moreover, the ducts themselves are generally not more diseased near their exit at the nipple than they are further in the interior of the gland. Were the infection to take place through these ducts it is only natural to suppose the primary lesion would develop close to their orifices and that the disease would be more advanced there than in the parenchyma of the gland itself. While no decisive statement can be made in regard to this matter until further observation, based upon a greater number of cases, has been made, in view of the chief location of the morbid process, and likewise in consideration of our knowledge of the mode of tuberculous infection in other organs of the body, particularly the genito-urinary organs, I am of the opinion that the usual mode of primary infection of the mammary gland is through the blood current. In this connection it is interesting to note that Kitt, who has studied bovine tuberculosis thoroughly, states that tuberculosis of the udders is almost always of hematogenous origin.

When secondary the infection may extend from neighboring structures, as, for instance, the pleura or ribs, or it may be transmitted through the blood current from a focus in a remote portion of the body, or be carried by the lymphatics from a diseased gland in the axilla or in the supraclavicular triangle.

Halsted believes that invasion by way of the lymphatics constitutes the primary mode of infection, even maintaining that those cases which are usually considered primary are in reality secondary, being due to the transference of tubercle bacilli from other parts of the body, principally the axillary and mediastinal glands, through the lymph stream.

Considerable has been written concerning the relative frequency of the primary and secondary forms, and much difference of opinion has been expressed. As has already been said, it is impossible to state positively that a case is primary, unless every organ of the body can be examined and the absence of tuberculous foci excluded. In regard to the relative frequency of those cases which are denominated primary because there are no other demonstrable lesions, and those in which it is plain that the disease is secondary, it is evident that a larger number of observations must be made before any definite conclusions can be drawn.

Some difference of opinion has been expressed as to whether the disease begins within the acini or in the connective tissue, but the weight of evidence is strongly in favor of the former view.

Concerning the **etiology** of mammary tuberculosis, it may be said that the disease occurs much more frequently in females than in males, and that it affects young women oftener than it does those of middle or old age. It may, however, occur at any period from puberty to senility. As a greater number of cases are reported it may be found that the disease shows a greater predilection to develop during a certain decade than at any other time. Out of thirty-two cases studied by Delbet, eighteen were in women between the ages of twenty-five and thirty-five. Schley found the disease to be equally common during the third, fourth and fifth decades. Of eleven cases recently reported from Bruns' clinic at Tübingen one occurred in the twenty-fifth year of life, four in the thirtieth, four in the fortieth, and two in the fiftieth. It has been stated that no cases have been observed after the menopause, but in looking over the literature of the subject I found one reported in a woman of seventy.

Heredity seems to exert no greater influence, if indeed it be as great, than in the production of tuberculosis in other organs of the body.

Previous inflammatory diseases and injury are naturally to be considered as predisposing causes. By lowering the vitality of the mammary tissues they, no doubt, prepare a favorable soil for the reception and growth of the specific microörganisms.

Tuberculosis in other parts of the body of course predisposes to secondary involvement of the breast. Thus, Mandry found an associated tuberculous affection in one-half of the cases which he studied.

Some investigators have attributed a considerable influence to pregnancy and lactation as predisposing factors, whereas others have flatly denied that they are of any etiological significance whatsoever. It is probable that the only causative effect which can reasonably be attributed to these processes is a secondary one, that is, they predispose to tuberculous infection only in so far as they lower the vitality of the mammary tissues by giving rise to inflammation or abscess, and thus produce a more favorable soil for the reception and growth of any tubercle bacilli which perchance may gain access to the gland.

Pathology.—A discrete and confluent form are usually recognized. In addition to these two forms intraglandular mammary abscess and miliary tuberculosis have been described. The last mentioned occurs as a part of a general miliary tuberculosis and, therefore, may be dismissed from further consideration.

In the discrete form there are a few isolated tubercles which are separated by apparently healthy tissue. These tubercles may undergo the ordinary changes which occur in all tubercles and still remain isolated, or, owing to the dissemination of infection from them, new tubercles may form in the intervening healthy tissue so that a larger area becomes involved. If the morbid process advances, coalescence of these tubercles may take place and the confluent form of the disease result. Indeed any difference between the two usually recognized forms of mammary tuberculosis has been denied, and it seems not improbable that the actual difference is in the degree of intensity of the infection and the resistive power of the tissues rather than in the morbid process itself.

The isolated tubercles vary in size, some being no larger than a pea while others are as big as a hazel-nut. If caseation and liquefaction occur abscesses develop.

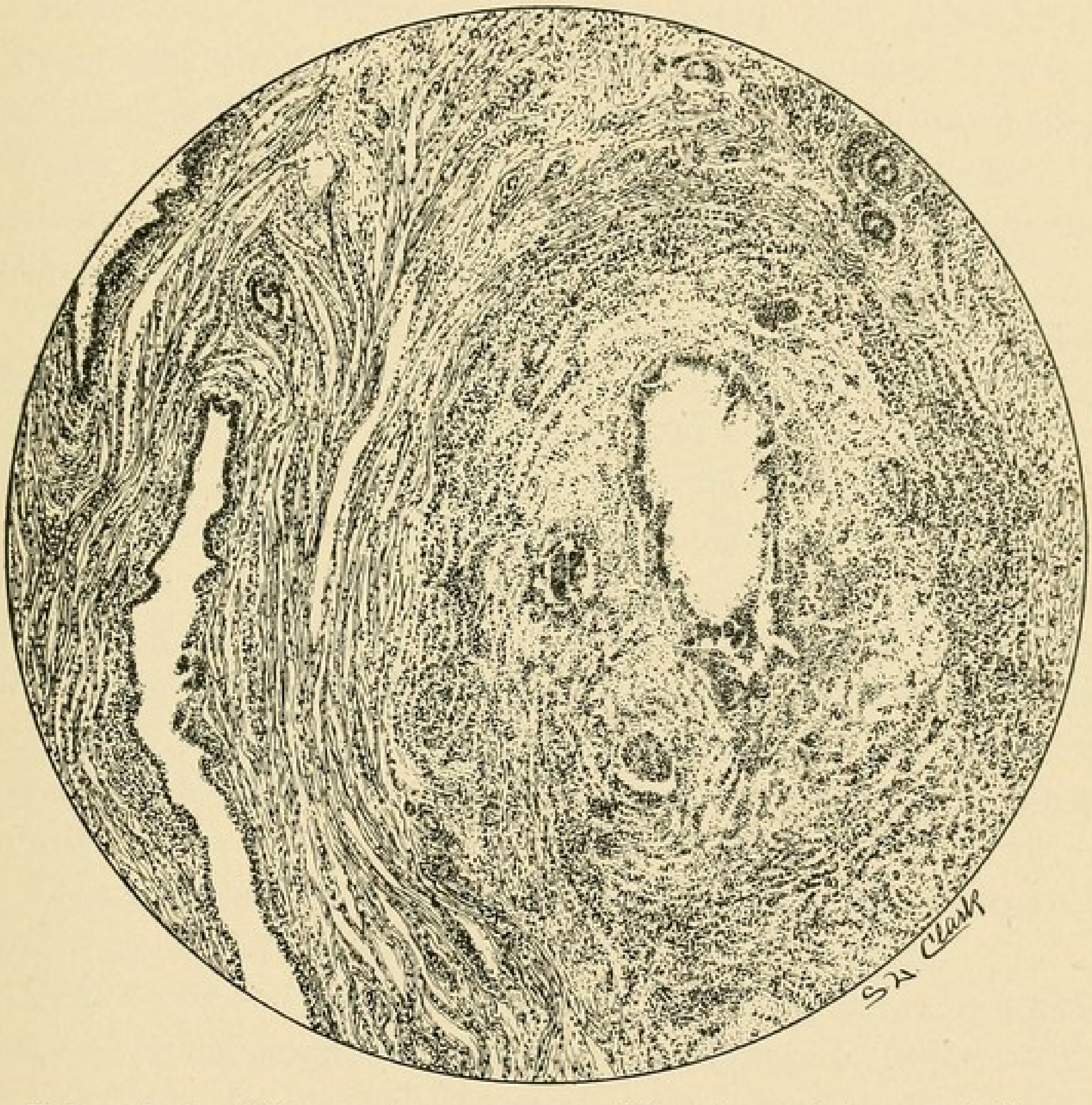
In the confluent form a swelling of considerable size is present in the breast. This tumefaction, however, is often not sharply limited, being ill-defined and irregular and presenting bosselations over its surface. When cut into during the early stages of its evolution such a tumor is found to be of a white or grayish color and of firm consistency. In the later stages, although this appearance may still be retained at the periphery, the center will have become yellow in color. If liquefaction occurs, an abscess is formed, the so-called intramammary cold abscess of Roux. In some cases softening and liquefaction is limited to certain parts of the tumor, so that small abscesses alternate with areas of indurated tubercle. It may be that the greater portion of the tumor has undergone liquefaction, but that certain portions have remained intact, persisting as trabeculæ between the various cavities of the abscess. The walls of a tuberculous mammary abscess do not differ from those of a tuberculous abscess in other soft tissues, being thick and lardaceous and covered with granulations and tubercles.

The **microscopic appearance** of a mammary gland affected with tuberculosis varies according to the stage of the disease in which it is examined. If seen at the very beginning it is probable that no changes other than simple inflammation could be detected. Early in the development of the morbid process the alveoli and ducts are still discernible and plainly recognizable. Later the alveoli disappear, granulation tissue is disseminated throughout the lobule, and giant cells are seen. There may be such an infiltration of embryonal tissue in the interstices between the alveoli as completely to destroy the latter structures. This new tissue also contains giant cells. Sometimes beginning tubercle-formation can be detected in adjoining lobules. The same changes occur around the ducts, although the alveoli are first attacked as a rule, the embryonal tissue compresses or invades these structures, just as it does the alveoli, and thus leads to their partial or complete destruction. In some sections studied, only the changes of simple inflammation were apparent around the ducts, although the typical alterations of tuberculosis involved the alveoli. The walls are thickened by an infiltration of leucocytes which may even extend into the lumen of the ducts. Granulations may also be present. Tubercle bacilli are very rare in the tissue and many sections may be examined before any are found. The diseased tissue is also poor in blood-vessels.

Four cases of tuberculosis of the breast associated with carcinoma have been recorded, and one associated with adenoma has also been reported by E. P. Davis. In the first class the symptoms of tuberculosis predominated and the macroscopic appearance of the diseased tissue was suggestive of tuberculosis rather than of malignant disease. Microscopic examination, however, demonstrated the presence of carcinoma cells in the diseased area.

Two of these cases were reported in the American Journal of the Medical Sciences, July, 1899, by A. S. Warthen, of Ann Arbor, Michigan. In one case it is probable that tuberculosis constituted the primary lesion; in the other, however, the carcinoma was undoubtedly primary.

PLATE III.



Tuberculosis. Microscopic appearance. (*Drawing made from a specimen loaned by Dr. A. O. J. Kelly, of Philadelphia.*)

Pilliet and Piatot (*Bull. de la Soc. Anat. de Paris*, May, 1897), reported another case occurring in a male aged fifty-one years.

The fourth case was reported by Kallenberg in his Tübingen thesis for 1902.

Rokitansky's teaching that carcinoma and tuberculosis never occur simultaneously is now known to be erroneous, and Rokitansky himself modified his theory as far as to admit that, though exceedingly rare, the two might be combined. A number of cases are on record in which the two have been found associated in different organs of the body.

That their simultaneous occurrence in the mammary gland is most unusual is shown by the paucity of cases thus far reported. Kallenberg was unable to find a single case recorded in German literature at the time he wrote his thesis in 1902.

Whether the combination is entirely fortuitous or whether one lesion gives rise to the other is unknown. Whether the irritation produced by tubercle sets up an abnormal proliferation of epithelial cells resulting in the formation of a malignant neoplasm or whether tuberculous infection is superimposed upon the carcinomatous process has not been positivelv determined.

This combination of tuberculosis and carcinoma is so rare that it is of pathological rather than clinical interest.

Symptoms.—The onset of tuberculosis of the breast is insidious and its development usually slow, although lactation seems to stimulate the morbid process to more rapid growth. The disease may last for months or years. It is remarkable that only one breast is affected.

In the discrete form areas of induration are detected in various portions of the gland, in some cases being distinctly separated from the surrounding tissue, while in others the outline is indistinct. In this form there is not much enlargement unless nodules situated close to one another coalesce and soften, in which case the products of liquefaction may give rise to a distinct tumor.

Isolated tubercles vary considerably as to their evolution. They may remain stationary for a considerable time or gradually increase in size.

Early in the disease the skin is not adherent, but often becomes so in the later stages. Fistulæ may also form. Pain, too, is usually not severe at first, although it may become so as the morbid process progresses.

The confluent form is of more rapid evolution, fistulæ forming much earlier than in the discrete form. A solid mass is present, varying in size from a walnut to an orange, and being hard or soft according to the stage in which it is examined. The outline of such a tumor is usually not clearly defined, but somewhat irregular. The most common site is the superior external quadrant. In the majority of cases the axillary glands are enlarged. They generally increase rapidly in size and may go on to suppuration. Retraction of the nipple due to sclerosis of the subjacent tissues has also been seen.

The tendency of these tuberculous areas is to liquefaction and abscess-formation.

Variations from the usual manifestations of the disease as above described have been observed. Thus, for instance, Orthman saw a case in which the infection apparently occurred from without, the first lesion which appeared resembling a simple furuncle. Instead of healing, however, its base became ndurated, and as it progressed in its development its true na ture was revealed. Kramer has reported a case in which the disease began as an ulceration of the nipple.

Such manifestations, however, are unusual.

Diagnosis.—The diagnosis of mammary tuberculosis may be very difficult. This is particularly true of the cases which are seen early, before much or any destruction of tissue has taken place. Naturally those cases in which fistulæ are present, together with marked enlargement of the axillary glands, offer less difficulty than those seen at an earlier period of their evolution. It is likewise the case when tuberculous foci in other parts of the body can be readily detected. A tuberculous abscess has been mistaken for a cyst, and also for a chronic abscess. In tuberculosis, however, the usual pronounced enlargement of the axillary glands will serve as a point of differential diagnosis.

In the early stages the disease might be confused with actinomycosis, although in the later stages the presence of the ray-fungus in the discharge would afford a positive means of differential diagnosis.

A few isolated tubercles might also be mistaken for syphilitic lesions, but the history and progress of the case and the failure of antisyphilitic treatment would reveal the true nature of the affection.

Cases of tuberculosis have been mistaken for carcinoma, and *vice versa*. In carcinoma the early adherence of the tumor to the skin, the slower enlargement of the axillary glands and their greater hardness are circumstances valuable in distinguishing between the two affections.

The age of the patient should also be taken into consideration, as the majority of carcinomata occur in women after middle life. Tuberculosis, however, seems to show a greater predilection for young women, although many cases have occurred in women past forty.

Prognosis.—In cases in which no other tuberculous lesions are present the prognosis may be considered good, provided all the diseased tissue is removed and the axilla thoroughly freed of enlarged glands. Recurrences, however, have been known to take place.

In cases in which other demonstrable tuberculous foci are present the prognosis is of course somewhat influenced by the nature and extent of these lesions. As regards the effect of the morbid process upon the gland itself, it will suffice to say that extensive destruction of tissue may result. Some interesting statistics bearing on prognosis have recently been reported by Braendle, one of Bruns' assistants at the Tübingen clinic. Out of sixteen patients whose history was followed after operation fifteen were cured. The time elapsing from operation to the publication of his report varied from one to nineteen years. Of these fifteen patients three succumbed to phthisis a number of years after operation; no local recurrence, however, took place. In no case was the other breast involved.

Treatment.—Tuberculosis of the mammary gland has been treated by curetting and cauterizing the sinuses, by excising a wedge-shaped portion of the gland containing the diseased area, and by amputating the breast. It remains to be shown that anything short of amputation is a certain and safe procedure, inasmuch as no one can tell whether the disease is not already implanted in portions of the breast which are apparently healthy, so that recurrence may take place even though it seems that all diseased tissue has been removed. Notwithstanding this fact I believe it justifiable to practise partial resection in the discrete form of the disease and even in those diffuse cases in which a considerable portion of the breast is apparently uninvolved. Such a course of procedure may save the patient, often a young unmarried woman, from a needless mutilation, which would seriously impair her chances of matrimony. The favorable results obtained by this procedure have been attested by the experience of a number of surgeons. Many good surgeons are now advocating resection of the epididymis in cases of tuberculosis affecting the testicle as well as this organ, believing that Nature will complete the cure after the primary focus has been removed. Certainly a similar conservative procedure is worthy of trial in mammary tuberculosis. Any signs of recurrence call for immediate amputation of the breast. The axilla should always be cleared of all diseased glands.

If operation be refused, injections of an ethereal solution of iodoform may be made into the diseased area. Cuneo states that intramammary cold abscess yields more readily to this treatment than other forms of mammary tuberculosis.

At the present day probably no article upon the treatment of local tuberculosis would be complete without some mention being made of Wright's bacterial vaccines, which are used in conjunction with a careful observation of the opsonic power of the blood. Wright discovered in the serum of the blood a substance named by him "opsonin," which appears to act upon the bacteria in such a manner as to render them easy prey for the phagocytic leucocytes of the blood, and without which the leucocytes are feebly or negatively phagocytic to the bacteria. He also found that by introducing minute but carefully estimated doses of the dead bacteria, he could increase the amount of this substance in the blood and render the leucocytes still more active than before.

It is said that this treatment has proved beneficial in almost all varieties of local tuberculosis, and although I have no knowledge of it having been used in mammary tuberculosis, there is no reason to doubt that it would do good in this form of the disease as well as in others. I wish to state distinctly, however, that it should not be used as a substitute for operation, which has been proved to be efficacious, but as a supplement to operation, with the view of hastening recovery by increasing the opsonic power of the blood. I am also inclined to consider it applicable to cases in which operation is refused and injections of iodoform fail to do good.

The vaccine used is the New Tuberculin Koch (bacilli emulsion) commonly known as Tuberculin R. It consists of the triturated bodies of tubercle bacilli suspended in glycerin. It should be administered by a competent laboratory expert, who is required to make frequent estimations of the opsonic power of the blood, so that the injections can be properly timed in order to avoid obtaining an accumulative depressant effect instead of the desired increase in the opsonic power. When the dose which will increase the opsonic index is determined, it is administered hypodermatically whenever the blood shows any tendency for the opsonic power to fall. It is not necessary to increase the dose limit further.

Another method of treatment which has proved of value, especially in the hands of its originator, is Bier's passive hyperemia. This method has given especially good results in all kinds of chronic fistulæ, tuberculous and otherwise. It is applied to regions like the breast by specially devised apparatus, that for the breast consisting of a large hemispherical glass vessel, slightly larger than the breast itself. In the dome of the vessel is a round aperture with a glass nipple attachment. To this is attached a rubber tube which is connected with a suction pump.

The apparatus is placed over the affected breast and sufficient negative pressure created by the pump to cause a red hyperemia, not allowing the skin to become blue or pale. It is left on for five minutes, then removed for five minutes, after which it is reapplied for another five minutes, etc. This alternation is continued for forty-five minutes daily. It causes a hypernutrition of the part and stimulates all reparative processes.

Passive hyperemia might be advantageously combined with Wright's vaccination method, for it is asserted that in these tuberculous sinuses the serum in the region of the morbid process has a lower opsonic index than in the remainder of the body. After several treatments with the Bier's apparatus, the local opsonic index is brought up to the standard of the general index. If we raise the general index above the normal we may, by combining the two methods of treatment, also increase the local index above the normal and greatly hasten the healing of the sinus.

SYPHILIS.

Syphilis may affect the mammary gland in its primary, secondary, or tertiary stage, and may occur in either sex, although it is far more common in females than in males. Fournier, whose experience is unrivaled, had seen only three cases in men up to 1897, when his classical work on extra-genital chancres was published.

In regard to the frequency of primary mammary syphilis as compared with other extra-genital forms of the disease, a series of cases recently reported by Ivanyi, of Buda Pest, is of interest. Out of 138 cases of extra-genital syphilis he found that only 6, or 4.34 percent, were of mammary origin. Thus it is seen that primary mammary syphilis is rare.

The initial lesion of syphilis as it affects the female breast is most common in nursing women, being produced by inoculation with the syphilitic virus from the mouth of an infant suffering with the disease. Infants affected with hereditary syphilis often convey the disease to wet-nurses, who in turn transmit it to other children whom they suckle; and these infants then become capable of disseminating infection among other wet-nurses to whose breasts they may perchance be put.

A nurse tainted with constitutional syphilis contracted through sexual intercourse may also infect a nursling, who of course becomes an immediate source of contagion to all those with whom it comes in contact, but particularly to its mother or other women who may nurse it. Thus it is seen that a single syphilitic infant or a single syphilitic wet-nurse may be the means of infecting a multitude of innocent persons. Epidemics of syphilis originating in this manner have been reported, especially in France and Italy, and many households have been rendered syphilitic in the same way, even when the original disseminator of the disease was apprehended and prevented from distributing the loathsome malady promiscuously.

This manner of conveying syphilis was well recognized by Ambrose Paré, who describes an instance in which a syphilitic wet-nurse infected an infant, who in turn infected its mother, with the result that its father contracted the disease. Later two other children became infected, presumably by eating or drinking from the same dishes used by the father.

In addition to this, the common mode of infection of the breast, there are cases on record in which the malady has been conveyed through the diseased mouth of a syphilitic adult. It was to this form of infection that Ricord caustically applied the expression "*contagion par nourrison adulte.*"

In persons of uncleanly and careless habits infection might easily be transmitted through the medium of towels, handkerchiefs, or articles of wearing apparel, which had been contaminated with the syphilitic virus. Whether such cases have actually occurred I do not know, but the possibility of their occurrence is worth bearing in mind.

One or both breasts may be infected and the initial lesion may be multiple. Thus, for example, Keyes has observed a case in which there were twelve chancres, eight on one breast and four on the other.

This multiplicity of lesions is not surprising when we come to consider the conditions in the lactating breast favoring infection. The various erosions and fissures so often present serve as admirable portals of entry for the syphilitic poison, and the repeated applications of the child to the breast furnish a frequent source of fresh infection.

In regard to the location of the initial lesion, it has been found that the most common site is at the junction of the nipple and areola, although it may be situated upon the nipple itself, upon any part of the areola, or upon the cutaneous surface of the breast. The last named site, however, is very rare.

Fournier, who has had the opportunity of observing incipient mammary chancre in four cases, describes three different forms: 1, a very minute round cutaneous elevation, smaller than a lentil; 2, a dark red cutaneous elevation; 3, a cutaneous elevation the center of which soon becomes desquamated and eroded, and is smaller than the head of a pin. This form of initial lesion looks more like an abrasion than anything else.

The fully developed mammary chancre may be incrusted or open. In the latter instance it may present the appearance of a fissure or show signs of well-marked ulceration. The latter form is not uncommon. Occasionally mammary chancre may become phagedenic, particularly in debilitated women.

Thus it is seen that the primary lesion is often atypical. This circumstance renders diagnosis difficult, particularly in the early stages of the sore. When any doubt exists, the safest thing to do is to consider the lesion syphilitic until time proves it not to be. By so doing the spread of contagion may be checked.

Paget's disease may resemble an ulcerating chancre in some respects, but its slower evolution and the absence of axillary involvement serve to distinguish it from the latter.

A thorough and careful examination would prevent confusion of a phagedenic chancre with malignant disease. Other signs of syphilis would be found, or would develop while the case was under observation.

Mammary chancre gives rise to enlargement of the axillary glands, and in course of time the ordinary secondary signs of syphilis develop.

Some have maintained that constitutional syphilis following mammary chancre is often more severe than that developing after inoculation through other portions of the body. These observers evidently overlook the fact that many subjects of mammary chancre are ill-nourished, overworked, and debilitated, so that they are unable to withstand the encroachment of their infection as well as the more fortunate persons in the better walks of life who contract their syphilis in the more usual way. Certainly there is no reason to believe that syphilis following a mammary chancre would be more violent than that developing after any other form of initial lesion, provided that the individual's powers of resistance are not below par.

In addition to the ordinary cutaneous eruption of secondary syphilis which may appear on the breast, the softness of the skin, the moisture, and the friction of the two opposing surfaces at the junction of the breast and thoracic wall, all favor the development of moist syphilides, particularly in women whose breasts are pendulous and who are of uncleanly habits. These lesions may appear as groups of papules, or as spots of various size, resembling mucous patches. Occasionally the latter form may cover the entire inferior surface of the gland or even extend to the chest-wall.

Papular syphilides and mucous patches are also found on the areola and nipple.

Tertiary syphilis may affect the mammary gland in the form of gummata, diffuse inflammation, tubercles, rupia and ulcers. Both sexes are subject to this stage of the disease, although it is more frequently seen in women than in men.

Gummata may occur in any part of the breast, appearing as hard, circumscribed tumors, which form insidiously and increase in size slowly, so that they do not attract much attention during the early stages of their evolution. In the later stages, however, they show a tendency to soften and break through the skin. As the process of softening advances the tumors become adherent to the skin, which assumes a dark congested appearance and later gives way to allow the escape of the products of liquefaction beneath. At this period the axillary glands are found to be enlarged.

Such softened gummata have been mistaken for cysts, and their true nature revealed only at the time of operation.

In their early stages gummata may be mistaken for benign tumors, particularly if there are no signs of syphilis in other parts of the body. Likewise there may be difficulty in separating them from malignant growths after they have become adherent to the skin and enlargement of the axillary glands has occurred. Under these circumstances a careful examination for other signs of syphilis and interrogation of the patient in reference to a previous syphilitic infection may prove of help in making a differential diagnosis. A history of previous nodules or masses in the breast which have disappeared without treatment is suggestive of syphilis, provided that inflammatory affections can be excluded. At all events the progress of the case will reveal its true nature. The therapeutic test, preferably in the form of hypodermatic injections of mercury bichloride and large doses of iodides internally, may be tried in doubtful cases. Gummata usually soften and rupture within a few months after they are first detected, their course thus being much more rapid than that of carcinomata.

In diffuse syphilitic inflammation of the breast a portion of or perhaps the entire gland is enlarged, hard, and sometimes painful. This form of mammary syphilis is not a remote manifestation of the disease, but usually occurs during the latter part of the secondary stage. It has been known to develop shortly after the first appearance of the secondary rash. The period of its incidence thus makes diagnosis comparatively easy.

As considerable evidence has been accumulated to show that the spirocheta or spironema pallida may be the specific cause of syphilis, in doubtful cases scrapings from the lesions, as well as the tissue juices and blood, should be examined for this organism. To stain for the spironema in coverglass spreads, the scrapings from the lesions or the tissue juices from their center are spread thinly over the glass and then dried in the air, after which they are fixed for ten minutes in absolute alcohol and then treated with the following modification of Giemsa's azur-eosin stain freshly prepared:—(1) 12 parts of Giemsa's eosin solution (2.5 cc., 1 percent eosin solution in 500 cc. of water); (2) 3 parts azur I (1–1000 water); (3) 3 parts azur II (0.8–1000 water). It is left in this stain for sixteen to twenty-four hours, washed for a short time in water, dried, and examined in cedar oil.

The organism can be recovered from the blood by Noegerath and Staehlin's method, which consists in taking 1 cc. of blood and 10 cc of a $\frac{1}{3}$ percent solution of acetic acid, mixing them, centrifuging, and examining the deposit.

The spironema is a very delicate spiral organism, weakly refractile, having flagella at both ends, and measuring from 4 to 20 microns in breadth. The spirals are very narrow and regular.

In regard to the treatment of mammary syphilis there is little to be said. The usual antisyphilitic treatment with mercury and the iodides is to be employed, and as a rule causes the lesions to yield rapidly. Chancres of the breast require little treatment other than cleanliness. If of the ulcerative type they may be dusted with calomel and bismuth subnitrate, equal parts, whereupon they will soon become healthy and heal.

Gummata yield readily to mixed treatment, or to inunctions of mercury and large doses of the iodides internally.

In poorly nourished, debilitated women, every effort should be made to build up the general health by means of generous diet and the use of bitter tonics, or iron and arsenic, in addition to the use of specific medication.

It is hardly necessary to say that the most careful prophylactic measures should be taken to prevent the propagation of the disease by women thus affected.

ACTINOMYCOSIS.

Actinomycosis of the breast is rare, although a few authentic cases are on record. The disease may be either primary or secondary, infection occurring from without through a wound or abrasion, or extending from other organs of the body, for example, the lungs or pleura.

The primary wound may heal and actinomycosis break out later.

The invading parasites set up inflammation, as a result of which the skin over the gland becomes reddened and breaks down, sinuses form, and pus containing the actinomyces is discharged. The substance of the gland may be destroyed, and in cases in which the infection occurs from without the pectoral muscles may be invaded and even the ribs attacked. Metastases may also occur.

Mammary actinomycosis is very rebellious to treatment, and the most active measures should always be adopted to combat its inroads.

The greatest danger is to be apprehended from the development of metastases.

The only rational procedure is to remove all the diseased tissue, cutting well into the healthy portion of the gland. It may be necessary to amputate the breast. Large doses of potassium iodide should be given.

When the disease is secondary the chances of cure are less favorable than in the primary form. In a secondary case reported by Nelaton, however, the patient overcame the disease to the extent of regaining her general health, and this despite the fact that a periodic discharge of pus containing actinomyces occurred not only from a small sinus in the breast, but also from others in the lumbar region.

CYSTS.

Much confusion has prevailed in regard to the etiology and pathology of mammary cysts. First of all it is necessary to distinguish true cysts from neoplasms which have undergone cystic degeneration, and it is only the former which will be considered here. The latter will be discussed in connection with tumors.

We recognize the following varieties of mammary cysts: **single retention cyst, lymphatic cyst, general cystic disease, galactocele, echinococcus-cyst, and dermoid cyst.** In addition to these varieties sebaceous cysts of the areola have occasionally been observed.

Single Retention Cyst.

This form of mammary cyst, which is not uncommon, is due to occlusion of a galactophorous duct by the products of inflammation. Thus previous disease of the breast or injury may alike be responsible for the obstruction of the lumen of the duct, which leads to dilatation of the remaining free portion.

These cysts vary in size, some being no larger than a marble, while others are as big as a small orange. They do not differ from cysts formed in other glandular organs by occlusion of the excretory ducts, being of comparatively rapid formation, and appearing in the breast as regular round or oval swellings of elastic consistency. Fluctuation may be plainly detected in most cases. Pain, tenderness, and involvement of the axillary glands are absent.

The fluid contained in these cysts is serous and varies in color from light yellow to reddish or brown. Discoloration of the fluid is probably due to solution of blood coloring matter from occluded vessels in the wall of the cyst.

The wall is thin and the surrounding tissue is normal in every respect.

Treatment consists in dissecting the cyst out in its entirety.

FIG. 13.—Large retention cyst of left breast.

LYMPHATIC CYST.

This form of cyst, which has been described by Birkett and later more carefully studied by Labbé and Coyne, is due to the accumulation and retention of fluid in the lymph-spaces in the connective tissue of the mamma. Lymphatic cysts may be either single or multiple and occur as firm, hard masses of round or oval shape, being usually about the size of a hazel-nut. Fluctuation is absent as a rule, and neither pain nor tenderness to pressure are present. The axillary glands are not involved.

The contents of these cysts is clear, pale yellow fluid, and the wall is lined with a single layer of flat epithelial cells.

Treatment consists in dissecting out the cyst exactly as is done in single retention cyst.

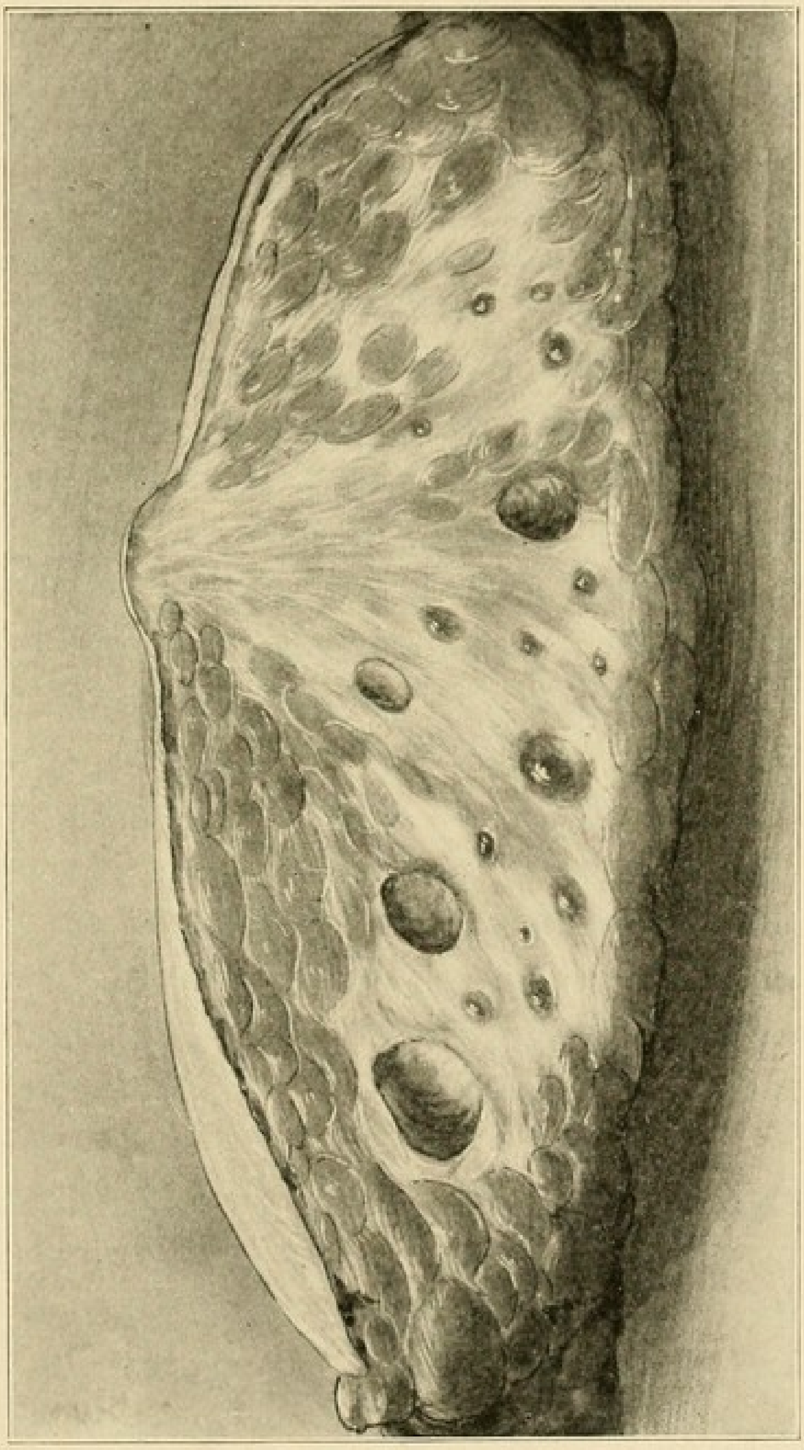
General Cystic Disease.

Of all the diseases to which the mammary gland is subject there is not one concerning which so much confusion has prevailed as this one, nor any to which such a variety of names has been applied. Although multiple cyst-formation in the breast has long been recognized, its pathology has been surrounded with obscurity, and various theories have been formulated in explanation of its cause and development.

Sir Astley Cooper recognized this condition, but erroneously called it hydatid disease. Sir Benjamin Brodie also gave a good description of it. He considered it to be due to dilatation of the galactophorous ducts. It is most interesting to note that this acute observer plainly recognized the progressive nature of the affection, and called attention to the fact that it assumes a totally new character as it proceeds. This observation is of particular interest in the light of our present knowledge, and especially as concerns the views to be enunciated here relative to the pathogenesis and nature of the disease.

Despite the contribution of these two surgeons little attention was given to the disease until 1860, when Reclus published an account of it, calling attention to the frequency with which both breasts are affected, the hardness of the diseased areas, and the absence of a well-defined tumor. He made further contributions in the years 1883 and 1887, and maintained that the disease was due to proliferation of the glandular

PLATE IV.



Abnormal involution (general cystic disease). Gross appearances. (*Warren.*)

epithelium. Although Reclus gave it the name of intra-acinous cystic epithelioma, it has frequently been called Reclus' disease, or simply cystic disease of the breast.

Following Reclus' contributions numerous investigations were carried on, principally by French and German surgeons and pathologists, with the result that other theories in regard to the origin and nature of the disease were advanced.

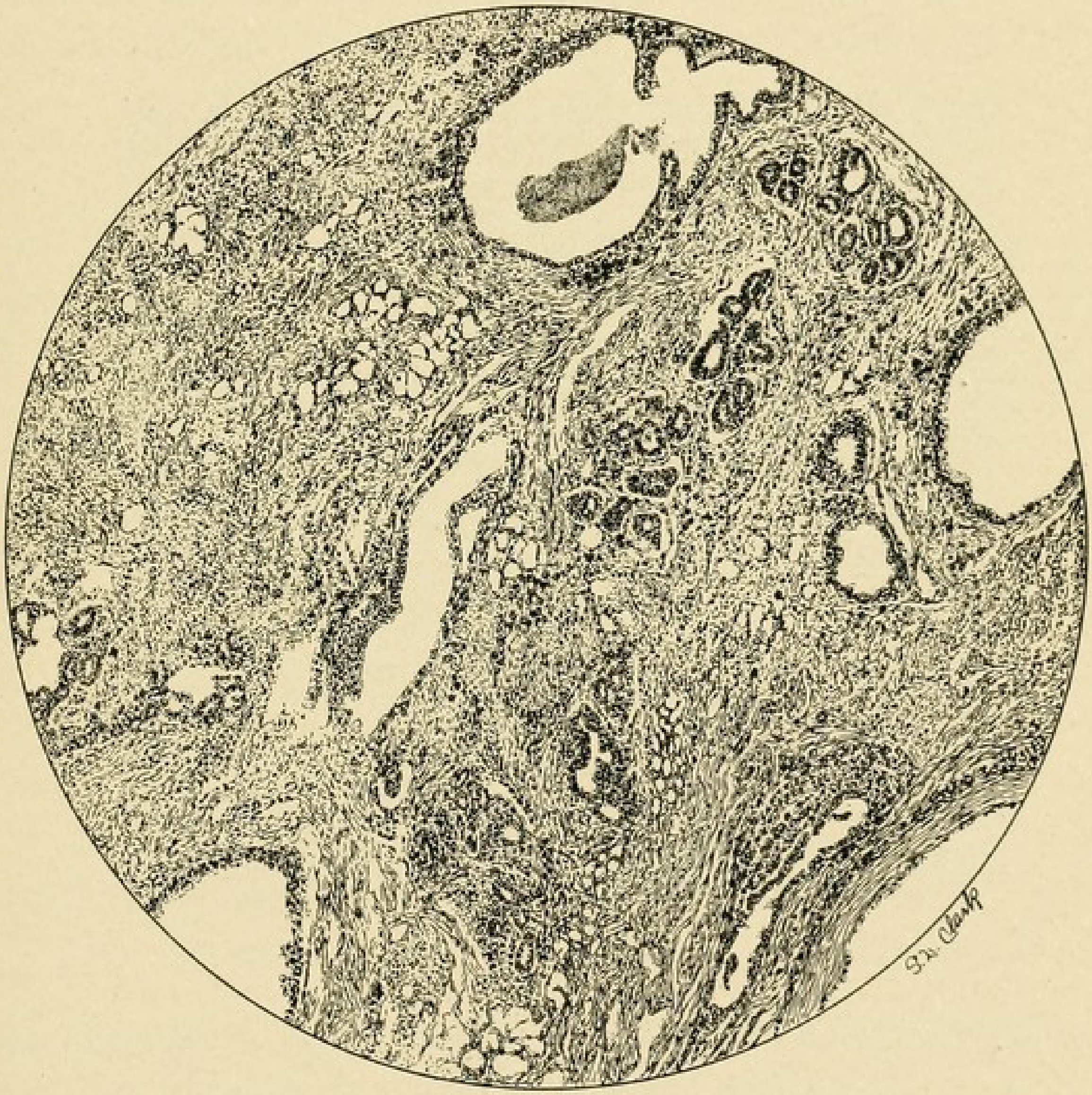
Tillaux and Phocas described the same condition under the name of *maladie noueuse*, and asserted that it was a chronic mastitis with formation of fibrous tissue. Rochard maintained that the condition was merely the expression of any one of a number of different pathological processes. Many differed from Reclus in regard to the close relation of the disease to carcinoma, notably Quénu and Verneuil. Others advanced the theory that the process was primarily inflammatory. In Germany Schimmelbusch made a study of the subject with the result that he decided the cysts were due to new formation, and added the name of cystadenoma to the list of those already in vogue. To increase the multiplicity of terms Sasse proposed the name of epithelial polycystoma, holding that the term cystadenoma was inadequate, inasmuch as the process is much more diffuse than an ordinary neoplasm, and is also especially characterized by epithelial formation.

In the article on **chronic mastitis** it was stated that in the diffuse form of that disease multiple cysts of the most various size were found dispersed throughout the mammary tissues, and it was furthermore stated that they were retentive cysts pure and simple, being due to the occlusion of the ducts by thickened fibrous tissue. Moreover, attention was called to the diversity of opinion which existed in regard to the location of the primary changes which occur. The condition of the epithelium within these cysts was also mentioned, it being stated that in some, particularly the smaller ones, it was normal, whereas in others proliferation could be plainly seen. The views set forth concerning the etiology of diffuse chronic mastitis will also be remembered. In brief it was stated that deviations from the normal functional activity of the gland, accompanied as they must be by alterations of structure, and particularly the changes and aberrations to which it is subject during pregnancy, lactation, and the period of involution, were responsible for the abnormal condition then under discussion.

What I wish to declare in this place is that I believe chronic diffuse mastitis with cyst-formation, and general cystic disease of the breast, to be one and the same disease. The only difference which exists is a difference in degree, and the reason for describing the stage in which cyst-formation reaches its height apart from the earlier stages of the disease is to better emphasize the belief here expressed as to their identity, and also to follow a nomenclature which has long been familiar to English readers. As far as scientific accuracy is concerned, it would no doubt be better to call the disease **fibrous and glandular hyperplasia with retention cysts,** a term devised by Dr. W. F. Whitney, of Boston. The term **abnormal involution,** used by Dr. Warren, is also an appropriate one.

As the process of cyst-formation advances and the cysts become larger, a stimulus to the proliferation of the epithelium within the affected ducts and acini is supplied, and in some cases this proliferation is so pronounced as to result in the formation of distinct papillary out-growths from the cyst-wall. It is this circumstance, no doubt, which has lead some to consider cysts presenting this appearance as true neoplasms. In addition to this form of proliferation Greenough and Hartwell have described what they call adenomatous proliferation, a condition in which the papillary outgrowths coalesce, so that when a section of the tissue is examined under the microscope it appears as though there is a space filled with epithelium in which an occasional open gland can be detected.

PLATE V.



General cystic disease (abnormal involution). Microscopic appearances. Note the dilatations.

Warren has called attention to the fact that there may be an increase in the number of the acini in this disease, and that there is usually a marked associated proliferation of the epithelial cells in the ducts.

In a certain proportion of cases of advanced cystic disease with proliferation of epithelium the morbid process may advance to malignancy. Greenough and Hartwell found associated

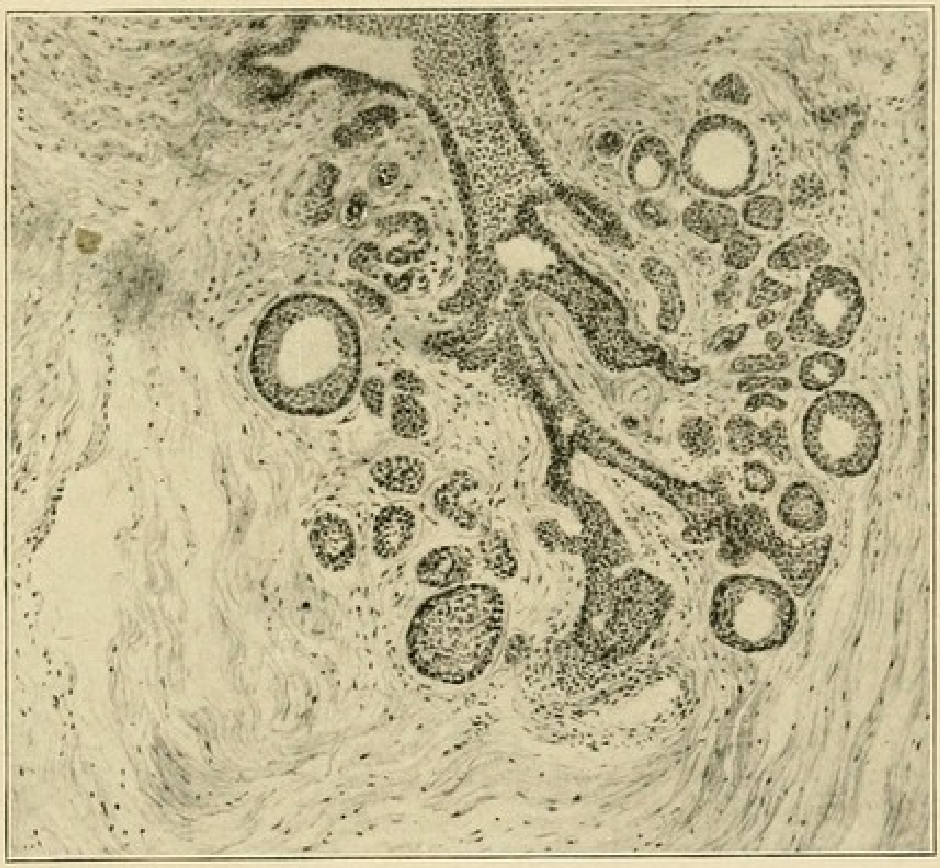


FIG. 14.—Abnormal involution. Acinal type of epithelial proliferation.

carcinoma in 10 percent of the cases which they studied and Warren found it in 13 percent of his series.

In regard to the symptoms and signs of this disease, the remarks made under the description of chronic diffuse mastitis are applicable. As the cysts increase in size alterations in their contents, as well as changes in their wall often take place. Thus the fluid within them may become turbid or discolored, as is the case in single retention cyst.

Treatment consists in removing all the diseased mammary tissue. In cases where a portion of the gland is comparatively free from disease I have of late practised plastic resection of the breast, according to the method of Warren, and find that it gives entirely satisfactory results.

In these cases, however, I consider it of the utmost importance to have a competent microscopist present at the operation, so that a portion or portions of the diseased tissue may be examined at once with a view to determining whether any signs of carcinomatous degeneration are present. If so, the breast is removed, together with the pectoral muscles and axillary glands. I consider it just as important to take this precaution in the class of cases now under discussion as in cases of tumors of doubtful nature. The extra time required for the microscopic examination is well repaid by the additional light which it may throw upon the character of the disease. In cases where the entire gland is riddled with cysts I invariably amputate the breast.

Galactocele.

By the term galactocele is understood a mammary cyst the contents of which is milk or some product of milk. In some such cysts the contents differs in no wise from the milk which is normally secreted by the breast during lactation, but in others it is thick and creamy or even caseous. Occasionally a caseous mass is found floating in milk-like or serous fluid. It is in recent galactoceles that the contents most closely resembles normal milk, whilst in those of long duration changes are apt to take place in the fluid which result in its assuming one of the characteristics just mentioned. Sometimes, too, the contents resembles colostrum.

From these remarks it is seen that galactocele is an entirely different condition than engorgement of the breast with milk.

This disease is one of the rarest to which the breast is subject. I have seen but a single case, and Keen, who states that he has

PLATE VI.

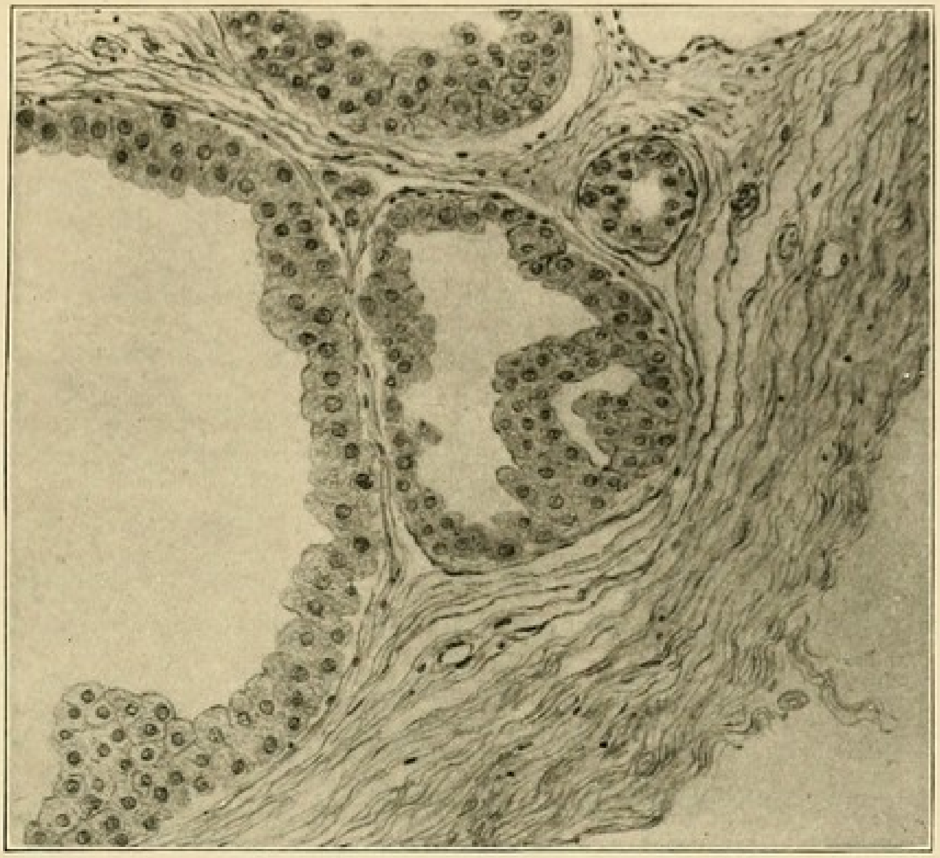


FIG. 1.—Abnormal involution. Microscopic appearances. Papillary and adenomatous types of epithelial proliferation. (*Warren.*)

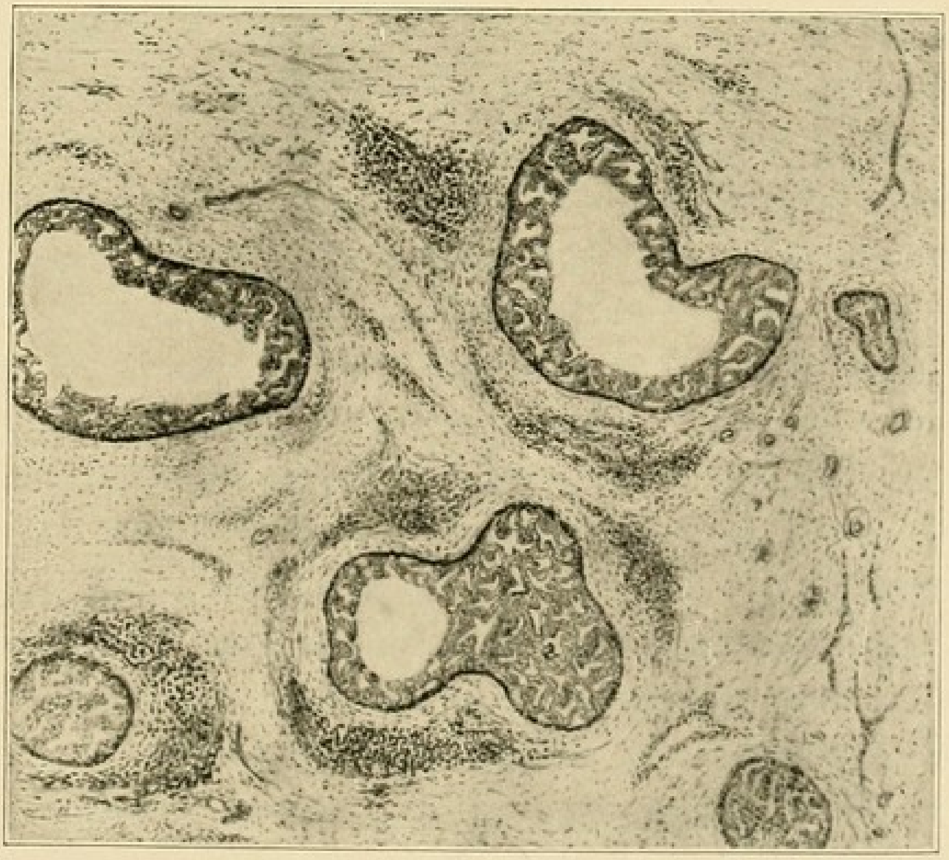


FIG. 2.—Abnormal involution and adenocarcinoma. Microscopic appearances. (*Warren.*)

amputated five hundred breasts and seen three hundred others which were diseased, has likewise seen only one case.

Although galactocele most frequently develops during lactation or just after the child is weaned, it may occur during pregnancy, and a few cases have also been observed in women who have never borne nor suckled children. My case was in a woman who had never been pregnant.

It is usually stated that galactocele is a retention cyst, and while it is true that partial or complete occlusion of a milk-duct in the lactating breast, from whatever cause arising, would be likely to be followed by a retention of the secretion of the gland, the fact that galactocele occurs in women whose breasts have never secreted milk leads me to believe that the primary cause of the formation of these cysts is to be found in changes in the epithelial lining of the galactophorous ducts, as a result of which alterations take place that lead to dilatation of the ducts. Whether these changes in the activity of the epithelium lead to the formation of vegetations which partly occlude the duct, as is maintained by Labbé and Coyne, or whether dilatation occurs irrespective of obstruction, I will not presume to say. At all events endocanalicular changes afford a plausible explanation for the occurrence of those cases which have been observed in women whose breasts have never secreted milk.

It would seem that traumatism is a factor of considerable importance in the production of galactocele, as a history of blows and other injuries to the breast has been given in a number of the recorded cases. In some of these cases, however, the injury was received so long before the development of the galactocele that it is difficult to trace any causative relation between the two, unless it be assumed that the traumatism gave rise to alterations in the tissues which later, particularly during lactation, resulted in the formation of the galactocele. In this case it would be reasonable to assume either that the epithelium of the ducts had undergone alterations, or that as a result of inflammation in the interstitial tissue compression of the ducts had been effected, so that free outlet of the milk secreted later could not take place.

It is evident that the ideas here advanced concerning the etiology of galatocele are purely conjectural, and it must be admitted that the cause of this form of mammary cyst, in common with the causes of many other affections to which the mammary gland is subject, are very obscure. Although little definite is known about them at present, it is to be hoped that further study will result in a better understanding of the manner of their production.

In regard to the appearance of galatocele, it may be stated that it usually occurs as a single rounded swelling situated, as a rule, in the external segment of the breast. The size of the swelling is variable. At first it is small, but as time goes on it may attain a very large size. The average size is probably about that of a medium-sized orange. It is slow in developing and may retain its original dimensions for a very long period of time. It has been observed that lactation causes a rapid increase in the size of the cyst.

When the contents of a galactocele is fluid fluctuation can usually be obtained, and pressure upon the swelling causes fluid to exude from the nipple. The latter circumstance shows that there is not complete occlusion of the duct. Galatocele is not painful and is not adherent to the skin nor to the parts beneath it. Its consistency naturally varies with the nature of its contents. A sign to which Gross called attention is pitting upon pressure. When this phenomenon is present it is probable that the contents is thick or caseous. Neither this sign nor fluctuation are always obtainable. Concerning the former Delbet states that in the absence of edema it is almost pathognomonic.

Suppuration has been known to occur in a galactocele, and ulcerations have been found upon the internal surface of its walls. In my case the breast was examined microscopically by Dr. McFarland, who found that the tissue surrounding the cysts was the site of a marked interstitial mastitis. Similar changes were found by Coplin and Ellis, who examined the breast in Dr. Keen's case. They state that the most conspicuous change was "a marked periacinous infiltration of mononuclear cells, nearly all of which were of the small round variety."

In regard to **diagnosis** it may be stated that any fluctuating tumor developing suddenly in the breast of a woman who is nursing a child is probably a galactocele. Pitting upon pressure likewise is good evidence in favor of galactocele, as has already been stated. In other cases where the cyst has been of long duration or developed irrespective of lactation, diagnosis will not be so easy, and its nature may not be suspected until incision is made.

The proper **treatment** of galactocele is enucleation of the cyst and excision of the surrounding tissue. Simple incision and evacuation of the contents is not satisfactory, as the sac is likely to fill up again. Puncture is mentioned solely to condemn it.

Hydatid Cysts.

The mammary gland is occasionally though very rarely attacked by hydatid disease. In comparison with other diseases of the breast hydatid disease is of little importance on account of the rarity with which it occurs. In 1,897 cases of hydatid disease collected from various sources by John D. Thomas only 20 affected the breast, an incidence of hardly more than 1 percent. When the rarity of hydatid disease itself is considered, the low percentage of the mammary form shows how rare it is in comparison with other affections of the breast.

In regard to the etiology of mammary hydatid disease nothing positive is known. How the embryos of the parasite reach the mammary tissues cannot be positively stated, but it is probable that in the primary cases they gain access through the blood-stream.

The breast may, however, be invaded secondarily from contiguous structures, notably from the great pectoral muscle.

So far as I have been able to determine hydatid cyst of the breast has occurred only in women. It may affect any portion of the gland.

Hydatid cyst of the breast begins as a small, hard, distinctly circumscribed swelling, which is freely movable on the parts subjacent to it. This swelling increases in size very slowly and may remain stationary for months or years. As a rule the cyst does not attain a very large size, probably not being any bigger than an orange in the majority of cases. In a case reported by Berard, however, it attained a volume twice as great as that of the other breast.

It has been known to grow rapidly after injury. This hard, firm consistence is usually maintained after the cyst has become of a considerable size, although in some cases fluctuation has been detected. The latter phenomenon, however, has been observed only in large cysts.

The wall of the cyst, which consists of two distinct layers, is apt to become inflamed and suppurate, with the result that the cyst becomes adherent to the skin and finally breaks through it, discharging pus and the hydatid membranes and hooklets. The axillary glands may also become enlarged.

It is in these later stages, too, that the breast becomes painful. It is common for these degenerative changes to take place in hydatid cysts of the breast the same as in those in other parts of the body. In twenty-four cases studied by R. G. LeConte the contents of the cyst showed changes from its normal limpid character in eight, or a percentage of thirty-three and a third.

A very interesting case of hydatid cyst of the breast was operated on by Dr. LeConte, in 1899, at the Pennsylvania Hospital. It occurred in a young colored woman, aged twenty-seven years, who had spent all her life in Philadelphia and the neighboring city of Camden. The tumor was of four years' duration. For two years it remained of about the same size, but began to grow rapidly after an injury to the breast. From twelve to fifteen ounces of pus escaped when the mass was opened. This pus contained large numbers of hydatid hooklets.

LeConte believes this case to be the first one reported in America. A search through the literature failed to show any others reported in this country before or since.

Diagnosis is very difficult, as these cysts closely resemble benign growths as regards both consistency and size, as well as their manner of evolution.

Suppurating hydatid may be mistaken for an abscess. Puncture of the cyst will reveal its nature, but this is likely to be practised only when suspicion exists that one is dealing with a hydatid. In most cases the diagnosis will be made only upon operation.

Treatment consists in dissecting out the cyst when possible, or if it should be so large as to have destroyed much of the glandular substance, in partly or completely amputating the breast. Suppurating hydatid should be treated as an abscess.

Dermoid Cysts.

Dermoid cysts of the mammary gland are so rare that they require simply to be mentioned. There are very few cases recorded in literature. These cysts are, of course, always of congenital origin, although they may be so small as to escape detection until they suddenly begin to grow, perhaps late in life, and then first attract the attention of the patient.

In addition to dermoid cysts in the substance of the gland, others originating from the sternum and encroaching upon the tissues of the breast have been reported.

Diagnosis is difficult and in the majority of cases will be made only at the time of operation. Treatment consists in excision of the cyst.

Sebaceous Cysts.

Sebaceous cysts are occasionally met with around the nipple, originating for the most part in the glands of Montgomery, although they may occur in any portion of the integument of the breast. They are usually small, but in some instances have been known to attain the size of an egg or even become larger. Increase in size, however, takes place slowly and the cysts may remain stationary for long periods of time. These cysts usually give rise to no symptoms, being painless and non-sensitive to touch. They may, however, become inflamed.

I recently removed one of these cysts from the breast of a young colored woman. She first noticed it about four months previous to the time of operation. It constantly increased in size, and for two weeks before operation had caused more or less dull aching pain, and occasionally sharp shooting pains. Treatment consists in dissecting the cyst out in its entirety, taking care not to rupture the sac.

DIFFUSE HYPERTROPHY.

This is a very rare affection in which the breasts increase abnormally in size either at puberty or during pregnancy. Its rarity is well shown by the fact that in 1902 Kirchheim was able to collect only forty-two authentic cases from literature.

The disease has been carefully studied by this author and also by Schussler and Delbet, and it is from their works that much of the material for this article has been taken. The great rarity of the affection makes it necessary for a collective investigation to be made in order that any definite conclusions can be formed in regard to its nature, symptoms and course.

In regard to the **etiology** of the disease, it may be stated that nothing is known other than that puberty and pregnancy exert a causative influence. Disturbances of the pelvic organs are often associated, but it cannot be logically maintained that they are causative. The mere circumstance that the menses fail to appear or suddenly become arrested, or the fact that ovarian enlargement exists simultaneously with the mammary disease, cannot be rightly construed to mean that the latter trouble is dependent upon the former.

Among other conditions to which causative influence has from time to time been attributed may be mentioned irritation, injury, cold, and celibacy. These, however, are to be considered as purely accidental conditions which have no bearing whatsoever upon the development of the disease.

It has also been stated that race and climate are etiological factors, but the researches of Kirchheim tend to show that such is not the case. It is doubtful, too, as to whether heredity plays as important role, although Rousseau mentions the case of a woman whose sisters and nieces had exceedingly large breasts, and states that one of the sisters had an abnormal enlargement of the breasts during pregnancy. Pflanz also relates a case in which an uncle of the patient had abnormally large breasts. These data, however, are too meagre to permit the formation of any inferences.

In regard to the **morbid anatomy** of this affection, it should first of all be stated that there seems to be a difference between those cases occurring at or about the time of puberty and those which develop during pregnancy. In the former class of cases the investigations of Labarraque, Bartel, Schussler, and Kirchheim seem to show that the morbid process is essentially a diffuse fibromatous overgrowth. In those occurring in pregnancy there is a marked increase in the glandular elements. In one such case recently studied by Deibel glandular structure predominated.

The subcutaneous fat over the breast frequently disappears, a circumstance which is probably due to the pressure exerted upon it by the new tissue.

The **symptoms** as well as the morbid anatomy vary according as the disease develops in association with or irrespective of pregnancy. It has been observed that the onset is more sudden and the development more rapid in those cases occurring in pregnant women than in those occurring in the non-pregnant. Thus, for example, in a case reported by Delfis the breasts of a pregnant woman became so hypertrophied that they rested upon her thighs when she assumed the sitting posture, and this abnormal increase took place entirely during the period of gestation, the breasts before having been entirely normal. Esterle has reported another case in which they attained the weight of twenty-six to thirty pounds in three and one-half months.

Two stages of the disease are usually described. In the first stage the normal contour of the breasts is preserved, the only change being an increase in their size. The skin is not altered, and the chief subjective symptom is uneasiness, or perhaps slight interference with respiration, owing to the increased weight of the organs. Pain may or may not be present in this stage. Some authors state that it is absent, others that it is present. From a study of the literature it is found that the symptom occurs in some cases and is absent in others.

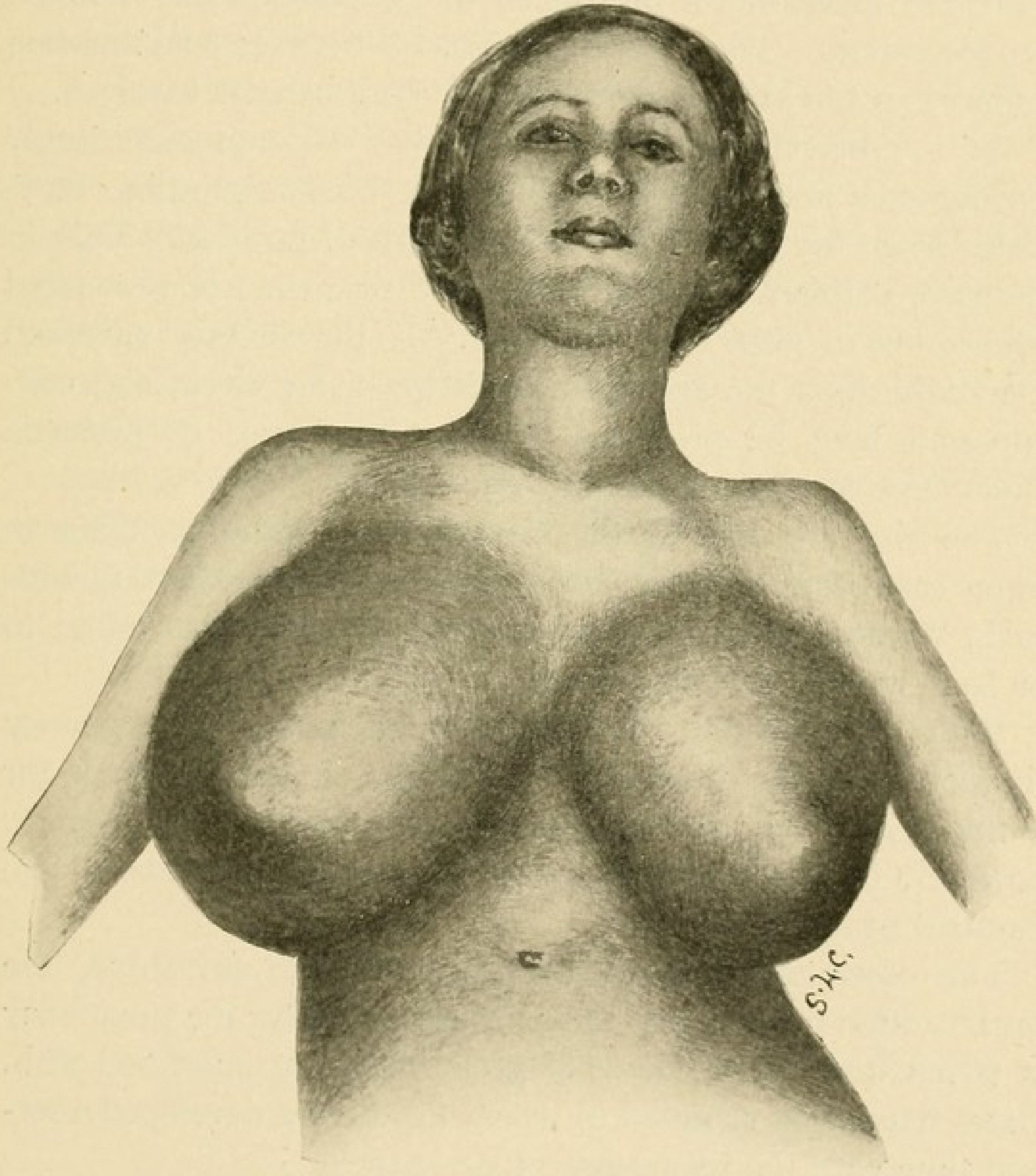


Fig. 15.—Diffuse hypertrophy. (*Donati.*)

In the second stage changes take place in the form of the breasts, being due undoubtedly to the great increase in weight. They may become displaced from the pectoral muscles and fascia, to which they are only loosely attached. Alterations in the skin also occur. The veins become distended and thickening and edema are sometimes observed. Excoriations and ulcerations have also been known to develop, particularly where the skin is arranged in folds. In one advanced case mentioned by Marjolin there was a protrusion of glandular tissue through an ulceration. This case is unique. Whenever inflammation supervenes the axillary lymph-glands may become involved.

As the breasts increase in size they become exceedingly burdensome and may greatly interfere with respiration, especially when the patient is in the recumbent position. Pain in the ribs, palpitation of the heart, and distortion of the spinal column have also been observed. If the breasts encroach markedly upon the abdomen, digestive disturbances and constipation may be produced. A certain degree of cachexia supervenes in cases of long duration.

The size attained by the breasts varies greatly. Thus in some cases they weighed not more than four or five pounds each, whereas in others their combined weight was found to be from twenty to sixty pounds.

With the exception of those cases occurring in pregnancy the course of the disease is progressive. It may continue for many years. In an exceptional case reported by Donati, however, the condition remained stationary after about two months' progression.

The cases associated with pregnancy are favorable, the breasts often returning to their normal size after the pregnancy is terminated. The course of gestation is not interfered with. Cases have been reported in which the disease developed a second time with the recurrence of pregnancy.

In regard to **treatment** it may be stated that amputation of the breast is indicated in all cases other than those associated with pregnancy, provided that the hypertrophy is sufficient to produce disturbances of any consequence. The progressive nature of the disease tends to make its treatment surgical. Beginning cases and those of slight degree have been treated by means of compression and the application of iodine ointment, but to me it seems irrational to expect much from such measures. As already stated the disease is essentially a diffuse fibroma. Therefore it is hardly probable that the above-mentioned measures will exert much influence upon it.

Amputation of the breasts, however, has always resulted in cure. Owing to the increased vascularity of the parts, troublesome hemorrhage has been encountered, and for this reason it has been advised to transfix the organs at their base with long pins and then make compression by means of an elastic band passed around them. Amputation of the second breast has also been deferred until complete recovery took place from the first operation.

Expectant treatment is indicated in the cases associated with pregnancy, for as already stated, the process undergoes resolution after the period of gestation is passed.

KELOID.

This disease, which is in reality an overgrowth of fibrous tissue beginning around the blood-vessels of the corium, is of importance when it affects the skin of the breast, as is not uncommonly the case, for the reason that it may be mistaken for incipient or recurrent carcinoma. In the mind of a patient the so-called spontaneous keloid, first clearly defined by Alibert, often causes fear that she is the subject of malignant disease, and the secondary or cicatricial form, particularly if it develop on scars following incisions for malignant tumors, may give rise to apprehension that the disease is breaking out again, and thus worry both patient and physician until its true nature is determined.

In regard to the **etiology** of keloid little is known. Formerly it was thought to develop solely in scars, but Alibert, as already stated, called attention to what he termed a primary or idiopathic form of the disease, which he thought developed irrespective of injury. Further investigations, however, have led to the conclusion, at least by most observers, that there is invariably an antecedent injury, be it ever so slight, which supplies a basis for the development of the disease. Cases have been known to occur in which no history of the slightest traumatism could be obtained, but if it be granted that a scratch or excoriation be sufficient, in those whose tissues are predisposed, to set up a morbid increase of cells, the futility of relying on absence of a history of injury becomes at once apparent. I do not believe in the existence of idiopathic keloid.

The disease has been observed superimposed upon the scars following burns of the mammary integument, furuncles, and those following the simple incision of abscesses, as well as those following more extensive injuries and operative procedures. Negroes are specially predisposed.

Symptoms.—Keloid may be either single or multiple. It occurs as round, oval, or oblong nodules or plaques, of a white, pink, red, or purple color. Very frequently prolongations of the new fibrous tissue stretch outwards from the body of the growth, giving it a claw-like appearance. These growths increase in size very slowly and seldom produce any subjective symptoms. Occasionally, however, itching or pain is present.

There should really be no difficulty in **diagnosticating** keloid, although if the disease develops upon scars made in removing the breast for malignant disease, it may at first be mistaken for a recurrence. The peculiar character of the lesions, however, should at once furnish an inkling as to their nature, which will be positively revealed as they progress. The so-called spontaneous keloid should offer no difficulty of diagnosis. The slow growth and the not uncommon claw-like projection, as well as the other characteristics above mentioned, should serve to distinguish it from scirrhus, provided, of course, that the existence of such a disease as keloid be borne in mind.

As to **prognosis** it may be said that the disease is very rebellious to treatment, and that it persists for a long time. Spontaneous diminution in size and even complete disappearance have been known to take place in cases which had resisted all therapeutic efforts. The disease is benign and does not endanger life; moreover, it seldom causes the patient any suffering.

Treatment is not very satisfactory. Operation as practised in the past has been almost always followed by recurrence. If done at all the lines of incision should be carried far beyond the diseased area, so that an extensive removal of tissue may be effected. The wound should be skin-grafted instead of being sutured, as it has been demonstrated that recurrence often takes place at the site of the needle puncture. I am satisfied that the cases I have grafted did much better than those where suturing was practised, and the explanation would seem to lie in the avoidance of tension and sutures.

I was led to make this suggestion many years ago, and an increased experience has only tended to confirm the opinion then expressed to the Louisville Surgical Society.

Having seen excellent results follow the use of the X-rays, which undoubtedly cause some absorption of the growth and a more supple condition of the cicatrix, I am inclined to try this treatment in all cases before resorting to operation. Electrolysis has also seemed to cause a diminution in the size of the lesions in a few cases, but it more often has failed.

TUMORS.

Before taking up the specific tumors of the breast, it may not be amiss to devote a little attention to tumors in general and the relation they bear to those in which we are most interested. The nature, origin and classification of tumors have long constituted a much mooted question. Authors differ in their conceptions as to the nature and origin of the individual tumors, so that many definitions have been given.

The two predominating views held by oncologists as to the nature and origin of tumors in general are those of Virchow and Cohnheim. Virchow taught that tumors developed by metaplasia of adult tissue under proper stimulus or in the absence of proper restraint, placing practically no limitations upon its possibilities, claiming that connective tissue can be transformed into epithelium and *vice versa*. Cohnheim took diametrically the opposite view, referring every tumor-formation to the embryonal state, describing a tumor as a "circumscribed, atypical production of tissue from a matrix of superabundant or erratic deposit of embryonal elements." He denies the possibility of metaplasia and refers every growth to the primary embryonic layers, portions of which, having been arrested at some stage of their development, have, under stimulus, taken on new growth and developed into tumors. Senn, in his work upon tumors, does not accept the Cohnheim view in its entirety, but claims, with Ribbert, that neoplasms may also be due to remnants or "anlage" of post-natal origin, giving as his definition of a tumor a "localized increase of tissue, the product of tissue proliferation of embryonic cells of congenital or post-natal origin, produced independently of microbic causes."

None of these views has been universally accepted, and it appears that they may all be used to explain the formation of different tumors and that none is the exclusive explanation of them all. The inclusion theory is undoubtedly the best explanation that has thus far been offered of the formation of the dermoid cysts and teratoid growths, which are almost invariably found in the center line and contain elements of misplaced epithelium in situations in which metaplasia cannot be considered. Again, it offers an excellent explanation for the neoplasms of the kidney composed of adrenal tissue (hypernephromata.) It might even be considered in many of the other tumors, as sarcoma, myxoma, angioma, enchondroma (in areas where cartilage is not a normal element), but that it cannot be offered in explanation of all the tumors appears evident from the examples that can so frequently be seen of direct metaplasia of normal structures into malignant growths. It is a well-recognized fact that carcinoma of the lip usually affects pipe smokers; that carcinoma of the tongue is frequently caused by a jagged tooth; that carcinoma of the uterus is most common in those who have borne children and have suffered laceration of the cervix; that carcinoma of the breast has a frequent antecedent history of injury; that melanotic sarcomata often follow injury to pigmented moles; that, in certain races, keloids often follow injury to any part of the body; that carcinoma of the stomach is most frequently found following history of ulcer, and in the pyloric region, and that carcinoma of the gall bladder is frequently found in conjunction with gall stones. The above examples might be multiplied, but they will suffice to illustrate the class of cases in which it is rather difficult to attribute the formation of the growths to the Cohnheim theory. It appears unlikely that these "anlage" should be deposited only in regions which are most subjected to injury. Finally, in some carcinomata of the breast, direct transition of normal acini into malignant growths can be detected; likewise in certain fibromata, the direct metaplasia into malignant sarcomata can be seen by the microscope as well as corroborated by the clinical history.

From the above, it appears most rational to attribute the origin of tumors to both sources, some as explained by the Cohnheim or even the Senn theory, and some to direct metaplasia, as maintained by Virchow. Metaplasia undoubtedly does occur but not to the extent claimed by Virchow. One tissue may be transformed into a related tissue of similar epiblastic, mesoblastic, or hypoblastic origin, but that a mesoblastic tissue becomes converted into a hypoblastic or epiblastic tissue, and *vice versa*, appears to me to be untenable. They are essentially different at birth and remain so until death. The apparent cases of mouse carcinoma becoming converted into sarcoma by transplantation are evidently due to the malignant metaplasia of the stroma of the growth, which has proliferated to such an extent as finally to overshadow the original epithelial growth and to appear as sarcoma. It is not an instance of direct metaplasia of epithelial tissue into sarcoma, but a case of the survival of the most active element.

In accordance with the above views, we may define a tumor as a newgrowth characterized by a histological diversity either of nature, amount, or arrangement of the cells, from the matrix in which it grows, having no beneficent functional activity and not microbic in origin.

Tumors can be classified in various ways, either according to the conception of the tumors themselves or with reference to their clinical activities.

From the pathological point of view tumors may be divided according to Ribbert as follows:—

1. **Tumors of the Supporting Tissues (Connective Tissues).**
   a. Fibroma.
   b. Lipoma.
   c. Chondroma.
   d. Osteoma.
   e. Chordoma.
   f. Angioma.
   g. Sarcoma.
      α, sarcoma.
      β, osteosarcoma.
      γ, chondrosarcoma.
      δ, lymphosarcoma.
      ε, myxoma.
      ζ, chloroma.
      η, myeloma.
      θ, melanoma.
2. **Tumors of Muscular Tissue.**
   Myoma.
3. **Tumors of Nervous Tissue.**
   Neuroma.
   Glioma.
4. **Tumors of Combined Epithelial and Connective Tissues.**
   A. Fibro-epithelial tumors.
      a. Cutaneous.
      b. Originating in mucous membranes.
      c. Originating in glandular structures.
   B. Carcinomatous tumors.
5. **Chorionepithelioma.**
6. **Endothelioma.**
7. **Mixed Tumors, Embryoma, Teratoma, etc.**

This classification, which is based upon the histological appearances of the tumors, is far from ideal, but is probably the best for practical purposes, and especially when applied to tumors of the breast. An ideal classification would be based upon the embryological basis alone, but this is difficult owing to the fact that whereas many of the tumors, especially of the fibro-epithelial variety, etc., are composed principally of epi- or hypo-blastic tissues, they contain a connective tissue stroma of mesoblastic origin. In addition combinations of almost all forms of tumors occur, some of which are of similar and others of different origin.

It will be noticed that the classification does not include the infectious granulomata or cystic formations due to retention of normal secretions. These are not true neoplasms and should not be classed as tumors.

While the above classification is most satisfactory from a pathological point of view, the division of the subject which is of most use to the surgeon is that which deals with the clinical behavior of the tumors. This is a very simple one, there being but two distinct classes, viz., benign and malignant. Benign tumors may be briefly defined as those growths, which *per se* exert no deleterious action upon the general economy, whereas malignant tumors may be defined as those growths which exhibit no signs of restraint, but progress to a fatal termination. Each has certain characteristics which distinguish it, and which, as a rule, should be recognized by the surgeon as soon as encountered, so that he should not always be compelled to depend upon the pathologist for a decision as to prognosis and treatment.

Benign tumors are usually very slow in growth and distinctly localized, having a definite capsule. They rarely attain excessive size, but occasionally, owing to their intrinsically benign character, may attain huge dimensions without injury to the general economy. Generally they are movable (unless bound down by surrounding inflammatory tissue or primarily attached to bone). They do not metastasize or become disseminated throughout the body, and when completely removed do not recur. They exert no influence whatever upon the general economy when favorably situated, but may endanger life by their size and situation when they interfere with the normal functions of any of the important organs of the body. They constitute the bulk of the tumors of youth, and need be removed only because of their size and location and because of the ever present danger of transformation into their correlated forms of malignant disease.

Microscopically they can be distinguished by their non-infiltrating character, by their distinct encapsulation, by their tendency to conform to some definite type of normal adult tissue, and the absence of an actively growing edge with an abundance of cells showing karyokinetic figures.

Malignant tumors exhibit diametrically opposite characteristics. They grow rapidly and usually diffusely. They are not encapsulated and may quickly attain considerable size, although huge malignant tumors are rather exceptional, since they usually prove fatal before they attain such proportions. They are intimately connected with the surrounding tissues and quickly become bound down and immovable. They metastasize and become disseminated rapidly through the lymph or vascular system, progressing steadily toward a fatal termination by the interference with vital functions caused by metastatic growths, or by an auto-intoxication which undermines the general health and produces the condition commonly known as cachexia.

Microscopically they can be distinguished by the embryonal character of the cells constituting the growth and by their atypical structure, conforming to no definite adult normal tissue. They can be seen to be rapid in their growth by the abundance of cells undergoing indirect cell division. They are not encapsulated, but tend to invade surrounding structures, blood and lymph channels, a circumstance which explains their ready metastasis.

Each layer of the original ovum is represented by one malignant tumor. The epi- and hypoblast are represented by the carcinomata and the mesoblast by the sarcomata. There are several types of each, but they are all related one to the other and all show some conformity to the above characteristics. All the other tumors are benign in nature.

Before taking up the consideration of the tumors particularly common in the breast, a few words remain to be said with reference to the differences which distinguish the carcinomata and the sarcomata. First and foremost is the character of the cells which constitute the different growths. The sarcomata are composed of embryonal connective tissue cells, being either round (large and small), spindle (large and small), irregular in shape or polynuclear; whereas the carcinomata are usually larger, polygonal or columnar in shape and represent atypical forms of squamous or acinous types of tissue. The sarcomata grow with practically no stroma, the blood supply being from very thin-walled blood-vessels, which are in intimate contact with the tumor cells, by which they are frequently invaded. Carcinomata, on the other hand, frequently possess an abundant stroma between masses of cells, with a finer stroma between the individual cells, the cellular element encroaching upon the lymph channels of the surrounding tissue and the stroma of the tumor itself. Sarcoma advances with a solid growing edge, encroaching on the surrounding tissue as a whole, whereas carcinoma sends out finger-like projections through the lymph spaces, the new-growths increasing in size until they cause destruction of the tissue they have invaded.

Sarcomata become disseminated, as a rule, by invading the vascular system, with the resulting transportation of emboli to distant organs, whereas carcinomata, while they may at times invade the system in a similar manner, usually do so by way of the lymphatic system, metastasis occurring first in the nearest chain of lymphatic glands and trunks, from them to others more distant, and finally throughout the economy. As a result of these differences in methods of dissemination, sarcomata will recur locally after operation should the primary growth not be thoroughly removed, but otherwise at some far distant point; while carcinoma, perhaps when thoroughly removed at the site of the local growth, shows a tendency to recur, not locally, but in the nearest lymphatic structures, and only late in the disease shows general organic involvement.

Finally, as a clinical difference of some value, but not so great as has been claimed in times gone by, is the difference in the age of the patients affected. It was formerly taught that carcinoma a was disease of old age (over 45) generally; but data are gradually accumulating which tend to convince us that we can never exclude the diagnosis of carcinoma merely on account of the youth of the patient, the writer having observed many carcinomata in children, and carcinomata of the breast have been noted as early as 19 years. The fact, nevertheless, remains that carcinoma occurs most frequently after forty (40) years of age.

Sarcoma, on the other hand, is most frequently a growth of youth or middle age but here the reverse of the above is often found to be true, for sarcomata are found at all periods from infancy to old age.

Concerning the benign tumors, little need be added to that already mentioned. The name given a tumor is in itself a description of the tissue of which it is composed, since benign tumors are more or less typical of normal tissues although functionless and varying from the normal growth only in their situations and the arrangement and comparative amounts of the various elements of which they are composed. In the tumors of mesoblastic structure, when composed of more than one kind of tissue, the name is usually made to include all the tissues comprised, beginning with the predominant one and going downward in the scale. In the benign hypo- and epiblastic tumors the same rule applies, with the exception that the mesoblastic element is not regarded unless present in excess of the amount required as a connecting stroma for the epithelial tissues. They are, however, classified under the fibro-epithelial tumors.

All that has been written above applies to tumors wherever situated, but it does not consider the relative frequency with which certain tumors are found in some regions and the peculiarities which they are liable to exhibit in various situations. Since the portion of the anatomy with which we are particularly interested is the breast, we can afford to devote our attention to it at once and leave the other organs to be treated in more general works.

The breast is not prone to a great variety of tumors, although it is one of the most frequent sites in the body for some of them. While the whole subject of the etiology, etc., will be treated under the different tumors, it may be well to mention here that carcinoma constitutes more than three-fourths of all tumors of the breast and that the great bulk of the remainder are benign tumors of the fibro-epithelial type. While lipoma, angioma, chondroma, sarcoma, myxoma and endothelioma do occur, they constitute an almost negligible quantity when compared to the other two types of tumors.

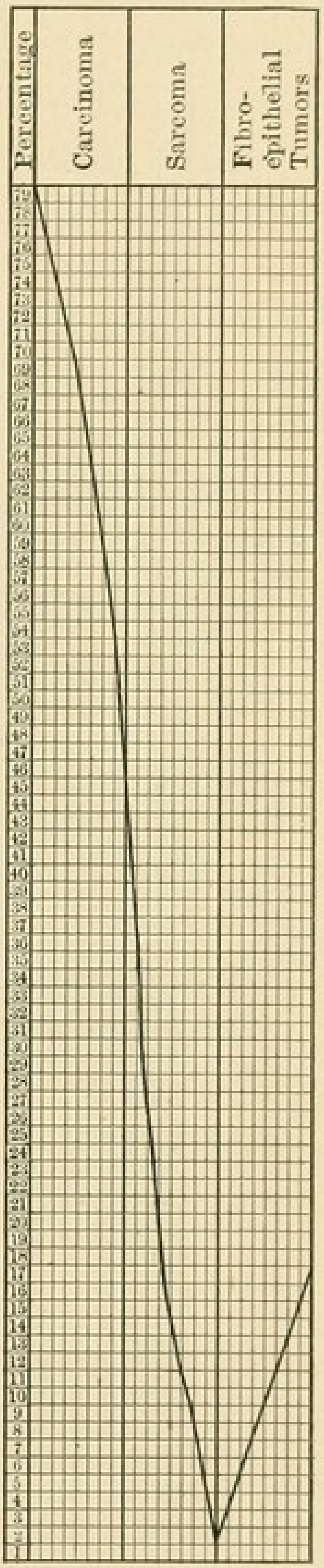


FIG. 16.—Showing the relative frequency of tumors of the breast; based on 5000 cases collected from various hospital reports.

The benign tumors of the breast have been so well studied and classified by Warren, that I believe the best scientific ends

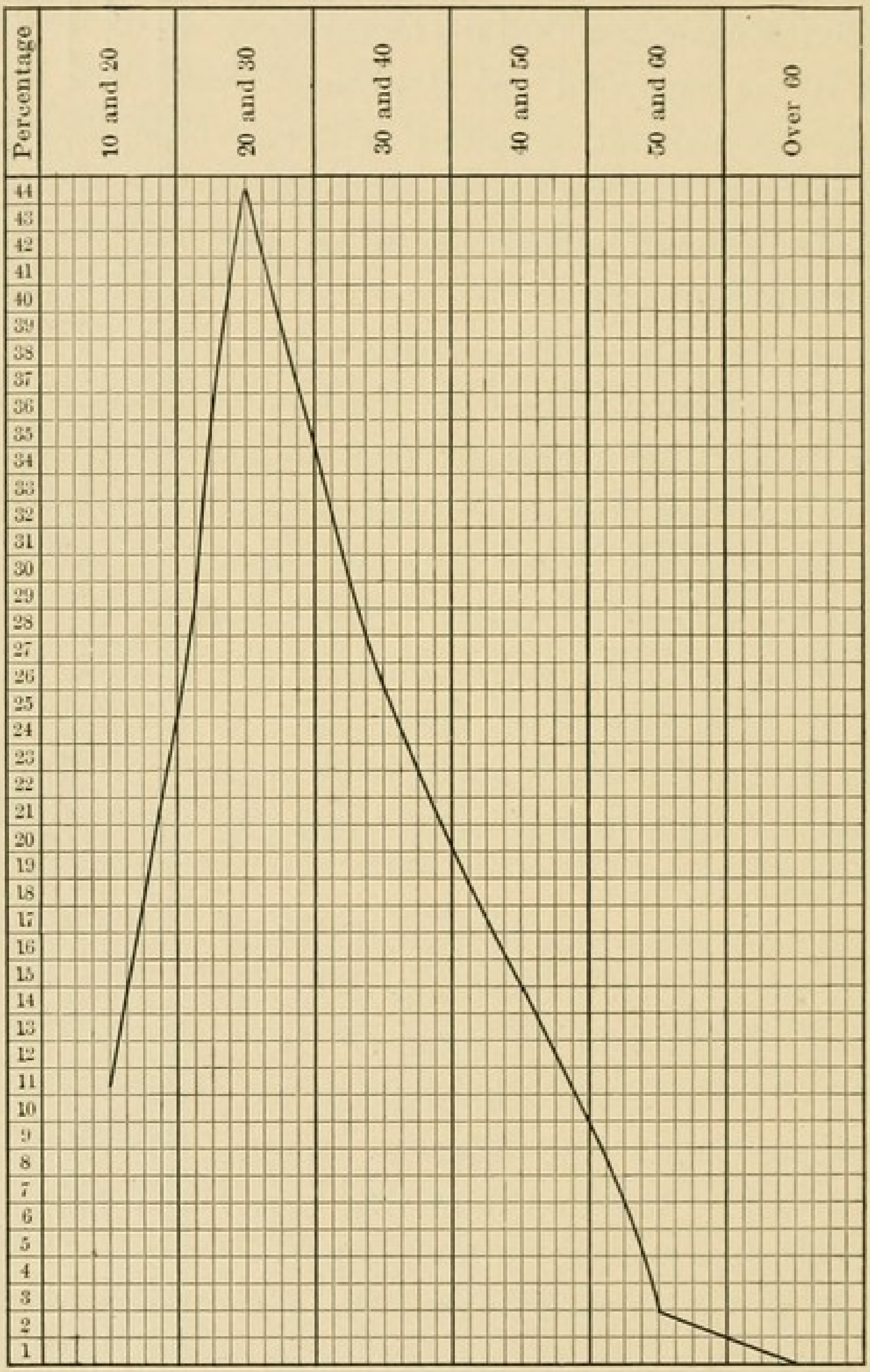


FIG. 17.—Showing the age incidence of benign tumors of the breast; based on 1000 cases collected from various sources.

will be served by adhering to his views almost in toto, at the same time contributing something to his effort at harmonizing and unifying the nomenclature used with reference to tumors of the breast in general. He has struck the keynote of dissimilarity which exists between these benign tumors when he classifies them all together as fibro-epithelial tumors which exhibit some differences, owing to the disparity in the nature of the breast tissues in which they arise, and also to the fact that their growth is intimately associated with glandular epithelium which, in some instances, forces itself into prominence.

These growths usually occur in young women, their greatest age incidence, as shown by the accompanying chart, being between the ages of twenty and thirty.

Before proceeding with the individual growths I will give Warren's classification, filling in a few omissions made by him, in addition to giving the classification of the carcinomata which will be followed in this book.

BENIGN TUMORS.

Fibro-epithelial tumors
- (1) Fibrous type:
  1. Periductal fibroma { Intracanalicular. / Pericanalicular.
  2. Periductal myxoma.
  3. Periductal sarcoma (slightly malignant).
- (2) Epithelial type:
  1. Fibro-cystadenoma.
  2. Papillary-cystadenoma.
  3. Simple adenoma.

Lipoma.
Enchondroma.
Myxoma.
Angioma.
Endothelioma.

MALIGNANT TUMORS.

Sarcoma.

1. Round cell.
2. Spindle cell.
3. Mixed cell.
4. Giant cell.
5. Alveolar.
6. Melanotic.

Carcinoma.

1. Adeno-carcinoma.
2. Medullary carcinoma.
3. Carcinoma simplex.
4. Scirrhus carcinoma.
5. Carcinomatous cyst.

FIBRO-EPITHELIAL TUMORS.

By the term fibro-epithelial tumor, which was first used by Ribbert, is understood a growth of new formation containing both fibrous connective tissue and epithelium.

Much confusion has existed in regard to the members of this group of tumors, owing to the diversity with which their constituent elements may appear, and likewise, though in lesser degree perhaps, to the difference of opinion concerning their origin. It is principally concerning those new growths in which the one or the other of the above named tissues predominated that the confusion has prevailed.

Soon after the existence of benign tumors of the breast was recognized by Sir Astley Cooper and Cruveilhier the difficulty in classifying them began. There can be no doubt that the growth described by Cooper as chronic mammary tumor belonged to the class now under discussion, and that they were identical or similar to the ones described by Cruveilhier some years later as fibroma. Cruveilhier, however, maintained that the fibromata were quite different from those tumors which Cooper has described. He believed that they originated in the fibrous connective tissue of the breast, but his views met with much opposition, particularly in France, after the existence of benign mammary tumors became generally recognized. Additional discord was lent to the subject by Lebert, who, in 1850, made the first report of the microscopical study of these growths. I am quite in accord with Delbet, however, concerning the error which Lebert made, being convinced that his mistake consisted rather in the selection of an unfortunate term than in failure to recognize the true nature of the growths. Although he called these tumors *partial hypertrophy of the breast*, he stated clearly that in some the hypertrophy affected chiefly the fibrous tissue, whereas in others its principal site was in the glandular elements. Despite the fact that he was attacked from all sides and his idea of partial hypertrophy subjected to ridicule, it is plainly manifest that the result of his observations constituted a decided advance in the knowledge of these tumors. Of course, a partial hypertrophy in the true sense of the word is impossible, but, as already stated, it is doubtful if Lebert intended to imply the existence of such a condition.

The presence of both fibrous and epithelial tissue in the tumors was likewise recognized by Broca.

Further investigation only served to increase the multiplicity of terms and lead to greater diversity of opinion in regard to the origin of the tumors. It was observed that cyst-formation took place in many of the growths, and that the stroma resembled sarcoma, hence the term **cystosarcoma** was applied to this form by Johannes Müller. It was also noticed that the epithelium of the cysts sometimes proliferated, and so the term **cystosarcoma proliferum** was used to distinguish this variety from those in which no proliferation occurred, the latter being designated as **cystosarcoma simplex.**

With few exceptions the members of the French school came to accept the belief that these tumors were of glandular origin, and thus the name **adenoma** was added to the list. To those tumors in which fissures and clefts were well-marked, as well as to those in which true cyst-formation occurred, the term **cystadenoma** was given. **Papillary cystadenoma** was also spoken of to designate those in which there was a papillary proliferation of the epithelium. Sir James Paget called this latter kind **proliferous mammary cysts,** and designated those in which cyst-formation does not occur as **mammary glandular tumors.**

Among other terms which have been used at various times may be mentioned **adenocele, cystoid adenocele, cystoid glandular tumor, and cystic fibroma.**

Finally after the presence of both fibrous connective tissue and epithelium came to be universally recognized as essential to all, or at least nearly all of these tumors, and the instability of the mammary glandular epithelium came to be better understood, matters were somewhat simplified by the adoption of the terms **adenofibroma and fibroadenoma,** according as one or the other constituent tissue predominated in a given growth.

Cystic fibroadenoma or **adenofibroma** was applied to those in which cysts formed, and when marked proliferation of the epithelium took place **papillary cystadenoma** was spoken of.

In his recent admirable paper on benign tumors of the breast,* Warren called attention to an important fact formerly pointed out by Billroth and also recognized by some of the French pathologists; namely, that the principal constituent of those tumors more distinctly fibrous is the transparent periductal tissue of the mamma, which develops during puberty and lactation. Therefore he calls this type of tumor **periductal fibroma, periductal sarcoma,** and **periductal myxoma,** according to the character of the fibrous tissue present and the richness of cells. These forms constitute the fibrous type of fibro-epithelial tumors.

The epithelial group, those in which the glandular element predominates and in which the epithelium is subject to marked changes, is composed of two members, according to Warren's classification, namely, the **fibro-cystadenoma** and the **papillary cystadenoma.** The former is the same as the cystic fibroma and the cystadenoma proliferum. The latter is identical with intracanalicular cystadenoma or the papillary cystoma.

In addition to these two neoplasms I recognize and shall describe the **simple adenoma,** which I believe to be a definite pathological entity, though very rare.

Etiology.—Various influences have been assumed to be causative of the fibro-epithelial tumors, but if the effect of injury

*The Surgeon and the Pathologist; *Jour. Am. Med. Ass.*, July 15, 1905.

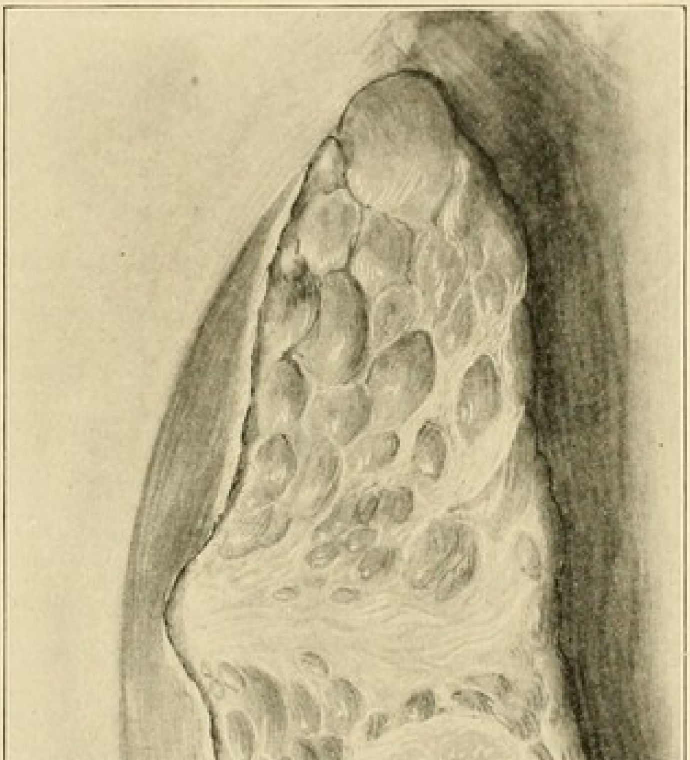
in the production of sarcoma be excluded, it remains to be proved that injury, heredity, pregnancy, lactation, or inflammatory disease exert any causative influence. A possible exception may be made in regard to the papillary cystadenoma, in which the secondary proliferation of epithelium seems to depend in part, at least, upon the functional activity of the breast.

Fig. 18.—Large periductal fibroma of right breast.

PERIDUCTAL FIBROMA (FIBROADENOMA).

These tumors occur in the breast as firm, round or ovoid, distinctly encapsulated bodies of varying size and consistency, as a rule being single, although they may be multiple. They

PLATE VII.



Periductal fibroma. Gross appearances. (*Warren.*)

are usually found in one breast only, but occasionally are present in both at the same time. Of slow development, they may remain of inconsiderable dimensions for a long period of time, or they may increase progressively in size from the beginning of their appearance in the mammary tissues. As ordinarily met with they are about as large as an English walnut or a small hen's egg, but I have seen them no larger than a cherry and then again as big as an orange. A few cases have been recorded in which these tumors attained extraordinary dimensions, some having been removed which weighed as much as six or seven pounds. In this era of modern surgery, however, such tumors are not likely to be encountered, for the reason that they will usually be subjected to the knife at a much earlier stage of their evolution.

In regard to influences producing unwonted rapid growth in these tumors, it may be stated that some have been observed to increase suddenly in size during the menstrual periods, and that pregnancy in many instances exerts an undoubted stimulating effect upon their growth. It has been observed that tumors which had remained stationary for years suddenly began to grow after the occurrence of conception. This circumstance in their natural history is of importance in reference to prognosis and treatment, and lends additional weight to the judiciousness of removing the growths, even though they give rise to only slight or perhaps not any symptoms.

Symptoms.—The periductal fibromata are freely movable beneath the skin and are not attached to the deeper structures of the breast. Indeed, it is characteristic of them that they are superficial. As concerns their location the majority of them are found in the upper outer quadrant of the breast, but no part of the gland is immune. Neither retraction of the nipple nor lymphatic involvement occurs. As these tumors increase in size they become lobulated, and may thus impart an irregular, uneven feeling to the palpating finger as it is passed over their surface. Their capsule is derived from the fibrous stroma of the breast. Both capsule and tumor move under the palpating finger.

Considerable diversity of opinion has been expressed in regard to the subjective symptoms produced by these tumors, some authors stating they never give rise to pain, and others, as Gross, for instance, that they are painful in the majority of cases. Personally I have rarely known them to give rise to severe pain, although I have frequently had patients complain of a sense of uneasiness in the breast at and around the site of the tumor. In many cases this symptom was especially noticeable during the catamenia. Labbé and Coyne, and after them Gross, as well as many of the more recent French writers, stated that small tumors, no larger than a pea, frequently produce severe neuralgic pain, and considered them to be the underlying cause of many obscure cases of mastodynia. I have observed such a phenomenon in only a single case, and therefore consider it to be very rare, particularly as I have seen a large number of cases during the last twenty years. The case in question was that of a married woman, aged thirty-eight years, who complained of severe pain in the left breast, which she had experienced in greater or less degree for seventeen years, the trouble dating from an inflammatory affection requiring incision. Upon examination a small, hard tumor about the size of a cherry was found in the lower quadrant of the breast. This growth was removed and after the wound healed the patient declared herself to be free from pain. I am of the opinion that this tumor, which proved to be a periductal fibroma, was responsible for the subjective symptoms experienced. It evidently was of very slow growth, so that it was not detected for several years.

Morbid Anatomy.—The appearance of these tumors upon section varies somewhat with the degree of their development. When still young the cut surface is white or rosaceous in color, whereas when older they are gray and have lost something of the glistening appearance which is characteristic of the younger growths. The line of demarcation between the capsule and the substance of the neoplasm is distinct. Bundles of fibrous tissue crossing one another in various directions can be plainly seen in the older growths. Microscopically they show both fibrous stroma and glandular elements in varying amounts.

FIG. 19.—Periductal fibroma. Microscopic appearances. (*Warren.*)

In one form the fibrous tissue reaches a high state of activity, the epithelium showing little tendency to proliferate. As a result of this inequality of growth distortion occurs. Tumors of this type correspond to the **intracanalicular fibroma.**

In another form both fibrous tissue and epithelium grow with an equal degree of rapidity, so that no distortion takes place. In a cross section of such a tumor the ducts are seen to be normally preserved. Tumors of this type correspond to the **pericanalicular fibroma.**

Thus some are dense and compact, while others show clefts and dilatations. If the dilatation takes place rapidly the clefts are irregular, whereas if the process is slow they are at first somewhat cylindrical in shape. The irregularity is due to compression at various points by the increasing periductal fibrous tissue. Moreover, this growth of fibrous tissue enlarges the walls of the alveoli, and the epithelium which lines them becomes arched over the protuberances or invaginated into the depressions which are formed in the wall, so as to accommodate itself to the enlarged surface. Such enlargement and dilatation may

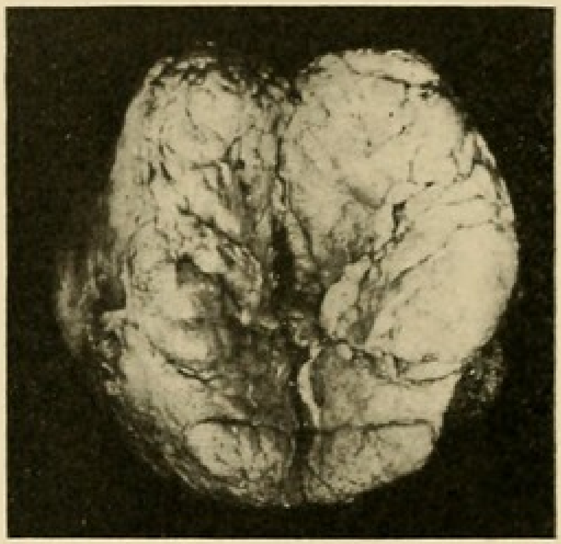


FIG. 20.—Large periductal fibroma of the pericanalicular type.

amount to cyst-formation, but as a rule the spaces are not large enough to be termed cysts.

If secondary proliferation of the epithelium takes place, however, it results in cyst-formation, and we then have to do with the fibro-cystadenoma.

Fibro-cystadenoma (Cystic Adenoma, Polycystoma).

Clinically these growths differ little from large periductal fibromata, being firm in consistence, lobulated, and rarely giving rise to fluctuation. They are freely movable, painless, and do not cause enlargement of the axillary lymphatic glands.

They commonly affect women of the same age as the simple periductal fibroma, although owing to the slow evolution of the latter growths the cystic changes sometimes do not occur until the tumor has existed a number of years. Gross observed that cystic changes in benign tumors of the breast were ordinarily found in those tumors removed from women between the age of thirty and forty, rather than in those between twenty and thirty. Although a portion of the tumors which he studied

Fig. 21.—Fibro-cystadenoma. Microscopic appearances. (*Warren.*)

were papillary cystadenomata, which occur later in life than the other forms, others no doubt were fibroadenomata of slow evolution in which cystic changes had taken place at a late period of their existence.

The contents of the cysts varies in color and consistency, being thin and clear in some and thick and opaque in others.

Warren observed that the ducts appeared to be more involved in the tumors of this kind which he studied than were the alveoli.

The important thing to be remembered about this form of tumor is that it is really the same as the periductal fibroma except that a secondary proliferation of the epithelial elements has taken place.

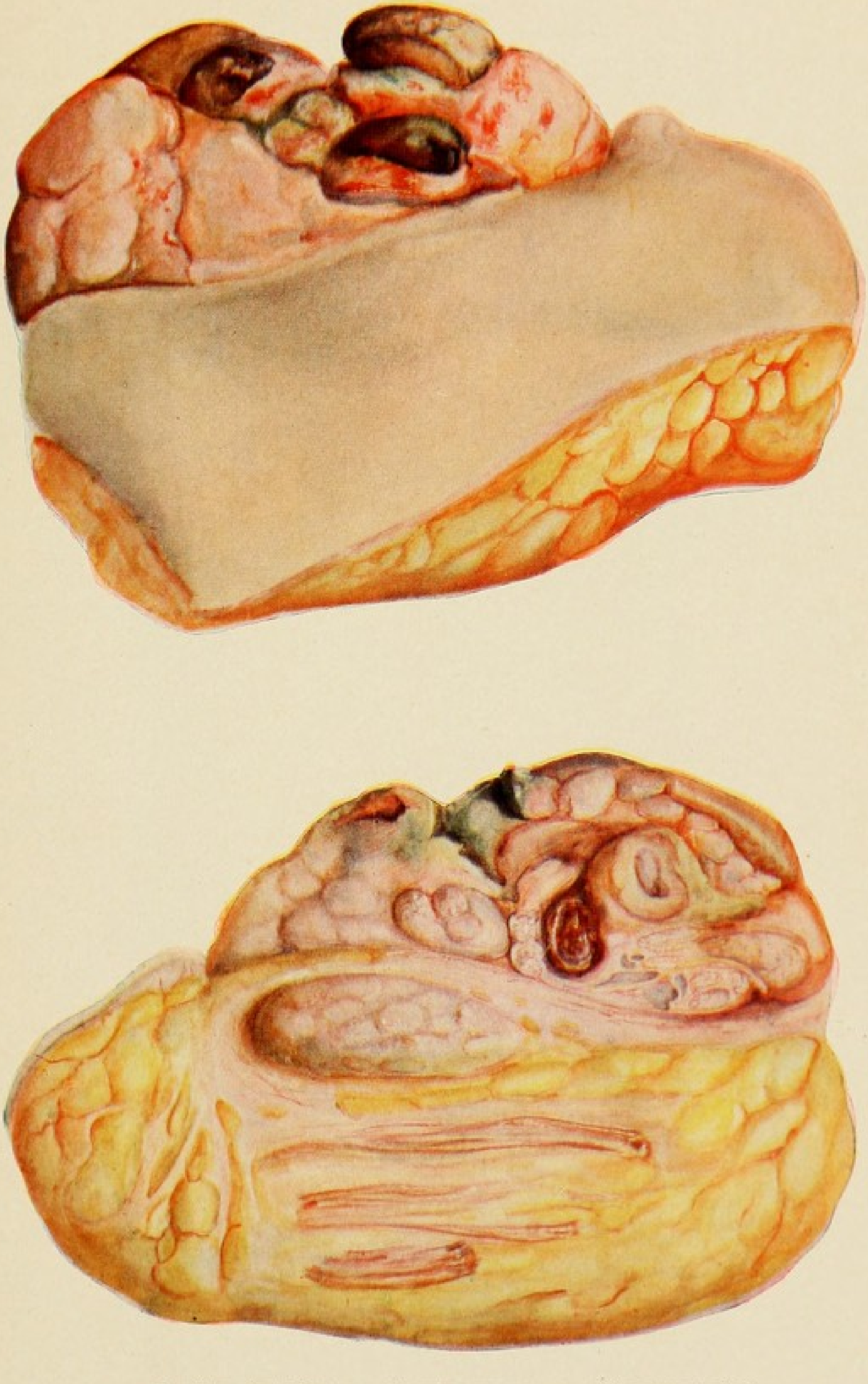
Papillary Cystadenoma.

In this form of tumor still greater proliferation of epithelium occurs. The proliferation takes place in the form of wart-like excrescences, often pear-shaped, which protrude into the cavity of the cysts, sometimes almost completely filling the space within them. Not infrequently a number of branches are given off from a single one of these papillary structures.

A multitude of names has been applied to this form of tumor, some of which have already been mentioned. In addition to intracanalicular cystadenoma and papillary cystoma, they have been called villous papilloma, duct papilloma and duct cancer.

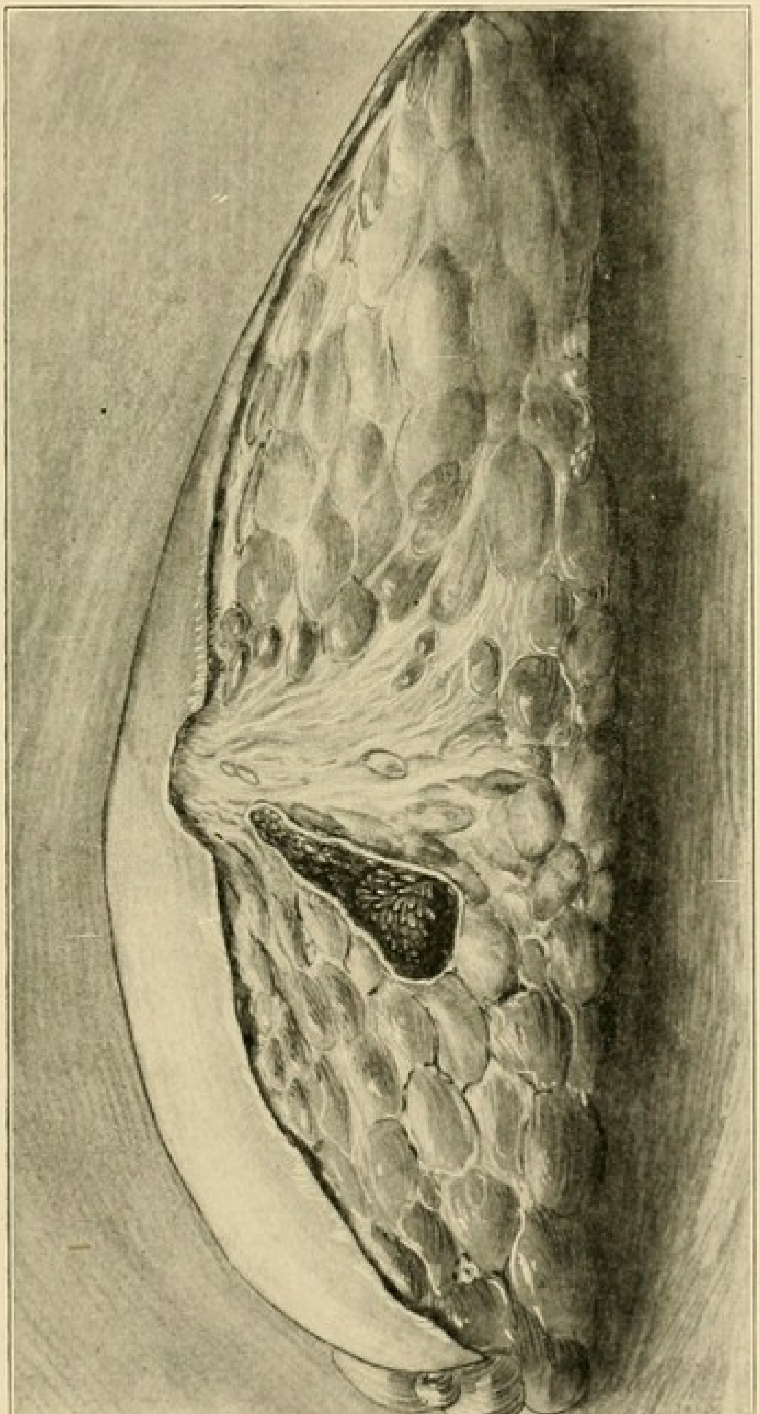
Warren has described these growths so accurately, both structurally and clinically, that I will quote from his article verbatim.

"The histologic picture of a papillary or warty outgrowth is that of a connective tissue pedicle surmounted by an epithelial covering. Papillary structures of this character are the distinguishing feature of the tumors of this group and serve to differentiate them absolutely from other benign tumors of the breast. Tumors of this character rarely attain great size. Their consistency is hard, although fluctuation may occasionally be detected. Adherence to the skin and enlargement of the axillary glands are not to be expected. The situation of the tumor in the breast is generally beneath or in close relation to the nipple. The fluid contents of the cyst is generally hemorrhagic. Microscopic section shows the characteristic papillary outgrowths of connective tissue surmounted by a luxuriant growth of epithelium. The epithelium in these cases



Papillary Cystadenoma. Showing appearance of the tumor when removed with contiguous tissues.—(*Maurice H. Richardson.*)

PLATE IX.



Papillary cystadenoma. Gross appearances. (*Warren.*)

presents the characteristics of ductal rather than acinal epithelial cells."

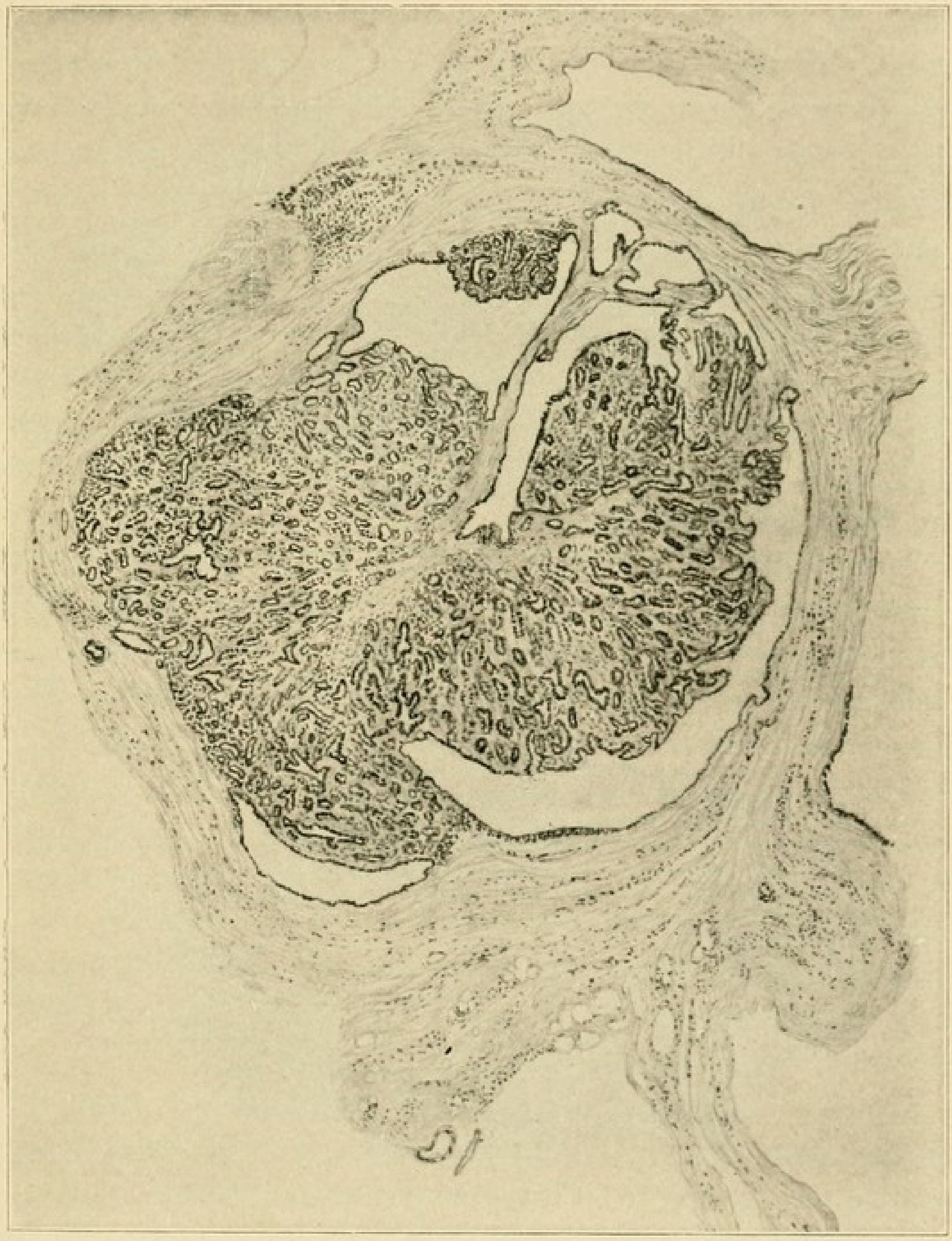


FIG. 22.—Papillary cystadenoma. Microscopic appearances. Note exuberant growth of epithelium over papillary outgrowths of connective tissue from the wall of the cyst cavity. (*Warren.*)

In twenty cases studied by Greenough and Simmons there was a history of trauma in five, no such history in seven, and no data could be obtained relative to the subject in the remaining eight. One case occurred in a man aged fifty-one. In Warren's cases the average incidence was fifty-two years. In the twenty studied by Greenough and Simmons it was forty-nine and one-half years. Thus it is seen that the disease is most common in middle life. The youngest patient was nineteen, the oldest eighty-one, so that no age would seem to confer immunity. Of nineteen women eleven were married and eight had had children. Thus, there were eleven whose breasts had not undergone lactation, a circumstance which would tend to show that pregnancy and lactation are not predisposing causes. Warren, however, expressed the opinion that women who have borne and reared a number of children are particularly predisposed.

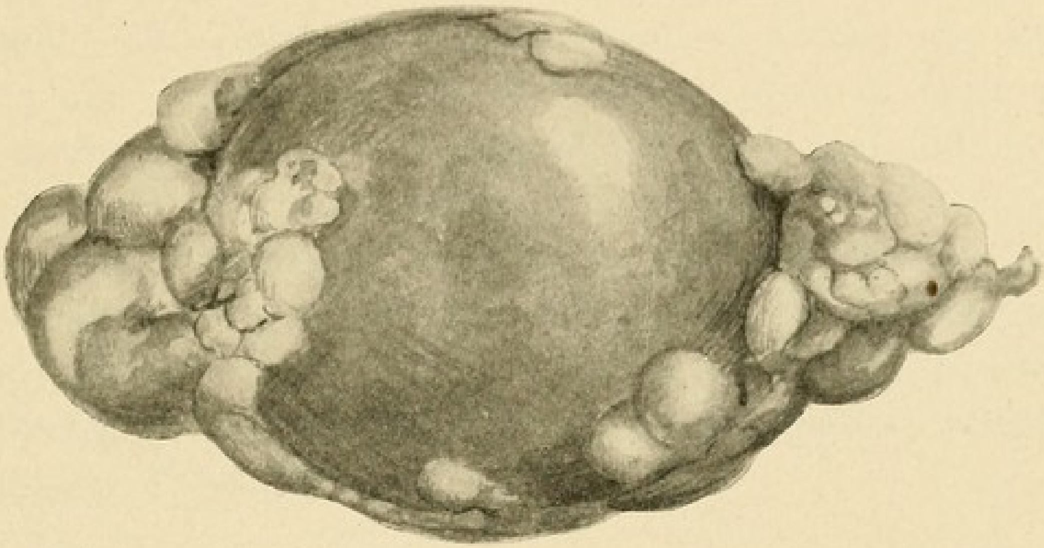
These tumors are of slow growth, are only slightly if at all painful, and are usually situated just beneath the nipple. They are usually firm in consistency, although when large they may yield readily to the palpating finger, imparting a sense of elasticity to it. The most characteristic symptom is said to be the discharge of bloody fluid from the nipple. This discharge may exist for a long time before a tumor is discovered in the breast, as was the case with three patients mentioned by Greenough and Simmons.

According to these authors the condition with which papillary cystadenoma is most likely to be confounded are cancer, abnormal involution and periductal tumors.

From cancer they are to be differentiated by their slow growth, definite outline, and by the freedom of skin, muscles and axillary glands from involvement in the disease.

From abnormal involution the diagnosis is more difficult. Serous discharge from the nipple in such cases is occasionally noted. The diffuse character of this condition, however, and the irregular nodular consistency of the breasts, associated with pain and tenderness are points that aid in differentiation.

PLATE X.



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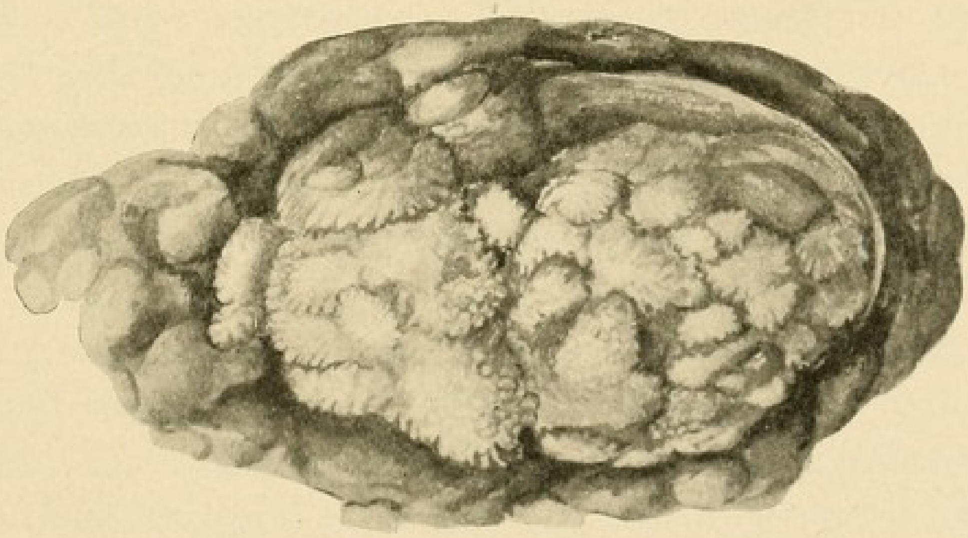


B

Papillary cystadenoma. A. External appearance of the tumor. B. Internal appearance. (*Maurice H. Richardson*.)

Involution changes are also more common in the periphery of the breast, while papillary tumors occur almost invariably near the nipple.

From periductal fibromata, the diagnosis should not be difficult. The periductal tumors occur, as a rule, at a much earlier age. They are firm and elastic, often of large size, and rarely occur near the nipple. They slip and slide in the breast tissue, and never produce discharge. The periductal fibromata are far more likely to be confused with the fibro-cystadenomata (the other type of the cystadenoma or epithelial group) and it is doubtful if the two can be distinguished without the aid of the gross and microscopic examination. (Annals of Surgery, February, 1907.)

Simple Adenoma.*

Simple adenoma is the rarest type of the fibro-epithelial tumors of the breast, Gross having observed only one in 115 breast tumors, Billroth only one in 103, McFarland only one in a very large experience. This tumor must not be confounded with the adenoma usually described in the text-books and monographs dealing with neoplasms of the breast, for they usually refer to the other forms of fibro-epithelial tumors.

Simple adenoma is usually found as a definitely localized, soft, nodular growth occurring in young adult to middle age. It is not adherent to the skin but is intimately associated with the gland structure. It is freely movable over the underlying muscles. On section it is usually white or flesh colored, soft, and at times exudes a substance that resembles milk. It may

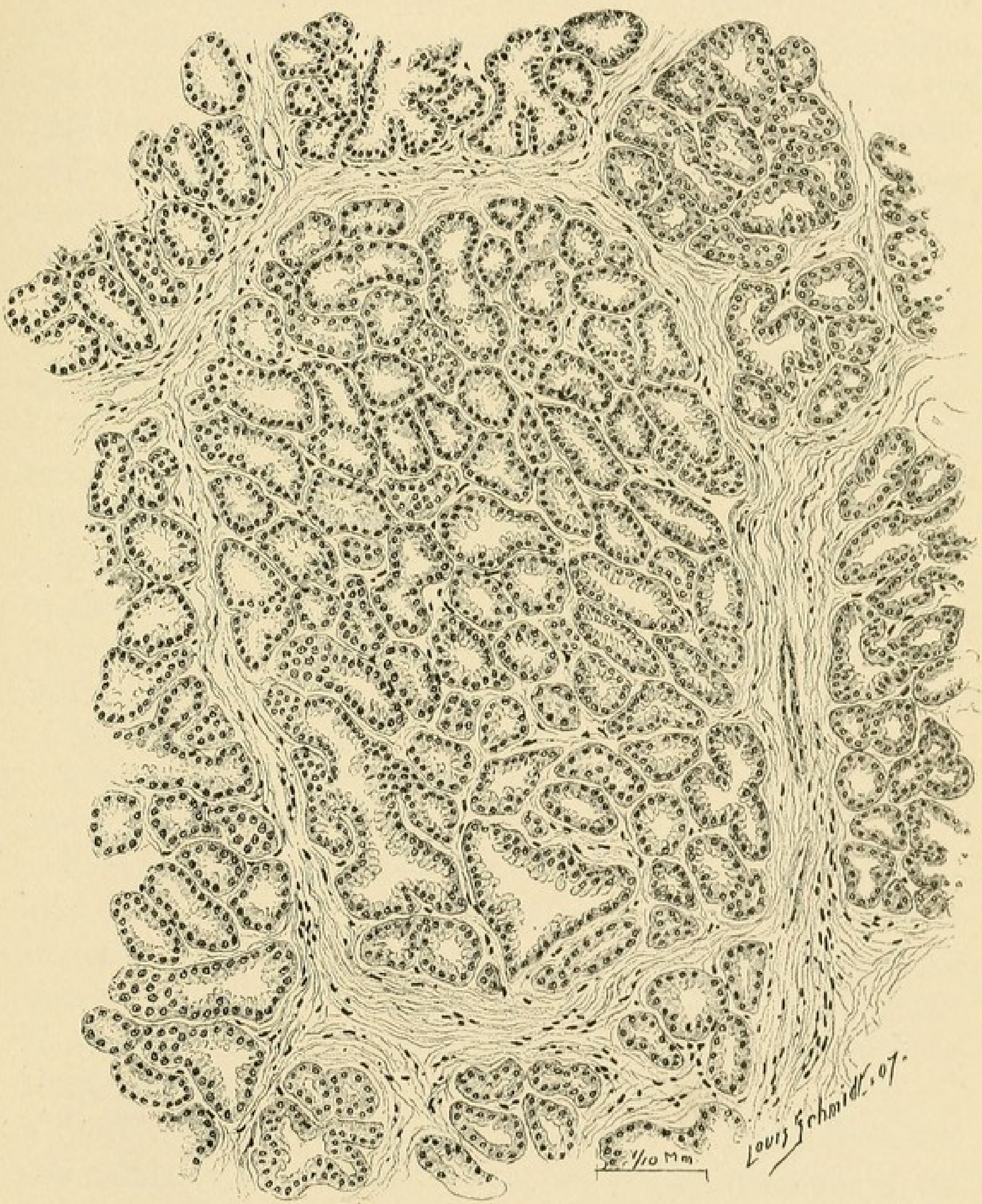
*I have added this tumor to Warren's classification of benign growths. Since this article was written I have discussed the subject with Prof. Coplin, of Jefferson Medical College, who examined hundreds of sections from Gross's specimen. Prof. Coplin states that no other tissue but that of pure acinous type could be found. The same condition obtains relative to the growth shown in Plate XI. Of course the normal stroma of the gland is present.

appear as one solid tumor or may be broken up into smaller nodules by thick septa of connective tissue. It is benign in its growth, not giving metastasis to the lymph glands or internal structures.

Microscopically a simple adenoma is seen to be composed of numerous gland acini placed close together, separated by only a very delicate stroma of connective tissue. (See Plate XI.) The acini are usually lined with a single layer of cubical epithelium, but some may show proliferation of the epithelium until it encroaches considerably upon the lumen of the acinus. In these instances there is usually degeneration of the central cells with the formation of a material resembling milk. Scattered throughout the groups of acini are usually some ducts, which are commonly blind, although Gross considers the expulsion of milk from the nipple on pressure over the tumor as a diagnostic point of considerable value. If such is the case, some of the tubules must connect with the normal galactophorous ducts. The essential and differentiating points about this growth are the great preponderance of the glandular acini over the very small amount of stroma and the fact that the epithelium lining the acini is strictly confined by the membrana propria. It exhibits no tendency to cyst-formation, infiltration or atypical epithelial proliferation. Should any portion of the tumor become infiltrating in character, it should no longer be considered an adenoma, but be immediately placed among the adeno-carcinomata.

Prognosis.—In regard to the **prognosis** of the fibro-epithelial tumors, it may be stated that all are benign growths, which do not recur after complete removal. The cases in which recurrence has been supposed to take place are those in which remnants of the tumor were left behind, or in which growths so small as to escape notice at the time of operation later developed and thus lead to the belief that the original tumor had grown again. The papillary cystadenoma may undergo malignant changes.

PLATE XI.



Simple adenoma. Microscopic appearance. (*Drawing made from a specimen loaned by Dr. George P. Müller, of the University of Pennsylvania.*)

In three out of twenty cases recently analyzed by Greenough and Simmons, associated carcinoma was found, cancerous nodules being present in the cyst-wall. It is stated that except for the infiltration of surrounding tissues, the nodules presented characteristics of growth of the same general character as the papillary structures within the cyst. The irregular cell growth and the infiltration, however, left no doubt about the diagnosis of adenocarcinoma. (Annals of Surgery, February, 1907.)

The duration of these cancer cases was nine, twelve and eighteen months respectively, and their ages were fifty-two, sixty-nine and seventy-six years.

The axillary glands were not palpably enlarged in any of these cases, and in two in which the axilla was cleared out no evidences of disease were found.

In two of the patients no evidences of recurrence were found at the expiration of one and two years. The third patient, however, died of recurrence four years after the operation. With early and complete removal, however, the prognosis of this group of tumors is favorable.

Treatment of the fibro-epithelial tumors is purely surgical and consists in extirpation of the growth.

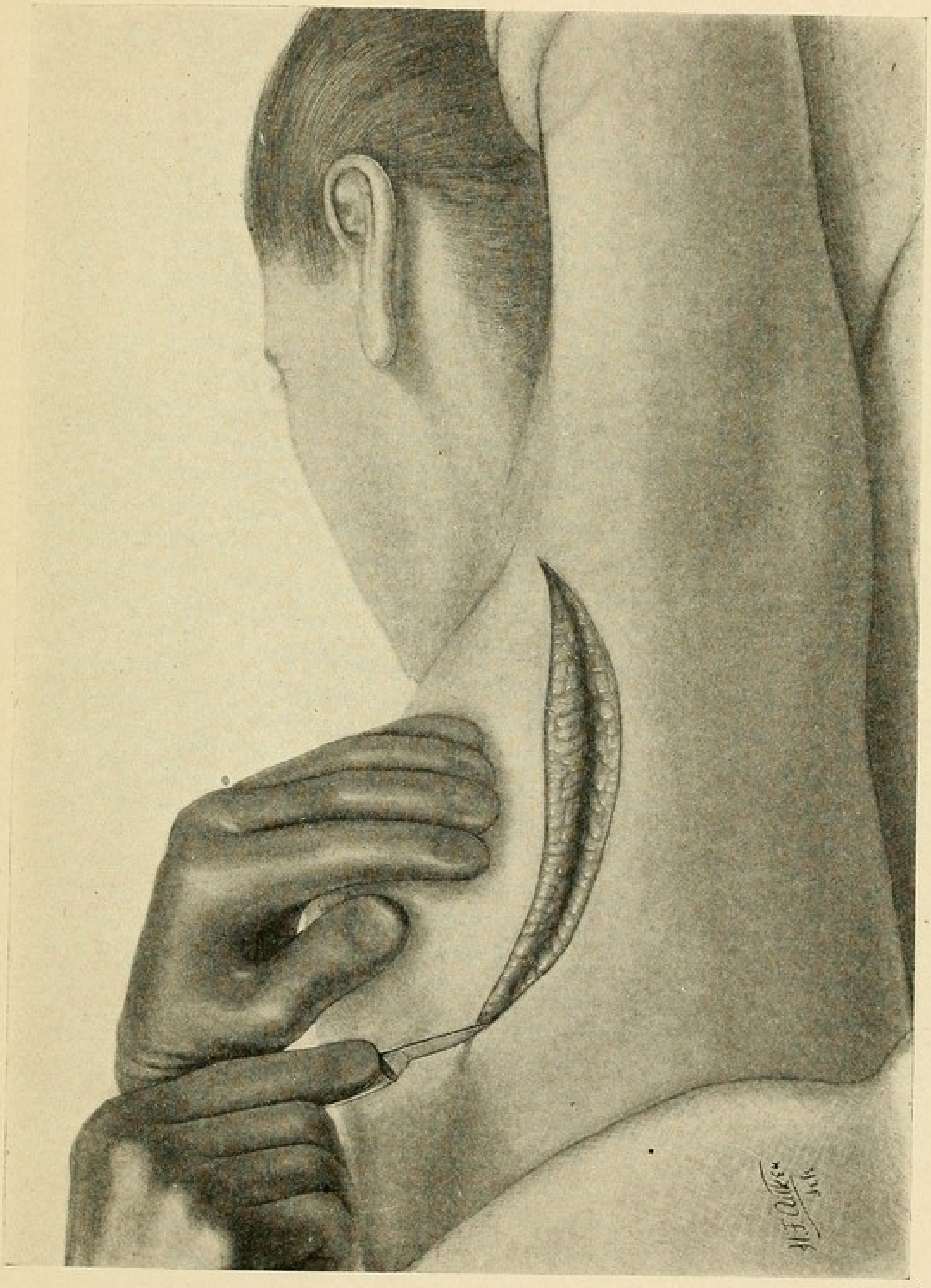
It is irrational to employ such local measures as the application of iodine or mercurial ointment with the expectation that they will even in the slightest degree produce retrogressive changes in the tumor. Their effect is nil. Spontaneous retrogression is not to be counted upon. I do not recall a single instance in which it has taken place.

Small growths superficially situated may be excised under cocaine. For others I prefer the plastic resection of the breast as elaborated by Warren. It not only obviates the necessity of inflicting an unsightly scar, but, moreover, enables the surgeon to inspect the entire breast, and thus detect the presence of small tumors which may be present and which could not be located if simple excision of the principal growth were practised.

The operation of **plastic resection,** first suggested by T. Gailliard Thomas and recently elaborated by Warren, is performed as follows: The preliminary incision is begun at the lower border of the breast, opposite the middle of the outer arc of the lower inner quadrant, and runs along the lower fold and outer margin to the inner border of the axilla, thus severing the lymphatic connections of the breast with the axillary plexus of lymph glands. The incision should be carried down to the lower border of the pectoralis major muscle, which should be freely exposed. The dissection is then carried along through the loose connective tissue, which lies between the pectoral fascia and the posterior layer of the fascia in which the mammary gland is contained. With the left hand the operator reflects the breast upward and inward, so that the posterior surface becomes exposed in its entire length. The gland tissue can now be seen through transparent fascia and easily inspected, and any cysts present readily seen. Usually one or two lie in the same quadrant, which can be removed by a V-shaped incision, without opening the cysts. The apex of the V lies directly under the nipple in the center of the gland. Radiating from this point incisions can be carried into the gland tissue in all directions, exposing and bisecting all small cysts so that none remain which have not been laid open. A second V-shaped incision may occasionally be necessary, but this is rarely the case. The next step after arresting hemorrhage is to close the V incision with two rows of catgut sutures, one along the anterior border and one bringing the posterior edges into contact. The gland is then dropped back on the pectoral muscle, and it will be found that the various incised portions resume their natural position and fit accurately together. The gland is then anchored to the pectoralis major muscle at the outer edge. Another row of sutures is advisable to hold together the deep layers of the superficial fascia before the outer edges of the wound are closed with silk-worm gut. The buried sutures remove tension from the surface sutures. The dressing is so applied as to produce lateral compression of the two hemispheres of the breast.

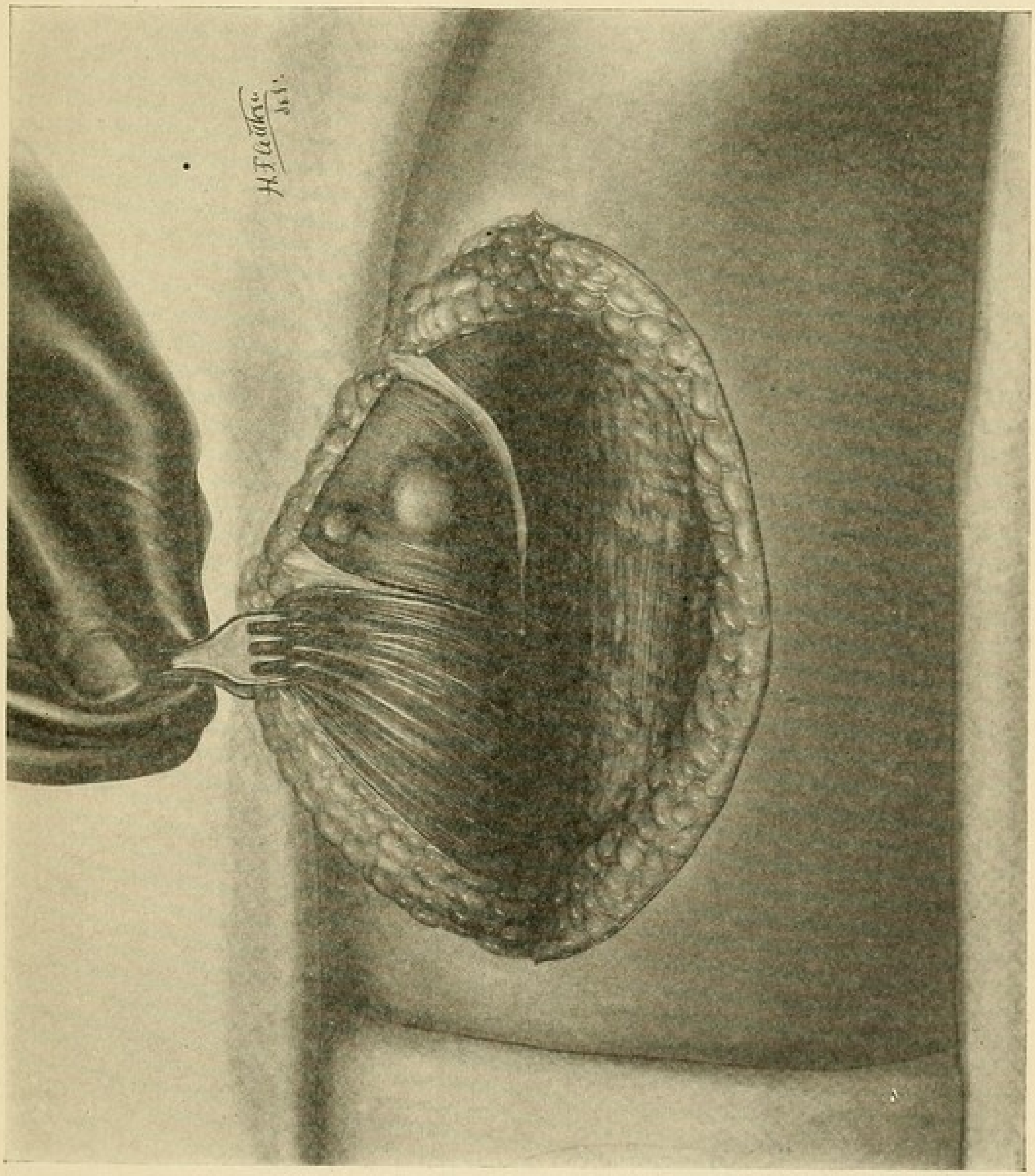
It has been stated that this operation endangers the nutrition of the gland by interfering with its blood supply, but this statement is based upon an erroneous conception of the manner in which the blood-vessels of the breast are arranged. By referring to the section on anatomy it will be seen that the *anterior* surface and portion of the gland receive the principal arterial and venous channels, and not the posterior, which is the one chiefly involved by the incisions. I have done this operation twenty times and find it satisfactory in every respect. In all these cases the wound healed by primary intention.

PLATE XII.



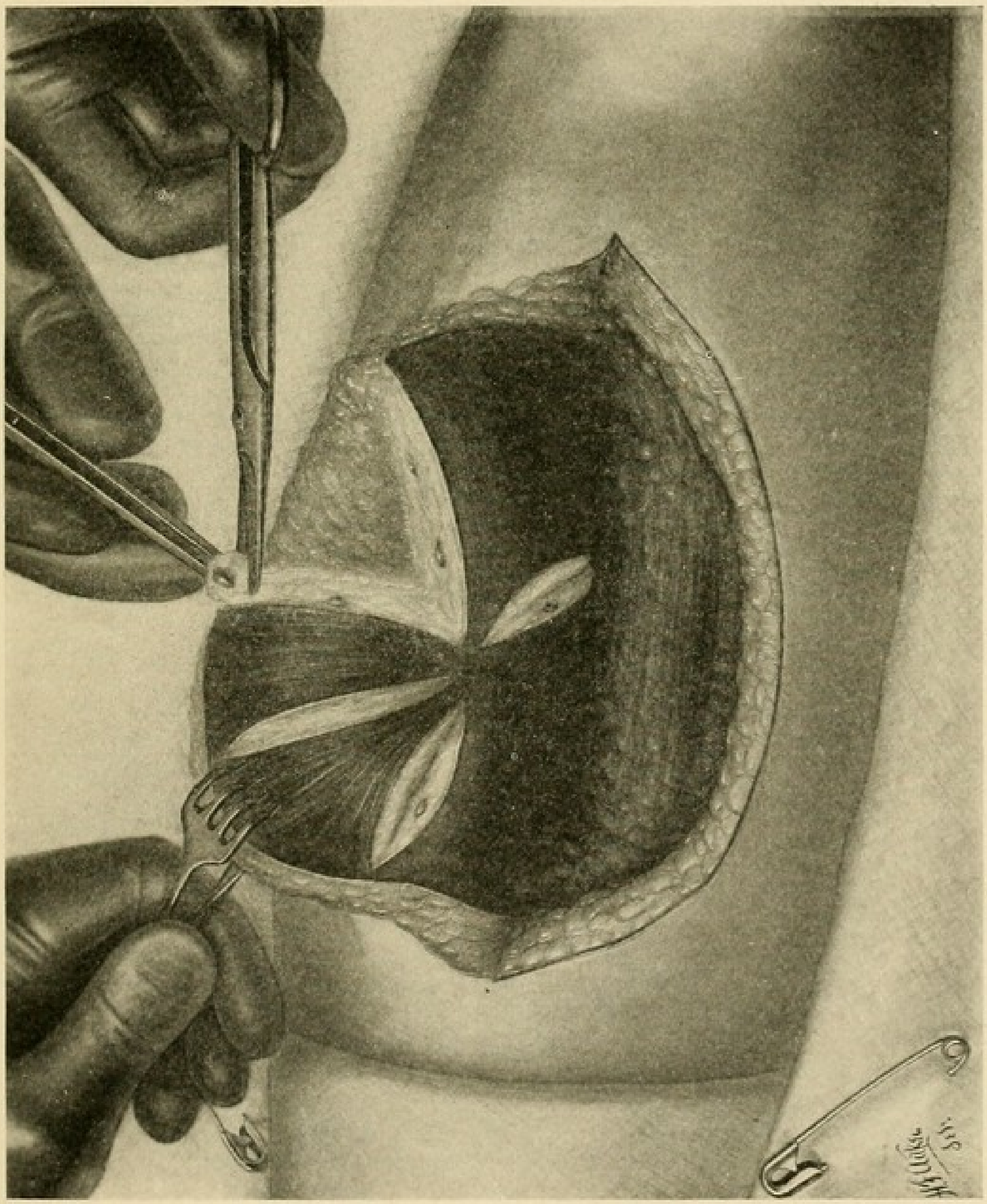
Plastic resection of the mammary gland. Primary incision. (*Warren. Annals of Surgery.*)

PLATE XIII.



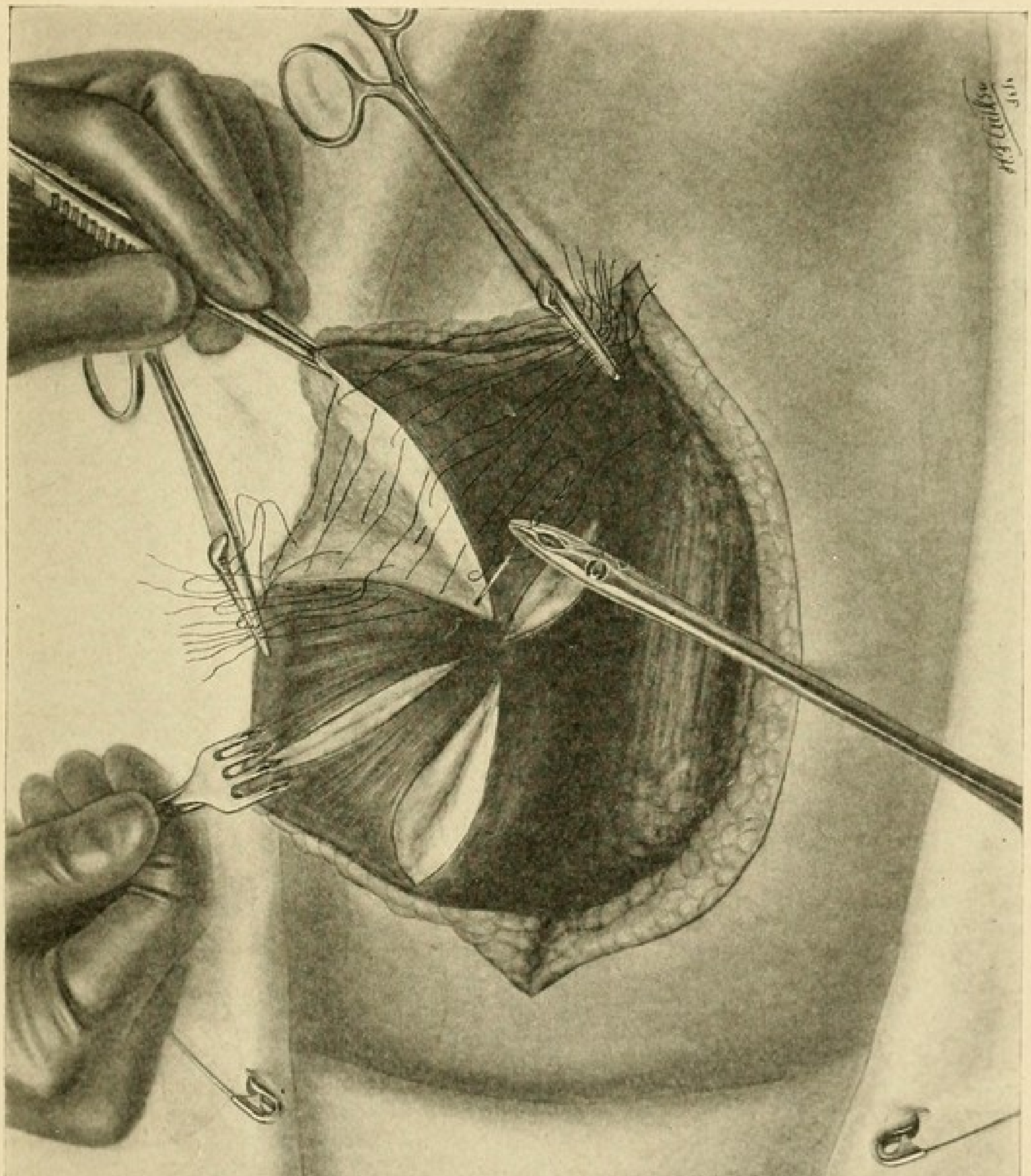
V-incision through posterior wall of gland, for removal of tumor.

PLATE XIV.



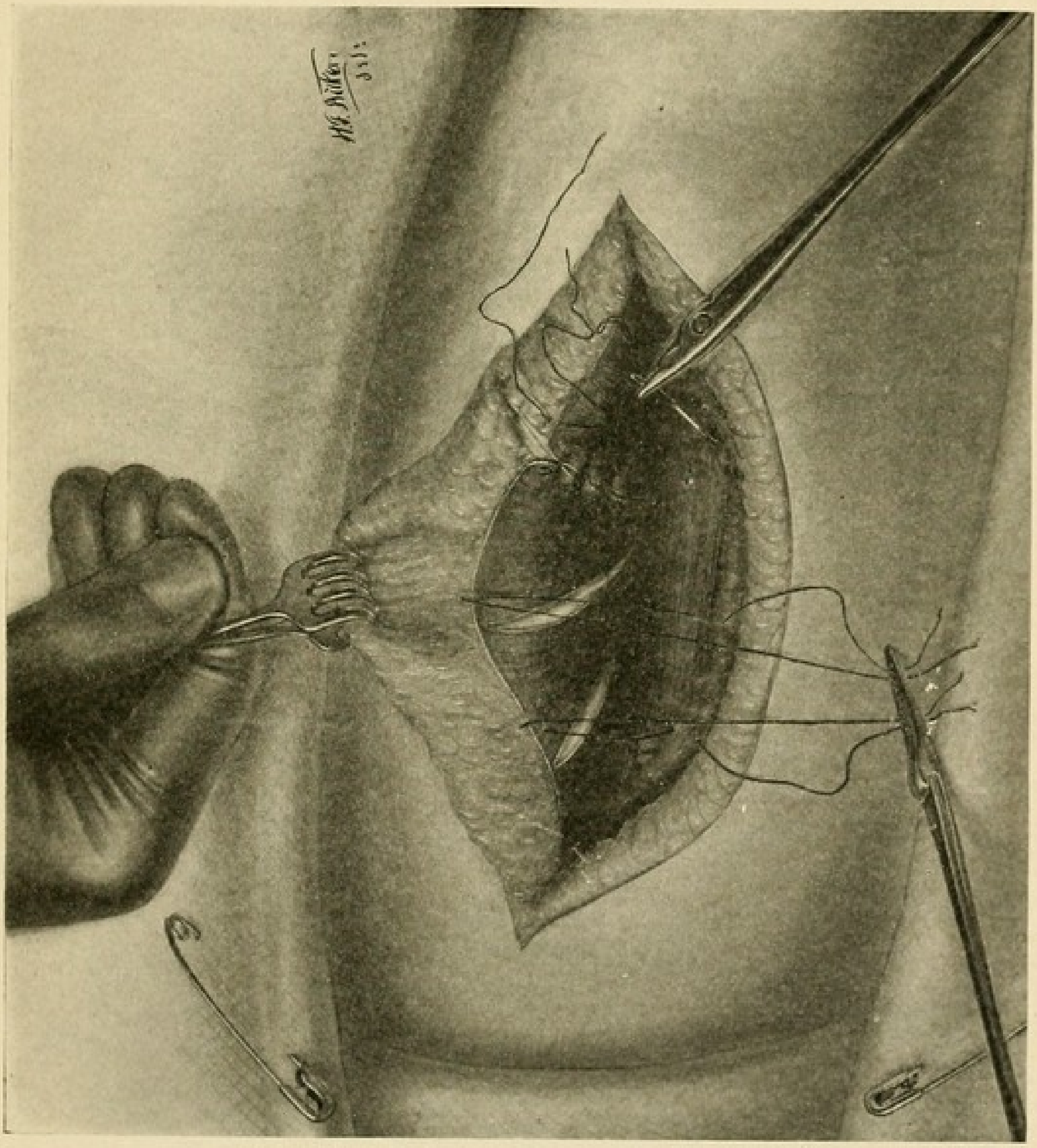
Radiating incisions following removal of large cyst. Note excision of medium sized cysts and incision of small cysts. (*Warren. Annals of Surgery.*)

PLATE XV.



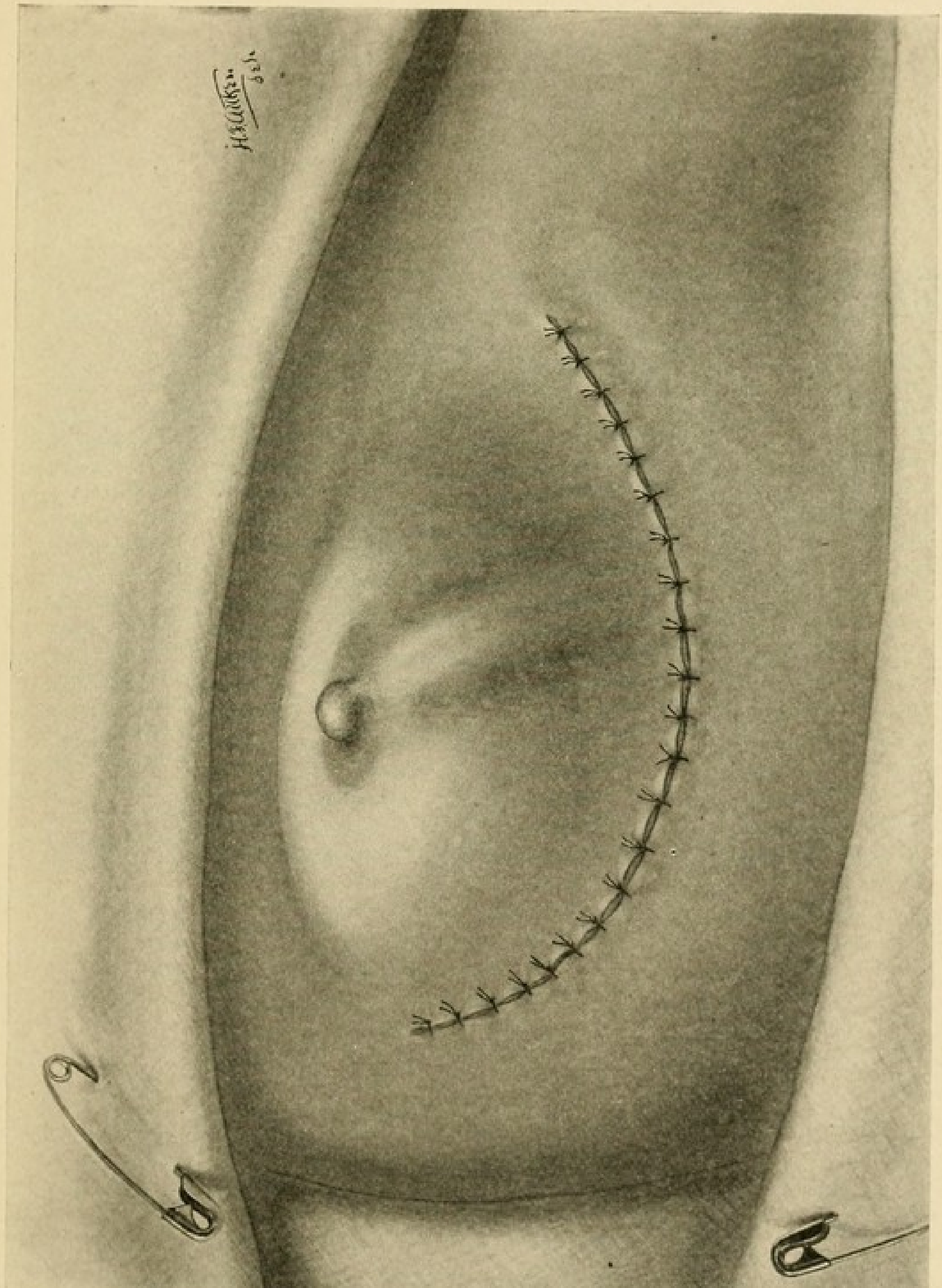
Method of suturing V-shaped wound.

PLATE XVI.



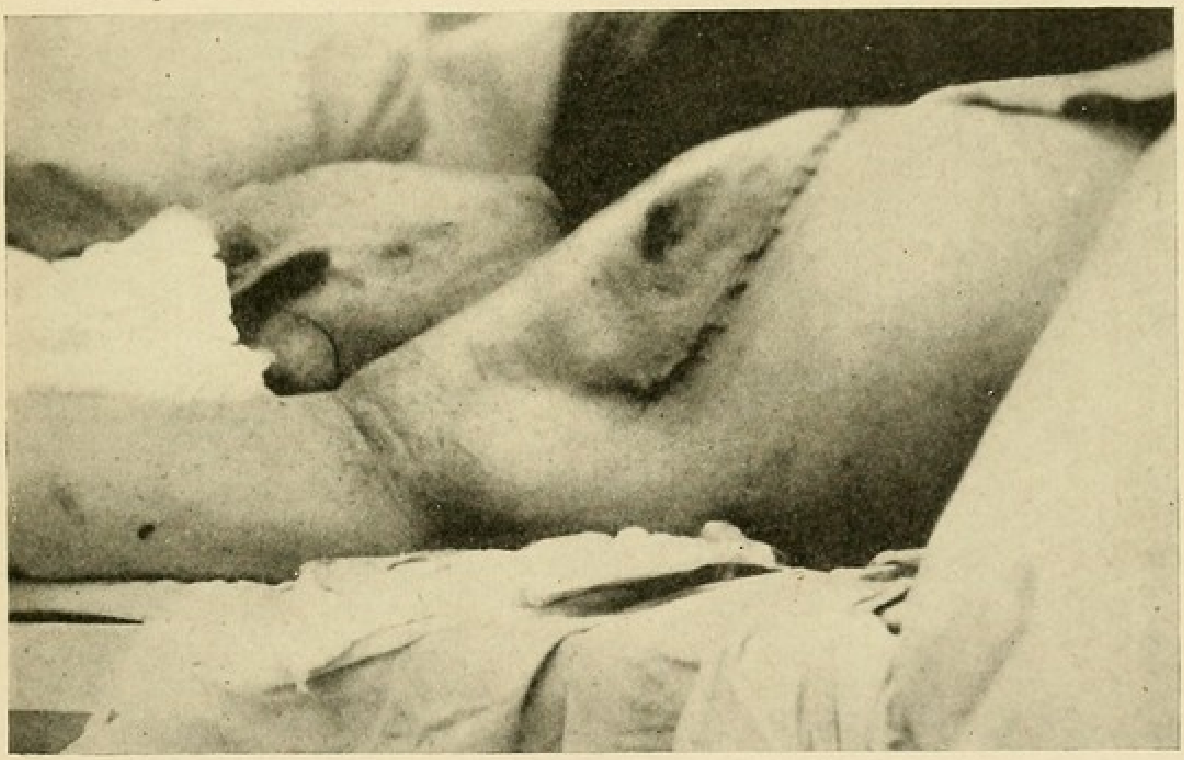
Adjustment of gland to outer edge of pectoral muscle. Note self closure of radiating incisions. (*Warren. Annals of Surgery.*)

PLATE XVII.



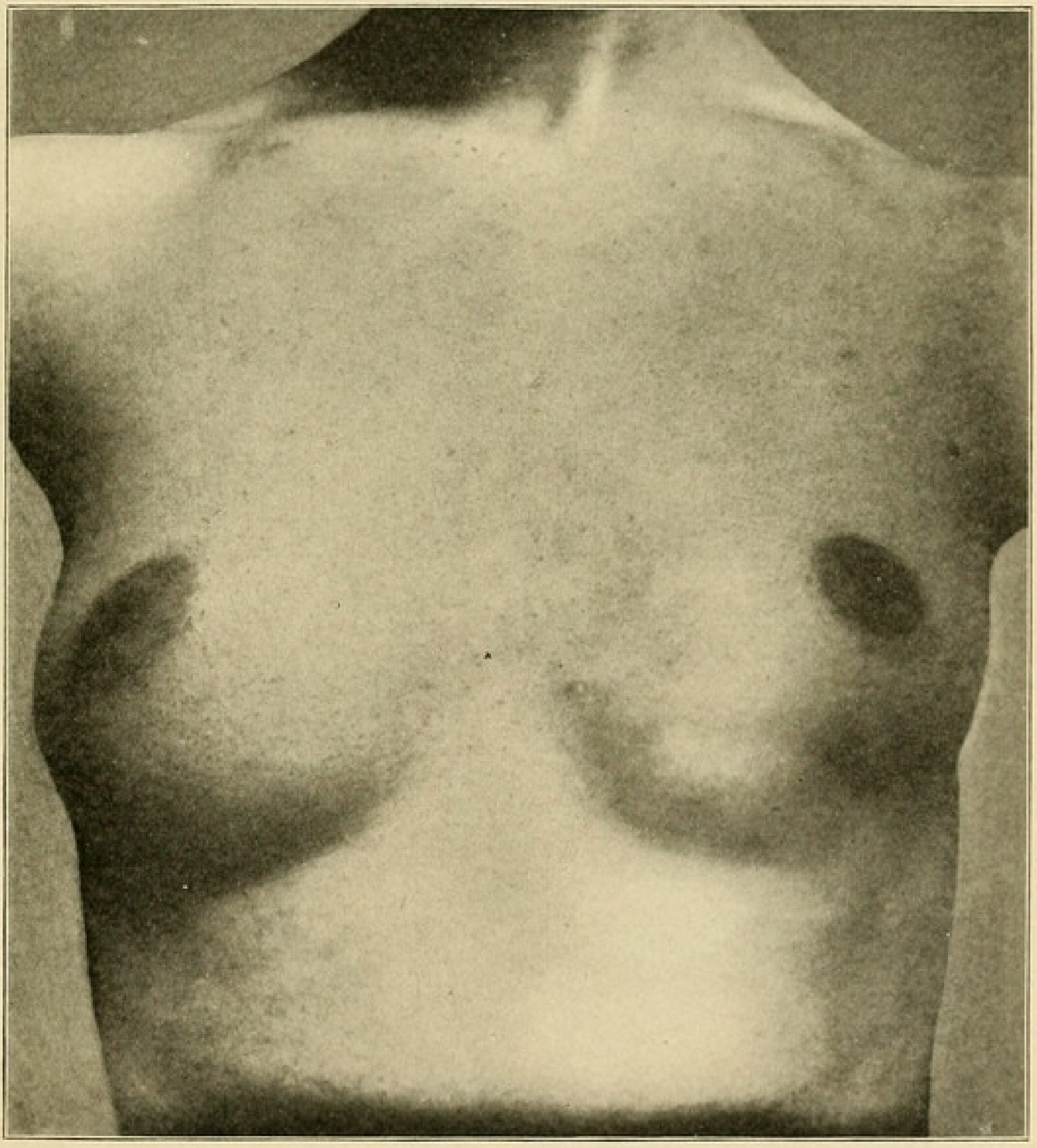
Appearance of breast immediately after application of buried sutures and closure of wound. Note prominence given nipple by purse string suture. (*Warren. Annals of Surgery.*)

PLATE XVIII.



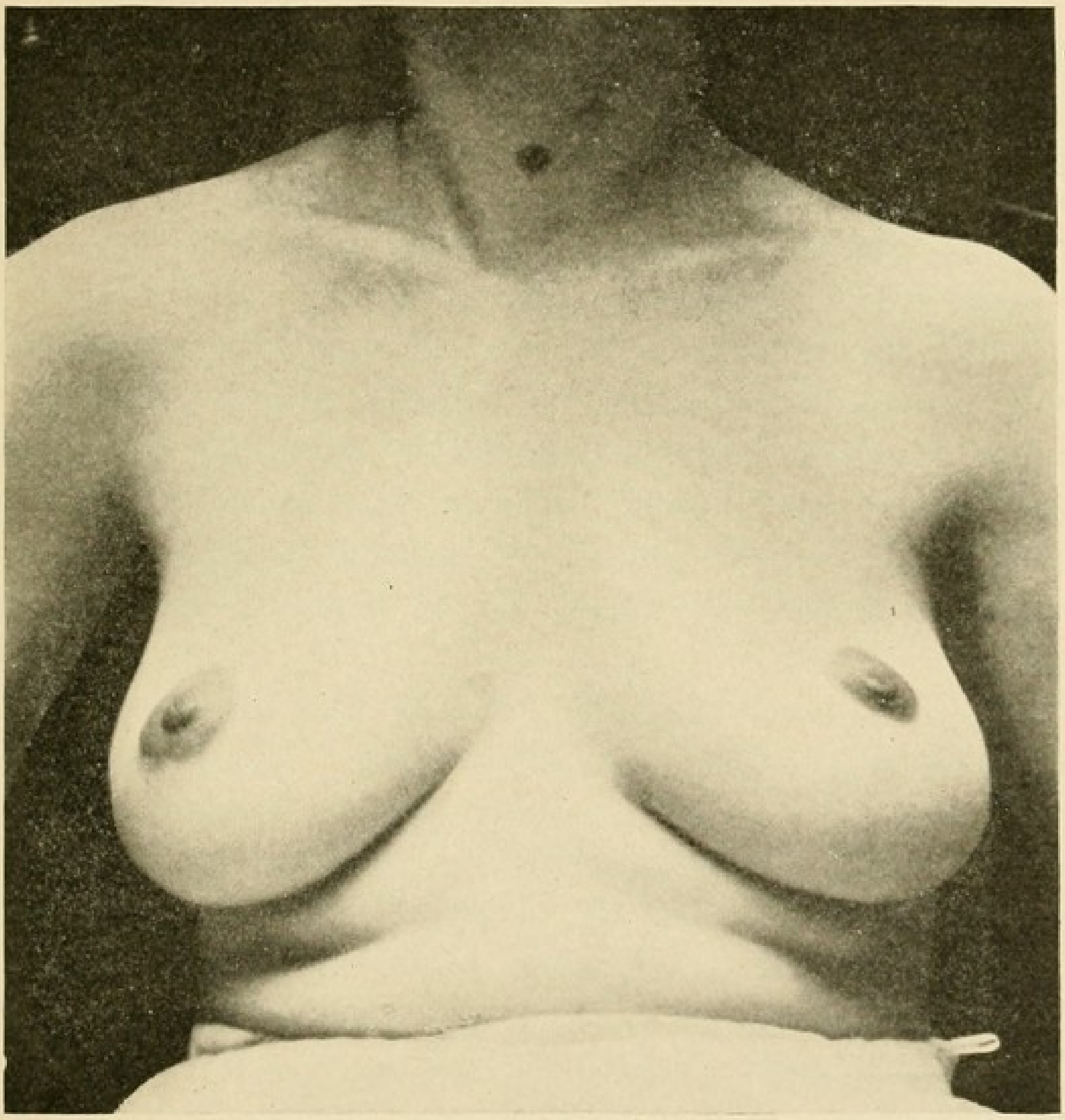
Showing the appearance of the breast after extensive removal of tissue for multiple cysts in the operation of plastic resection. Notice the slight degree of deformity.

PLATE XIX.



Showing appearance of the breast after plastic resection.

PLATE XX.



Showing absence of scar and deformity after removal of a benign growth from the left breast by the operation of plastic resection.

LIPOMA.

Lipomata of the mammary gland are rare, although they occasionally occur; they may develop in the gland itself or grow either in the subcutaneous tissue or in the retromammary region. When we come to consider the abundant supply of fat in the breast the question naturally arises why lipomata are not more common in and about this organ, and it seems to me to be peculiar that they are not more often met with.

In regard to their **etiology** little or nothing is known. They develop in the breast without any apparent cause. A certain causative influence has been attributed to injury in a few cases, but it is doubtful whether the relation between the traumatism and development of the tumor was one of cause and effect.

These tumors may be either single or multiple, and may vary much in size. Usually when the patient comes to operation the tumor is not larger than an orange, although in literature cases are recorded in which growths of enormous size have been removed. In one of Sir Astley Cooper's cases the tumor weighed over fourteen pounds. It has been observed that pregnancy stimulates them to active growth. The subcutaneous variety is probably the most common, although a number of cases of the retromammary form have been recorded. The former are always encapsulated by a thin fibrous membrane which sends septa down into the substance of the tumor. Their development is slow. In a case reported by Delage and Massabiau the tumor attained the size of an orange in seven years. They are not sensitive to pressure, but are frequently painful, and if of large size may cause discoloration of the skin owing to the congestion which they produce by pressure.

There is no involvement of the axillary glands and no tendency to encroachment upon the surrounding tissues. The tumor, as already stated, is encapsulated, and therefore well-defined, unless it be of large proprotions so that it practically obliterates the gland. Multiple tumors of small or moderate dimensions give the breast an uneven, bosselated appearance.

It is characteristic of subcutaneous lipomata that they roll readily between the thumb and fingers, and that they are not hard to the touch. Indeed they have been mistaken for cystic tumors and galactocele with caseous contents. Moreover, they are, when arising near the axilla, frequently symmetrical, tumors of equal size and shape, being found on either side. They also are frequently pedunculated.

Retromammary lipomata develop between the gland and the great pectoral muscle, and as they increase in size displace the breast, pushing it forward or to one side, according to their site and the direction in which they grow. They may attain a large size and cause congestion and discoloration of the skin over the breast exactly as do large subcutaneous tumors.

Intraglandular lipoma is very rare, and only a few observations have been recorded. In this form of the tumor microscopic examination reveals the presence of galactophorous ducts traversing the substance of the growth. In a case operated on by Demons some of the ducts within the tumor were considerably dilated and filled with a thick yellow substance resembling coagulated milk. Others were somewhat atrophied, their lumen appearing like a transparent point in the surrounding tissue. In some the epithelium was preserved in its normal condition, but in others it was found to have undergone alterations.

In a case recently reported by Delage and Massabiau evidences of myxomatous degeneration were observed in the tumor.

An interesting case of a lipoma containing cartilage has been reported by Sick, of Hamburg. The tumor was removed from the breast of a woman aged seventy-two years. It was made up of firm, pure lipomatous tissue, throughout which were interspersed small areas of hyaline cartilage surrounded by a zone of fibrous tissue.

Lipomata are essentially benign tumors, yet their removal is always indicated. Single or small multiple subcutaneous growths may be excised. For the removal of retromammary and intraglandular growths I advise plastic resection of the breast, unless the tumor or tumors are so extensive as to completely destroy the gland, in which case amputation is the proper measure to employ.

ENCHONDROMA.

Although tumors containing cartilage or composed entirely thereof are not uncommon in the breasts of certain animals, particularly bitches and she-goats, they are rarely found in the human breast, and when they do occur it is usually in combination with other tissues rather than as pure cartilaginous growths. Thus chondrosarcoma, chondromyxoma and even chondrocarcinoma are more frequently met with than pure enchondroma or chondro-osteoma.

Instances of invasion of the breast by cartilaginous tumors originating from the costal cartilages have been recorded, but such mammary involvement is merely a secondary change, and is not to be considered with the intrinsic neoplasms of the gland.

While some cases which have been recorded as enchondroma of the breast were undoubtedly mixed cartilaginous tumors, that is, sarcomatous or myxomatous growths containing cartilage, pure chondromatous and osteo-chondromatous growths certainly may occur. Thus, for example, Sir Astley Cooper removed a tumor which was undoubtedly a pure enchondroma, and Burck removed a breast containing an osteo-chondroma as large as a man's fist.

This tumor, which was carefully examined by Edmund Leser, who reported the case, was taken from a woman aged sixty-seven years. It was first noticed sixteen years prior to the time of its removal, being no larger than a hazel-nut. There was no known cause for its development. It was oval in shape, encapsulated, firm, and resistant to the knife. The cut surface was gray in color. In the interior of the growth there was a bone-like nodule so hard that it could not be cut except with a saw.

In another case, that of a patient operated upon by Mazzuchelli, the tumor had existed even longer than in the above case, having been present twenty-five years. During this time it had attained the size of an egg, and gave rise to pain only six months before it was removed. This tumor was also hard, firm, and gray in color. The cut surface was shiny, and in the center there was a softened area.

Microscopic examination of both these tumors showed them to be composed of cartilage cells.

These two cases well illustrate the slow growth of enchondromatous mammary tumors, and the absence of symptoms arising from their presence.

In regard to the **etiology** of these tumors, it is probable that they are of heterotopic origin, although the theory that the cartilage develops from the fibrous tissue of the breast has been advanced by different investigators. It has been suggested again only recently by Cornil and Petit, who base their belief upon the circumstance that they found the connective tissue to have various modalities, such as the myxomatous, chronic inflammatory and pseudo-sarcomatous; and also upon the fact that they found remains of mammary tissue in ossified portions of the tumors which they examined. I must confess, however, that I find it difficult to relinquish the idea that tissue is generated from tissue of its own kind, and therefore hold to the inclusion theory.

It seems convenient to consider in this place the **mixed tumors containing cartilage.**

As already stated, such tumors are met with more frequently than pure enchondromata. The cartilage varies in quantity, in one being contained only in small amounts, whereas in others it constitutes the greater portion of the tumor.

In chondrosarcoma the cartilage may form well-defined trabeculæ.

These mixed tumors vary in size, some being small and others large. In Dubar's case of chondromyxoma the breast was as large as a child's head, and the skin had ulcerated.

A very interesting case of mixed cartilaginous tumor has been recently reported by Salomoni. The tumor was oval in shape, as large as a baby's head, and was well-defined from the skin, the great pectoral muscle, and the surrounding mammary tissue.

A small cyst containing dark viscous fluid was present in the substance of the growth.

Upon microscopic examination the tumor was found to be made up of a stroma of fibrous connective tissue arranged in parallel bundles, containing oval and round cells in the meshes of the stroma and in the cavities. In the older portions of the tumor myxomatous degeneration was detected, and zones of fibro-cartilage were interspersed throughout the section. I incline to the belief that all such mixed tumors are prone to become malignant, if indeed they do not actually represent malignant growths from their very beginning. For this reason I advise amputation of the breast as the proper method of treatment. So, too, whenever simple cartilaginous tumors are diagnosticated or suspected I would advise removal of the breast. As already stated, I believe them to be of heterotopic origin and consider them likely to assume malignant propensities. Enchondromata, wherever situated, are dangerous neoplasms and they are even more prone in the breast than elsewhere to undergo malignant transformation.

MYXOMA.

This is a very rare growth and, indeed, its existence as a primary neoplasm has been questioned, it having been asserted that the myxomatous tissue was due to degenerative changes in other growths.

A few cases have been reported, however, which seem to show that myxoma may exist in the breast as a primary growth.

A good example of such a case has been recently reported by Clement. It was that of a woman, aged fifty-nine, who presented a voluminous pedunculated tumor of the left breast, which extended downwards to the abdomen, and which had an extensive area of suppuration upon its lower extremity. The skin over the remaining portion of the breast was much discolored and the nipple had almost disappeared. Upon palpation the tumor was found to be soft, fluctuating and uneven. There was no axillary involvement, although the tumor was of three years' duration. It had been painful, however, from the beginning.

A diagnosis of ulcerating cystic sarcoma was made and the breast removed.

The tumor was found to be encapsulated, was gelatinous upon section, and showed vascular striations.

Upon microscopic examination it was found to be composed essentially of mucous tissue. There were also fibromatous and hemorrhagic areas. The normal elements of the gland had nearly all disappeared.

This case was evidently one of pure myxoma, as the tumor was of too brief existence for such extensive myxomatous degeneration of a fibroma to have taken place.

Such instances as this are to be considered as borderland cases between benign and malignant neoplasms. Myxomatous tissue, as is well-known, is the lowest type of adult tissue, and its existence as a primary mammary neoplasm, of which it makes up the essential constituent element, seems to me to represent the connecting link between fibroma and sarcoma.

This view is corroborated by the circumstance that myxomatous degeneration of benign tumors is often associated with, or followed by, sarcomatous changes. Clinically the rapid growth and not uncommon occurrence of such tumors after removal lends support to this view. It must not be forgotten, however, that sarcoma may undergo myxomatous degeneration exactly as fibroma does.

In regard to the origin of the myxomatous tissue, it may be stated that it develops in the periductal connective tissue. When secondary it probably is produced as the result of edema in this tissue (Warren).

Myxomatous tumors vary in size, some being no larger than a hen's egg, while others are as big as a cocoanut. They are encapsulated and lobulated, and vary in consistence, some being soft or fluctuating and others hard and firm. The axillary glands are sometimes involved. Occasionally cysts are found in the substance of the tumor, particularly in those in which the myxomatous process is the result of secondary degeneration.

Treatment consists in amputating the breast, and also clearing out the axilla, if there is any glandular involvement. Recurrence is not so apt to take place as it is in sarcoma.

ANGIOMA.

Angioma may affect not only the integument of the breast and the subcutaneous tissue, but may also occur as a primary growth in the substance of the gland itself. Although Klebs asserted that involvement of the gland proper was always secondary, being caused by extension of the growth from superjacent structures, several cases of undoubted authenticity have been reported in which the tumor originated in the breast itself.

In regard to the **etiology** of mammary angioma, it may be stated that the tumor is always present at birth or makes its appearance during the first weeks or months of life. Sex appears to be entirely without causative influence. Cases have been observed at all periods of life from infancy to old age. Thus it is seen that the tumor may remain of insignificant dimensions for a long time and then after the lapse of years suddenly begin to develop. In a number of cases, however, it increased constantly, though slowly, from birth, so that it attained a considerable size during the early years of childhood. In Althorp's case the affected breast had become very much enlarged at the seventh year of life, and in one reported by Bajardi a child two years of age presented a tumor of the right breast as large as a mandarine.

Following injury these tumors not uncommonly begin to grow rapidly, so that one which has been no larger than a walnut for years may become as large as an orange within a few months.

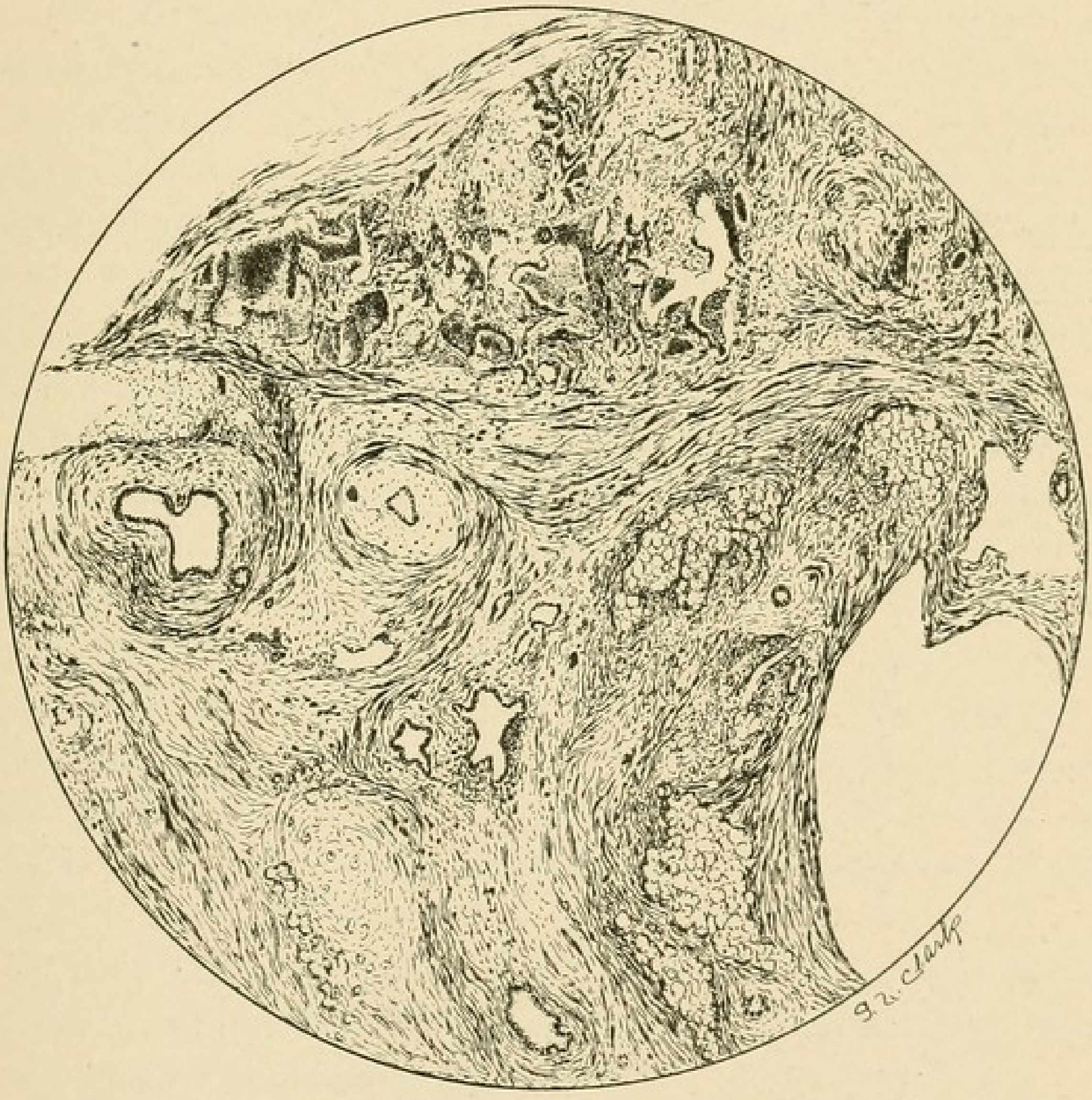
Morbid Anatomy.—Angioma of the mammary gland develops in the fibrous stroma and interlobular fat. The growth is riddled with cavities varying much in size and containing blood, which may be either liquid or inspissated. Some may be as large as a marble while others are no bigger than the head of a pin. These cavities may be either round or irregular in shape, and are separated from one another by fibrous or fibro-muscular septa. Pressure of the tumor upon the glandular structure causes atrophy of the latter, so that in cases in which the entire breast is affected there may not be a vestige of the acini and ducts left. When the tumor occupies only a portion of the gland, however, normal elements are present in the parts not affected.

As a rule angiomata are not encapsulated, although in Bajardi's case there was a distinct fibrous envelope around the tumor, from which the fibrous septa between the cavernous spaces within the growth were evidently derived.

Cysts may also form in angiomata and probably represent degenerative changes. At least this is the view put forth by Malapert and Morichau-Beauchant, in whose case there were three distinct, separate cysts contained within the tumor, and is one with which I readily agree. The cysts may contain serous or sanguinolent fluid.

When examined microscopically the vascular spaces are seen to be filled with red blood-corpuscles. There is also an infiltration of leucocytes at the periphery of the septa dividing the spaces one from another. Between the different spaces a collection of fat-corpuscles may be seen, and areas of hemorrhage can sometimes be detected in the interstitial and fatty portions of the growth. In a case carefully studied by Malapert and Morichau-Beauchant the acini in parts of the gland close to, but not invaded by, the tumor were found to be inflamed. There was a decided proliferation of the epithelium, and some of the acini were completely filled with new cells. In the same case sections of the cyst-wall were examined, and it was found to consist of two distinct layers. Blood-vessels were very numerous. The external layer of the wall was infiltrated with cells resembling lymph cells, being round and presenting a single large nucleus, which stained readily with hema-

PLATE XXI.



Angioma. (*Sick.*)

toxylin. These cells were placed one upon another without any intervening tissue, so that in certain places they appeared like minute nodules. In the interior of some of these masses cavity formation had already begun.

In Sick's case the tumor consisted chiefly of connective tissue poor in cells with little masses of fat interspersed throughout its substance. The ducts were greatly dilated and lined by a single layer of cylindrical epithelium. Veins and arteries having normal walls were exceedingly numerous. At certain places they were surrounded by leucocytes. Besides these vessels there were many large spaces filled with blood-corpuscles. A few of these dilatations had a wall composed of muscle fibers and connective tissue, whereas others showed merely an epithelial lining. (See Plate XXI.)

Symptoms.—Angioma appears in the breast as a soft, elastic tumor, which is painless and not sensitive to pressure. It frequently pulsates and often becomes reduced in size under pressure, although it resumes its former dimensions when the pressure is removed. The gland is freely movable and the skin over it is not adherent. Not uncommonly there is a dilatation of the cutaneous veins. In Bland Sutton's case the skin became invaded by new growth and ulceration occurred, which gave rise to some hemorrhage. Discoloration of the skin has also been observed.

Violent exertion, straining and crying have been observed to cause enlargement of the growth. The effect of trauma has already been mentioned.

If cysts are present they may make the surface of the tumor rough and uneven and may give rise to fluctuation. Under these latter conditions it is evident that diagnosis may be extremely difficult.

The treatment of mammary angioma consists in complete removal of the breast. In cases of areolar or subcutaneous angioma excision of the diseased tissue may be practised.

ENDOTHELIOMA.

Among the tumors but rarely found in the breast, although comparatively common in the salivary glands, is endothelioma. The only case of which the writer has any knowledge is that reported by J. Chalmers DaCosta, in 1903, the pathological report upon which was made by W. M. L. Coplin. This tumor was found in a woman 31 years of age who had borne one child ten years previously. The tumor was 10 cm. in diameter and had been noticed three months previous to operation. It was not accompanied by any discharge from the nipple and caused a dull ache only one month prior to its removal. It was located near the nipple, the skin being healthy and movable over it. There was slight retraction of the nipple which was more apparent than real. The axillary glands were not enlarged. Incision into the growth was accompanied by more than the usual amount of hemorrhage.

Microscopically it was characterized by the formation of large spaces with no definite walls, but filled with closely packed round or oblong cells of various sizes, having small, deeply staining basophilic nuclei and granular cytoplasm. Some of the spaces contained blood in addition to that contained in the rather vascular stroma. The tumor was not encapsulated.

Prognosis.—Owing to the extreme rarity of this form of growth it is difficult to make any definite statement upon this point. Considering its behavior in other organs, however, we may, by analogy, say that total extirpation should be followed by absolute cure, but that rapid recurrence with increasing tendency to malignancy is almost certain should removal be incomplete.

SARCOMA.

Sarcoma is one of the rarest neoplasms which affects the mammary gland, and is not even so common as the older surgeons, who stated that it comprised from five to nine percent of mammary tumors, believed it to be. No doubt the higher percentages formerly considered as correct are attributable to faulty nomenclature; for as in the case of the benign tumors of the breast, so likewise as regards sarcoma, there has been an inaccuracy in the use of terms employed to designate these growths. As an illustration of this error, it will suffice to mention that even Tillmanns, in the last edition of his excellent treatise on surgery (Lehrbuch der Allgemeinen und speciellen Chirurgie, Leipzig, 1904) speaks of cystosarcoma phyllodes in his article on sarcoma of the breast. This tumor, as I have already stated, is in reality the papillary cystadenoma, it being the name applied to this growth many years ago by Johannes Müller.

In this connection it is noteworthy that Finsterer's statistics, based on the cases which came under observation in Hochenegg's clinic in Vienna during the last twenty years, give a percentage of six if cystosarcoma phyllodes be included, but that the percentage falls to three if the latter be excluded.

No doubt a similar distinction would decrease the percentage in other series of cases.

Still another way in which an erroneous idea as to the frequency of sarcoma may have gained ground is in mistaking benign cystic tumors, particularly papillary cystadenomata, for cystic sarcomata.

W. Roger Williams, who collated 2397 cases of tumor of the breast, found that ninety-four, or 3.9 percent were sarcomata. My own statistics, based upon a still larger number of cases, show even a lower percentage. Thus, of 5000 cases of tumor of the breast which were collected from entirely trustworthy sources, only 2.78 percent were sarcomata. As further illustrating the rarity of this disease I may mention incidentally that when studying the age incidence of mammary sarcoma I was able to collect only one hundred cases reported in recent years in which the age of the patient was stated. Not more than one-half dozen cases in which the age of the patient was not stated were found. My material included the cases which have occurred in nearly all the large London hospitals during the last fifteen years, or at least all those which appeared in the official reports of these institutions. In a recent analysis of 628 cases of malignant tumor of the breast Sick, of Hamburg, found that only 12, or 1.9 percent were sarcomata.

The late S. W. Gross based his classic paper on sarcoma of the breast on one hundred and fifty-six cases, which was all that he could collect after a most exhaustive search through the literature. He, however, considered the disease to be much more frequent than later statistics show it to be.

Williams has also pointed out that the relative liability of the female breast to sarcoma is considerably below the average for the body in general, 9.4 percent of the body neoplasms being sarcomatous, whereas only 3.9 percent, or according to my statistics, 2.78 percent, of the newgrowths of the female breast are sarcomatous. In regard to its comparative frequency with carcinoma my statistics show that 4001 out of 5000 cases of tumors of the breast, or 80.02 percent were carcinomata, whereas only 138, or 2.78, percent were sarcomata. Thus it is seen that carcinoma is nearly thirty times as common as sarcoma.

In regard to the **etiology** of sarcoma little definite is known, although I am of the opinion that traumatism plays a more important role in its production than it does in other mammary neoplasms.

The disease is much more frequent in women than in men. In a review of the literature Finsterer was able to collect only nine authentic cases occurring in the male sex. He reports three others which came to operation in Hochenegg's clinic during the thirty years from 1877–1906.

I am of the opinion also that some mammary sarcomata owe their origin to misplaced embryonal tissue elements, which assume active growth in adult life. When such embryonal remnants have been deposited in the breast it is very probable that even a slight injury may stimulate them to active growth. Further investigation is required to determine whether heredity exerts any causative influence, or whether the occurrence of carcinoma in the relatives of those affected with sarcoma in any manner predisposes to the development of the latter disease. It is not known whether pregnancy, lactation, or the involutionary changes of the breast exert a causative effect. In regard to age incidence it may be stated that sarcoma is unquestionably a disease of middle life, as is graphically shown by the accompanying chart, which is based upon one hundred cases collected from various sources. It has been stated that sarcoma in the majority of instances affected young women, and I myself was inclined to consider such to be the case until the above-mentioned collective investigation showed that one-half the cases occurred between the ages of forty and fifty. It must be borne in mind, however, that the disease may occur at any age. The average age incidence in Finsterer's collection of cases affecting the male breast was 45.6 years.

Pathology.—It has been customary to distinguish two principal varieties of mammary sarcoma, namely, the **cystic or adenosarcoma and the true or pure sarcoma.** The former originate in the transparent periductal tissue, and for this reason I shall adopt the term periductal sarcoma, used by Warren, in preference to either of the others above mentioned.

The **pure sarcoma** originates in the true connective tissue stroma of the mamma.

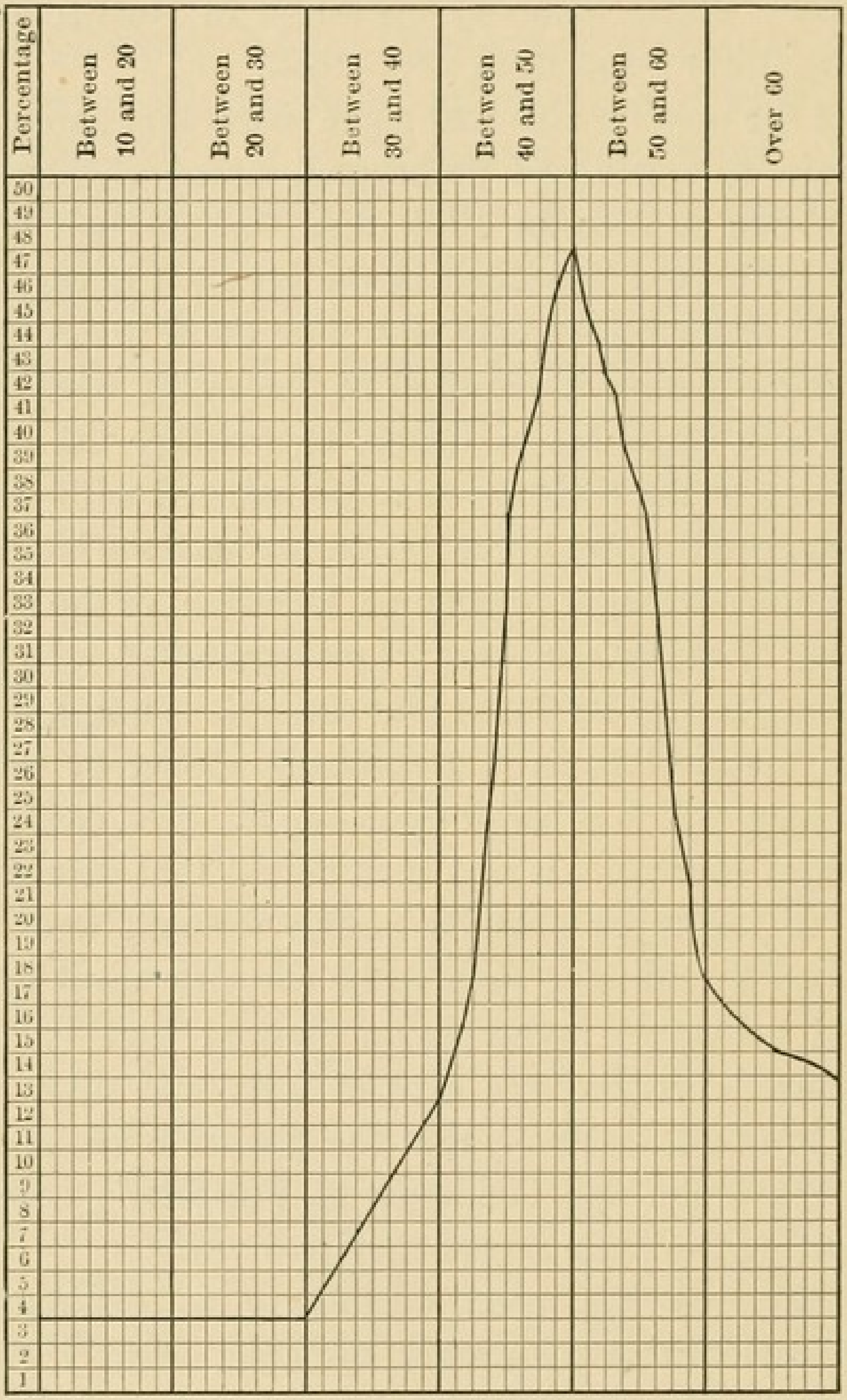
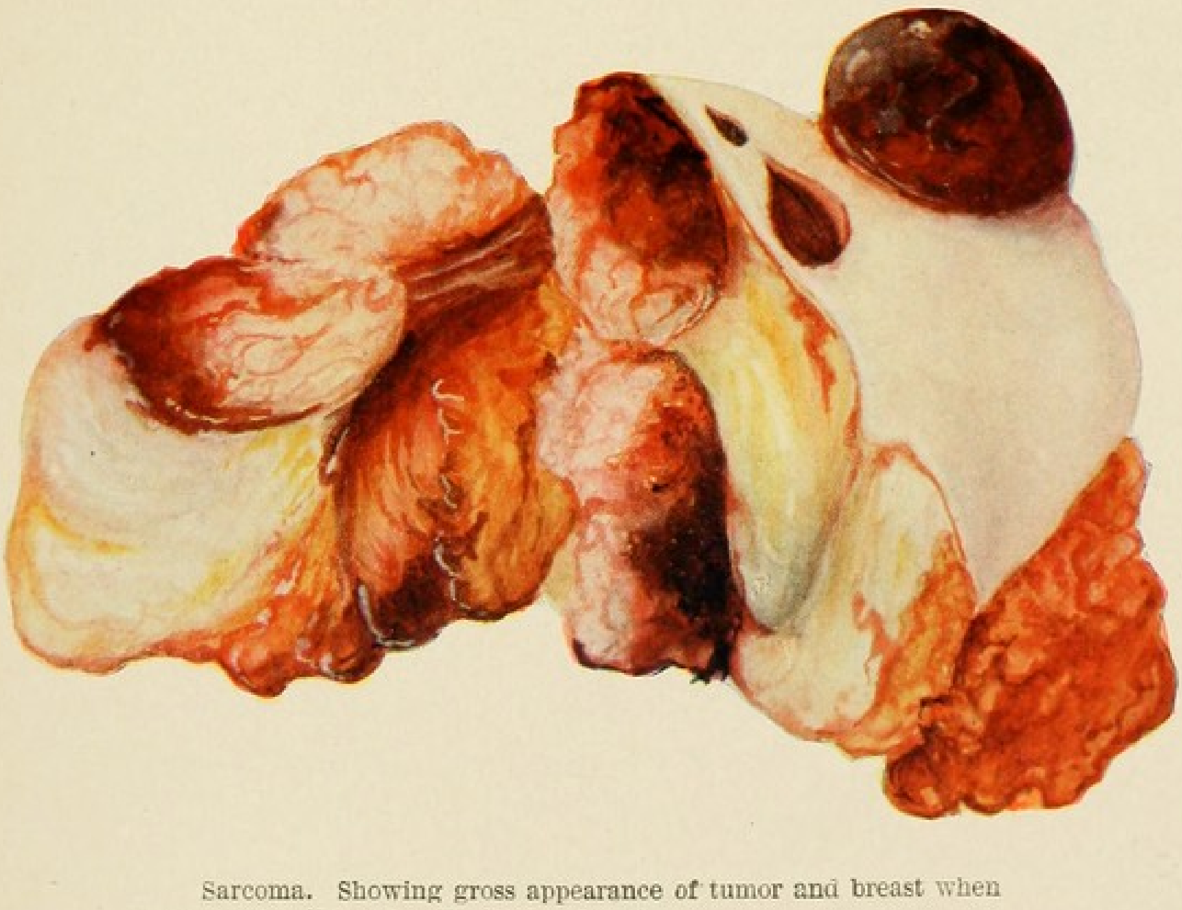


FIG. 23.—Showing the age incidence of mammary sarcoma; based on 100 cases collected from various sources.

In regard to the relative frequency of the two varieties the statistics of Williams are interesting. According to his inves-



Sarcoma. Showing gross appearance of tumor and breast when removed.—(*Maurice H. Richardson.*)

tigations the proportion is about 80 percent of the periductal to 20 percent of the pure type.

In regard to the **structure** of mammary sarcomata it may be said that all forms occur—round-celled, spindle-celled, giant-celled, alveolar and melanotic. Of the 156 cases studied by Gross 68 percent were said to be spindle-celled and 5 percent giant-celled. I believe that the mixed form, namely, a combination of round and spindle cells, is more common by far than any of the others. It is unusual to find a tumor composed entirely of round or spindle cells. Of course one or the other may predominate and thus give distinction to the growth. Ernst Siebert states that growths having a preponderance of spindle cells are more common in young women, whereas those in which round cells predominate occur mostly in women of middle life. The average age for the latter was found to be $47\frac{1}{2}$ years; for the former $36\frac{3}{4}$ years. Further investigation will no doubt prove whether this age incidence will hold good in a larger number of cases.

That the round-celled sarcomata are more malignant than the spindle-celled is a matter of common knowledge among surgeons and pathologists. It grows more rapidly and not uncommonly proves fatal within three or four months after its onset. With the exception of the very rare melanotic form, it is the most deadly which occurs.

There is a very material difference, both as to the microscopic and the gross characteristics, between the periductal sarcoma and pure sarcoma. The former, as already stated, originate in hyaline tissue around the ducts, and as a result of their location it comes to pass that, as the tumor increases in size, the ducts become included in the neoplastic tissue by which they are compressed and distorted, so that clefts, and later cysts, are formed within the substance of the growth. The contents of these cysts, which is often hemorrhagic, exudes from the nipple in a considerable percentage of cases. From the walls papillary outgrowths not uncommonly project, being due to proliferation of the epithelial lining. Glandular elements may also be included in the newgrowth, the acini being surrounded by sarcomatous tissue or cysts. It was formerly believed that these elements developed *de novo* in the tumor. In the stroma of the growth myxomatous degeneration is very often seen, and fatty or even calcareous changes have been observed. Fatty degeneration if extensive imparts a yellow color to the affected area.

The term **myxosarcoma** is often applied to those growths in which myxomatous degeneration is extensive.

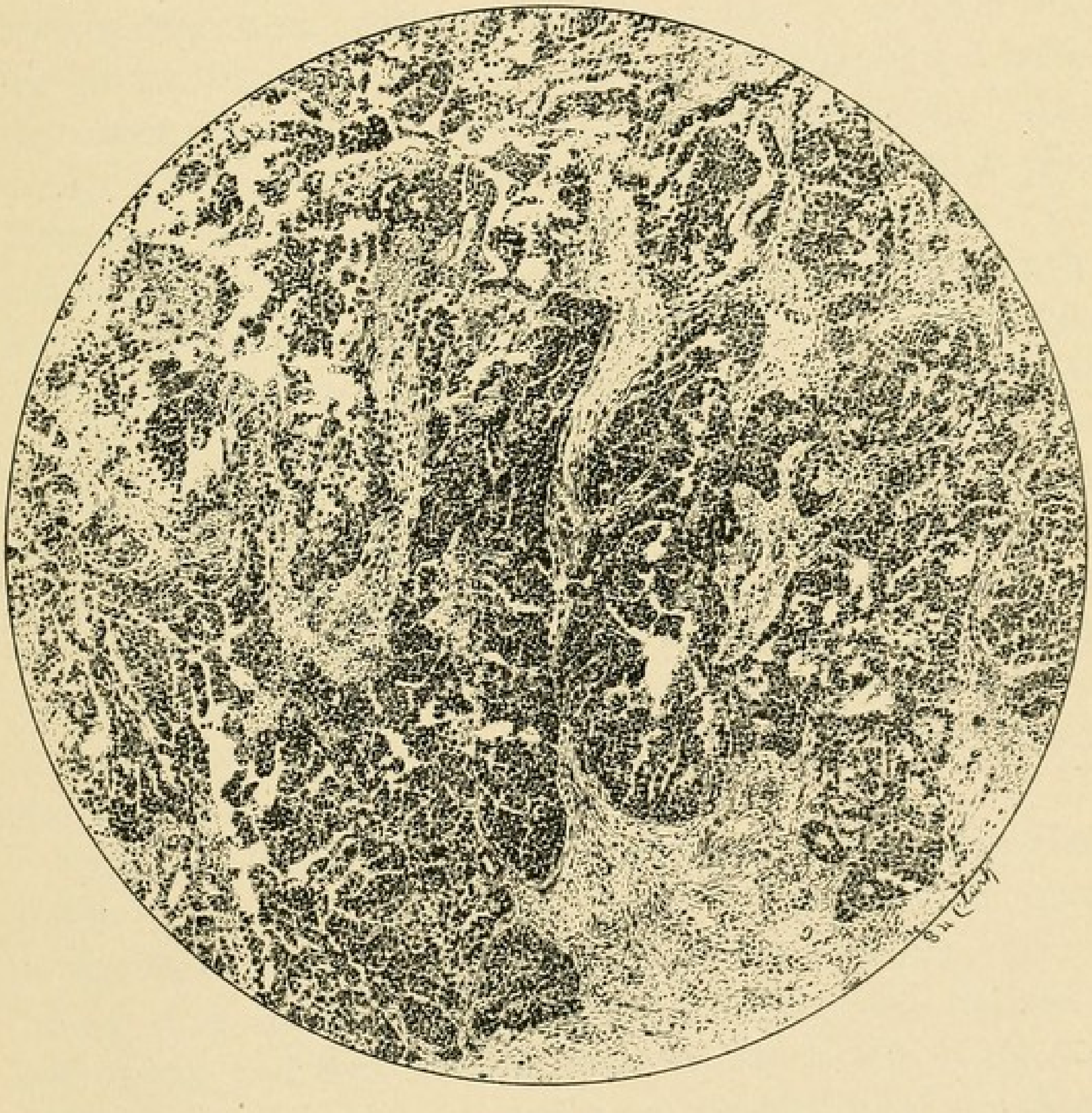
Cartilage has also been found in mammary sarcomata. This condition has already been discussed under enchondroma.

Periductal sarcomata appear in the breast as round or ovoid tumors which are clearly circumscribed and somewhat movable. They are encapsulated and as cyst-formation takes place become distinctly lobulated. As a rule they are firm and indurated in consistency, although occasionally when large cysts are present fluctuation can be detected. They vary in size, although as a rule they are large when first seen by the surgeon. The superficial veins of the breast are distended, the skin not uncommonly reddened, and as the morbid process advances ulceration is wont to take place. Fungous sarcomatous masses then protrude through the ulcerations, and from them hemorrhages may take place. In like manner after the capsule has been broken through, neighboring structures may be invaded, the morbid process having been known to advance to the ribs and pleura.

Pure sarcomata differ from the periductal form in that they are usually smaller, harder and more regular in shape, and that they do not contain cysts. They are encapsulated at first, but later may break through the capsule and become diffuse. Glandular and ductal elements are, of course, not found in them.

Symptoms.—During the early stages of its evolution mam-

PLATE XXIII.



Sarcoma.

mary sarcoma gives rise to little disturbance, so that it not uncommonly escapes detection until it has become large enough to attract the patient's attention. When first noticed it may be no larger than a marble or a walnut, and as it is painless and in no wise annoys the patient, it often happens that little notice is taken of it until increase in size begins to produce the fear that it may be cancerous. Although cases have been reported in which the growth remained stationary for a number of years, I believe that most mammary sarcomata increase rapidly in size. At all events a time always arrives when rapid growth takes place. Pregnancy invariably stimulates them to great activity. I recently saw a woman eight months pregnant, with apparently a large sarcoma growing from the periphery of the axillary quadrant, which was as large as a small cocoanut. At the beginning of her pregnancy it was, I am told, no larger than a small walnut. I saw another case in consultation during my residence in Louisville, Kentucky, in a woman four months pregnant. The tumor was situated in the upper hemisphere near the periphery. Against my advice the surgeon removed only the neoplasm, leaving the gland. Within a month there was an enormous fungating mass, and the woman died at the end of the sixth month of pregnancy.

Pain is variable, as a rule, being trivial or altogether absent unless ulceration takes place, when it may become severe. It has been noticed by several observers, however, that the tumor may become slightly painful before and during the catamenia, and that swelling may likewise occur at the time.

The general health is usually not affected until the disease has become well advanced and ulceration occurs. When this stage is reached, however, the patient becomes emaciated, cachectic, and enters upon a rapid decline. As already stated round-cell sarcoma usually proves fatal within a few months.

The **diagnosis** of large periductal sarcomata, particularly those in which cysts have formed, should present little or no difficulty. The large, lobulated, movable tumor, with its distended superficial veins, together with the history, in most

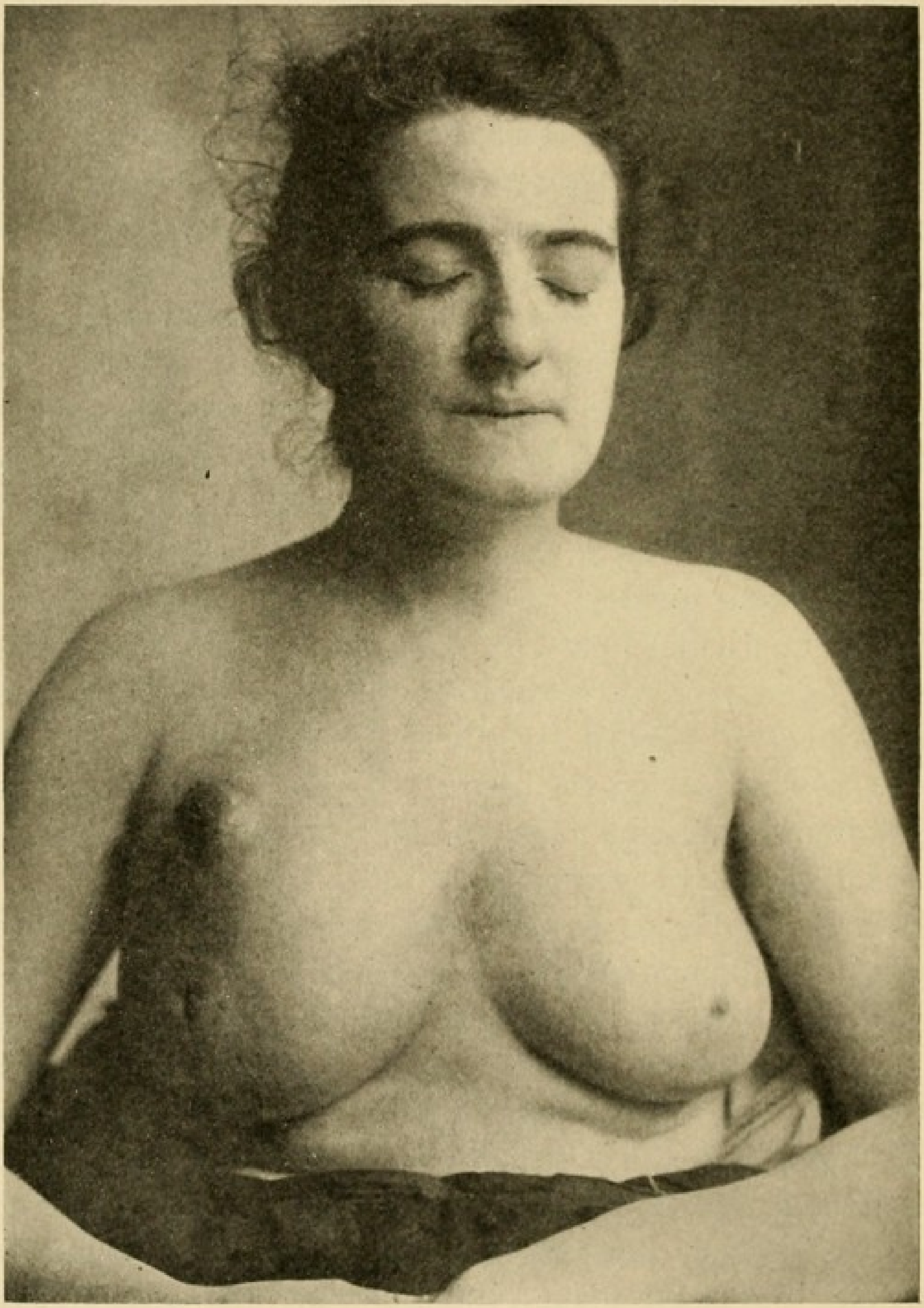


FIG. 24.—Sarcoma. (*From a photograph loaned by Dr. W. B. Coley.*)

cases at least, of rapid increase in size, will reveal the nature of the disease. When ulceration has occurred the protrusion of fungous sarcomatous masses above referred to will likewise make the condition plain. The diagnosis of small sarcomata may be very difficult or even impossible. If discovered very early in their evolution they may be mistaken for the knot-like indurations of chronic mastitis. From carcinomata they are to be differentiated by the absence, as a rule, of lymphatic involvement, fixation of the skin and retromammary tissues, and retraction of the nipple. The nipple, though often displaced, is never retracted as it is in carcinoma. The periductal fibroma and the fibro-cystadenoma do not grow so rapidly as sarcoma, and in the majority of cases affect younger women.

Prognosis varies, depending upon the character of the growth. It is now generally admitted that the periductal sarcoma is not so malignant as true sarcoma and that recurrence rarely takes place when timely operation is practised. Indeed, Warren states that the tendency to malignancy in the periductal sarcoma is very slight. In the Munich cases studied by Siebert internal metastases did not occur.

Pure sarcoma offers a less favorable prognosis, and many cases of local recurrence as well as metastasis to the internal organs have been reported. As dissemination of the disease takes place through the blood-vessels rather than through the lymph-channels, metastases may occur even when no signs of local recurrence are present. Thus it is that while regional recurrences are much less common than in carcinoma, involvement of the internal organs is more common. Metastases have been found in the long bones, the vertebræ, the ribs, the brain, heart, lungs, liver, pancreas, ovaries, and peritoneum, and in the inguinal and mesenteric lymph glands.

The fatal course of the disease in pregnant women has already been alluded to.

Treatment consists in complete excision. The breast should invariably be amputated, and I also favor clearing out the axilla. The necessity of the latter procedure has been questioned, inasmuch as the axillary glands are, as a rule, not involved. Exceptions to the rule, however, do occur, and in view of this fact it is well to remove the glands, especially as the more complete operation will not subject the patient to greater risk and may save her from a recurrence.

Finsterer mentions a case from the Vienna clinic in which it was necessary, four months after removal of the breast, to clear out the axilla owing to involvement of the lymph glands. He also mentions two cases in which the supraclavicular glands were enlarged. It is my belief that a thorough axillary dissection should always be made, as it adds nothing to the danger of the operation and possibly gives a greater security to any given case.

CARCINOMA.

Etiology.—We possess no more knowledge of the primary cause of carcinoma of the breast than we have of its occurrence in other organs of the body. To discuss all the theories of its causation which have from time to time been propounded would not be apposite to our subject, so only those predisposing causes which are generally recognized as being more or less important, together with certain circumstances which seem to have a bearing upon its incidence in the breast, will be fully considered.

In view of the interest which has of late years been manifested in the parasitic or germ nature of cancer it may not be amiss, however, to discuss this subject before entering into an examination of the various supposed etiological factors of its production in the mammary gland.

Many different investigators have found minute spherical bodies, surrounded by a delicate membrane and having a highly refractive center, in both the protoplasm and nucleus of carcinoma cells, and some have believed them to be parasites. It yet remains to be proved that they are such or that they are in any way related to the production of the disease. In 1904, Doyen announced that he had discovered and made cultures of a germ which caused cancer, and to which he applied the name *Micrococcus neoformans*. Metchnikoff reported favorably, though not positively, upon Doyen's assertions. Other reports, however, were entirely adverse to them, and at present little credence is given to the result of Doyen's findings.

Simultaneously with the announcement of Doyen's discovery, there came a strong article before the Surgical Section of the International Congress at St. Louis, September, 1904, from Professor Orth, of Berlin, combating the germ theory of carcinoma, and announcing his adherence to the cellular theory in the most positive way. It is very clear that if parasites are present they are intracellular and play a secondary and not the chief role as an etiological factor. They certainly do not, and according to Orth, it is simply impossible that they should bear the same etiological factor to cancer that the bacillus of Koch does to tuberculosis, and pyogenic cocci to suppuration. The language of Orth could not be stronger, and considering its high source is, therefore, quoted: "In order to produce pus or tuberculosis, etc., it is sufficient for the pus cocci or tubercle bacilli to reach suitable media; to bring about a secondary cancer it is absolutely necessary that cancer cells from the primary or from a similarly created secondary tumor shall reach the particular spot, and there continue their growth. In the case of secondary cancers we have to do with a successful transplantation of cancer cells; in the case of pus foci or tuberculosis there occurs a transplantation of the parasites, which do not themselves form the new focus, but they impel the local tissue, without any coöperation of the tissue of the primary focus, to certain pathological changes. Therefore there is an important difference between these two classes of phenomena; and one cannot conclude that since, in the case of pus foci, tuberculosis, etc., parasites play a role, this must also necessarily be the case in the carcinomatous newgrowths. One can, however, say that if in cancer parasites should happen to play a part, then these parasites must be of an entirely different kind from those above mentioned, because they must bear the closest relation to the cancer cells which characterize the growth. I do not consider it impossible for an intracellular parasite to play a part here; but it is impossible for it to play an independent part. It cannot possibly in itself be the decisive factor in the newgrowth; it cannot determine the variety and character of the newgrowth, since the cells themselves, and only they do this."

The transmission of a cancerous tumor from one individual to another, though often cited as evidence of the parasitic nature of the disease, proves absolutely nothing further than that a successful grafting has taken place. The tumor thus formed is the result of the multiplication of the cells introduced and is analogous in every way to epidermis when transferred from one person to another, as in skin grafting. Until cultures from the supposed germs can cause, alone and of themselves, independent of cells, a primary tumor, it is useless to insist upon the infectious nature of the disease. Cases of so-called auto-infectivity prove even less, for here the host has tissues admittedly prone to degeneration; and it is easy to understand how successful grafting can follow prolonged contact.

I am not inclined to attribute much value to the results obtained by inoculating and grafting experiments upon animals, as mice for example.

The rare, if not unheard of infection, of operating surgeons by cancerous patients is the strongest possible evidence against the infectious nature of the disease.

To pass now from these preliminary considerations to a study of those conditions which bear upon the occurrence of carcinoma in the mammary gland, it may be stated that **sex, age, and race** undoubtedly exercise a considerable influence over the development of the disease. Thus the proponderance of cases occurring in women is a fact so firmly established that no figures need be adduced to confirm it.

Not more than one percent of all cases occur in men. Out of 1460 cases of mammary carcinoma studied by Keyser only 10 affected the male breast; of 307 cases treated at the Johns Hopkins Hospital, Warfield states that only 3 were in men; Fantino found only 1 case in 228, and Sick found only 2 in 616. These figures do not show such a high percentage among men as those of some of the older authors, for instance Billroth, who stated the percentage to be 2.82.

So, too, it has long been known that age constitutes an impor tant etiological factor, a vast majority of all cases occurring in women in or past middle life, usually at about the time of the climacteric. Various statistics, though showing minor differences, are in the main harmonious upon this point. Thus, for example, Gross's, Williams's and Mahler's analysis of cases

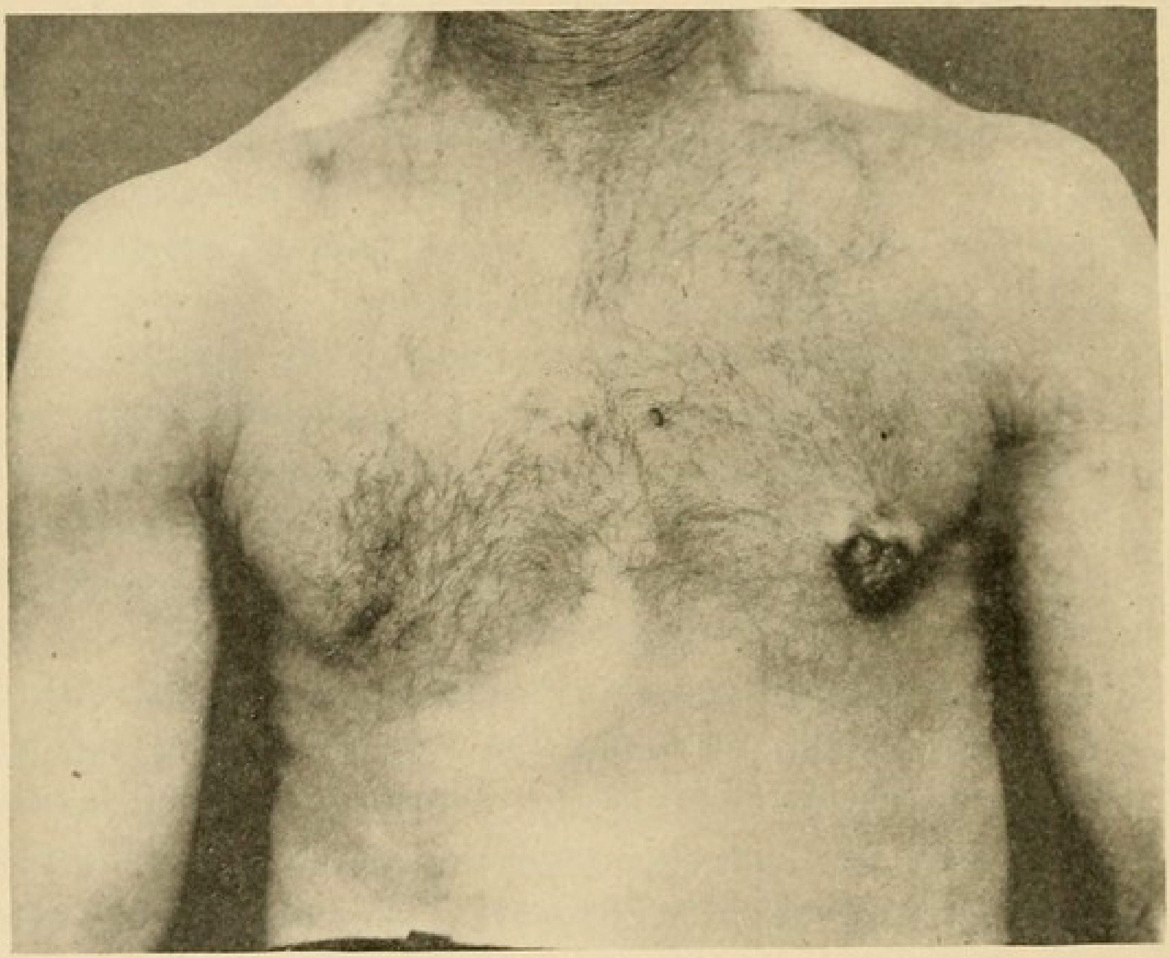


FIG. 25.—Carcinoma of the male breast.

all give an average age incidence of forty-eight years, Sprengel's show fifty years as the most common period of its occurrence, Gebele's 50.8 years, and Sick's 52.3 years. My own statistics, presented graphically in the accompanying chart, confirm previous observations, in so far as they show the greatest incidence of the malady to be in middle life. It must be remembered, however, that there are more women living between the ages of forty and sixty than there are over sixty. If there were as many women over sixty alive as there are between forty or forty-five and sixty, I doubt not that fully as great a percentage of cases would be found in them as among the others. It will be seen from the accompanying chart that 21.5 percent of the 5000 cases were in women past sixty. It will also be observed that the percentage of cases occurring in the sixth decade of life is 1.5 percent greater than those occurring in the fifth decade. Had it been possible to divide the entire number of cases into quinquenial instead of decennial periods, it is probable that only a very minute difference, if indeed any whatsoever, would have been found between the periods from forty-five to fifty and fifty to fifty-five.

The most striking thing shown by the chart is the sharp rise in morbidity which occurs after the fortieth year. The next one, and one, too, which is of quite as great importance, is that 9 percent, or nearly one-tenth of the entire 5000 cases, occurred in women between the ages of twenty and thirty. These latter figures, based as they are upon a sufficiently large number of cases to insure at least a fair degree of authenticity, strengthen the view which I had formerly often expressed relative to the incidence of mammary carcinoma in young women. Between the years 1898 and 1906 I operated upon five cases of cancer of the breast occurring in patients aged 23, 25, 25, 27, and 28 years respectively. In all but one of these cases—and that in the case of the patient aged 23 years—the tumor was a typical scirrhus carcinoma. McCosh, Richardson, Park, and Warren have operated on patients aged 19, 21, 22, and 22 years respectively, and in the Tübingen cases analyzed by Mahler there was one patient aged 26 years. These circumstances led me to believe that mammary carcinoma is much more common in young women than it is supposed to be, and it was rather for the purpose of securing information on this matter than for corroborating that which has come to be generally accepted regarding its most frequent occurrence in middle aged women that I had the age incidence of the disease

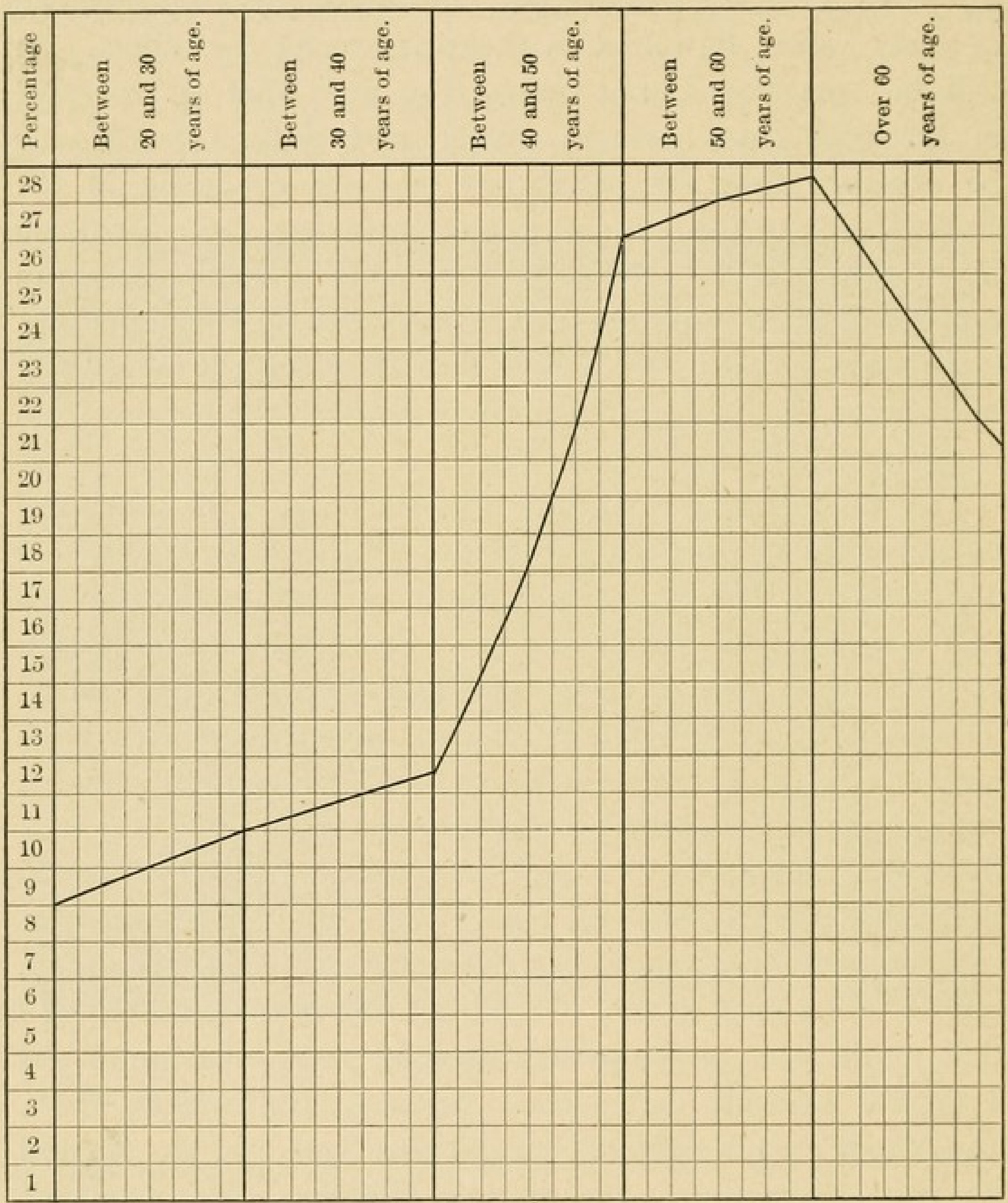


FIG. 26.—Showing the age incidence of mammary carcinoma; based on 5000 cases collected from various hospital reports and other sources.

investigated in a large number of cases. The result of this investigation, as herein portrayed, is significant.

It has been stated that mammary cancer affects the male at a more advanced age than the female. In nine cases Keyser found the average age to be 61.5 years. Williams states that the average age is 50 years. The eight cases which I have seen were in elderly men. J. Chalmers DaCosta, however, has seen two cases in men under 40 years of age. In view of the paucity of cases analyzed, I am of the opinion that further investigation is necessary to determine the difference in the age incidence of the disease in the two sexes. It is interesting to note that a case of mammary cancer occurring in a man 91 years old has been reported. This is said to be the oldest case on record. (Lunn, Trans. Path. Soc. of London, Vol. xlviii.)

In regard to **racial influence,** it may be said that races such as the American negroes and Indians, which were formerly considered immune, have become susceptible since living under changed environments. This is especially true of the negro, and applies to carcinoma of various organs, as shown by my investigations at the Louisville City Hospital. In lesser degree it is also true of the Indian. All observers seem to agree that savages are peculiarly exempt from cancer, and that Africans are the most immune of all. All early writers testified to the immunity of the Africans in their adopted country and, indeed, I think it cannot be doubted that cancer was rare with them up to fifty years ago. These early writings, however, have too much influenced practitioners of this generation, and many still believe that the disease is rare among negroes because it was so a few generations ago.

Far from being uncommon in the mammary gland, carcinoma is as frequently met with in American negroes as it is in the American white races. I have seen a dozen cases myself. The first case of cancer of the breast I ever saw was in a negress about forty years of age, as black as a crow's wing. She died from recurrence after operation, at the usual time and in the usual way, confirming the clinical diagnosis. In at least six of the other cases, too, the diagnosis was confirmed both by microscopic examination of the neoplasm and the subsequent death of the patient from recurrence.

There were 839 cases of cancer of the breast reported in the eleventh census; 811 females, 28 males. One occurred under 15 years of age; 163 between 15 and 45; and 670 at and over 45; rate of death to 100,000 inhabitants: females 823; males 0.29; age 45 to 65, 30.08; 65 and over, 50. Death rate practically the same in white and colored, being 4.27 in the former and 4.19 in the latter.

The records of the Louisville City Hospital for twenty years show that three-fifths of the cases were white and two-fifths colored, though the latter represent but one-third of the Hospital population.

I am of the opinion that the negro, although still enjoying a comparative immunity to carcinoma in general, being exceptionally free from carcinoma of the lip, tongue, penis, etc., is more obnoxious to cancer of the breast and uterus than the white.

According to W. Roger Williams, who has investigated the subject carefully, mammary carcinoma is common in China. He quotes Cantlie, who states that of 114 cases of carcinoma affecting Chinese patients 38 were mammary, and also states that 11 out of 30 operations for malignant disease performed in one year at Dr. Kerr's Hospital in Canton were for neoplasms of the breast.

It has been said that Jews are less subject to carcinoma than other white races, but this statement I believe to be erroneous. It certainly is not in accord with the result of observations made in the United States.

With the passing of the constitutional theory of cancer and the demonstration and acceptance of its local origin about thirty-five years ago, there began a tendency to minimize the influence of heredity as a predisposing cause. This tendency has been carried too far, just as has been the case with tuberculosis.

The disease, of course, is not inherited, but the soil is prepared and made ready should the seed be sown at a time when the epithelial tissues are prone to run wild. In my own experience at least one-third of all cases which come to operation have been preceded by one or more cases of cancer, usually of the breast, in the family.

Delbet, who has studied this subject carefully, found from analysis of a large series of statistics that the number of cases in which hereditary influence was present varies between 5 and 10 percent.

Recent statistics tend to show that carcinoma of the breast is more common in married women, and especially those who have borne and nursed children, than it is in single women. I cannot agree with those who believe that it is equally common in the single and married, the sterile and fruitful.

Certainly some consideration must be given to such results as have been derived from the examination of hundreds of recorded cases, as for example those analyzed by Guleke, who found that of 982 patients treated in von Bergmann's clinic 90 percent had borne children. As those familiar with the work of the late S. W. Gross may remember, he found that 316 out of 416 women affected with mammary cancer had nursed children.

In view of these and other similar findings, it has been inferred that a direct causative relation exists between the functional activity of the gland and the occurrence of carcinoma. The periodic changes which take place in the breast as the result of pregnancy and lactation are associated with evolution of tissue, which may predispose to the proliferation of epithelium in the acini, thereby leading to the development of cancer. Perhaps the inflammatory processes to which the gland is often subjected during the period of lactation may lead to the formation of connective tissue which compresses the acini, produces irritation, and thus causes cell proliferation.

Granted that there be a causative relation between functional evolution and involution of the mamma and carcinoma, there yet remains a percentage of cases in which this factor can be entirely eliminated. Every surgeon of experience has seen cases of cancer of the breast in maiden ladies whose sexual life has beyond any doubt been absolutely negative. In such cases it would not be illogical to infer that the organ assumes morbid activity to compensate for the deprivation of normal function which it has sustained.

Traumatism, chronic inflammation, and mammary abscess have often been cited as predisposing causes. The exact etiologic relation, if indeed there be any, which exists between these conditions is not known. Statistics relative to the influence of mastitis show such wide variations that they are totally useless. Thus, for example, Winiwarter found a history of mastitis in twenty-four out of one hundred and fourteen cases, whereas Billroth obtained a similar history in only seven out of two hundred and eighty-two cases. It is interesting to note that in 1000 cases observed by Williams there was only one in which the disease immediately followed injury. Moreover, out of 137 women whom he interrogated, only 35, or 25.5 percent, gave a history of antecedent injury. Of course in the remaining 74.5 percent there may have been a considerable number who had received injuries which had passed unnoticed or been forgotten.

Cancer of the male breast seems to have been associated with injury in a considerable number of cases, and in many of these the relation between the traumatism sustained and the development of the disease has undoubtedly been one of cause and effect. In two of the eight cases which have come under my observation there was a history of traumatism; one was in a shoemaker who for years had pressed a last against his breast, and the other was in a laborer who was in the habit of resting the handle of his shovel against the breast. Cases similar to these have been reported by other surgeons.

Personally, I feel inclined to consider these factors as more or less influential in the production of the disease, particularly since all forms of carcinoma are generally found at points subject to persistent irritation.

It has been stated that the left breast is more often affected than the right. Although I think I have seen more cases in which the former was affected than the latter, I have never believed that the examination of a large number of cases would show much difference as to the frequency with which the two

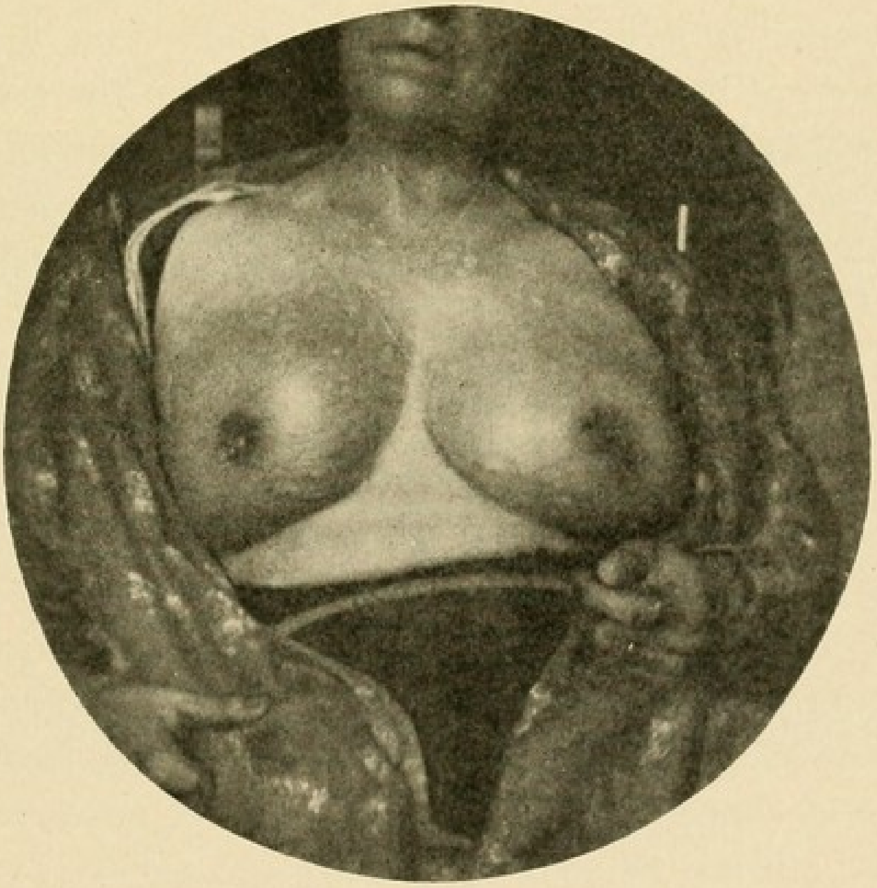


FIG. 27.—Bilateral mammary carcinoma.

breasts are attacked. The recent investigations of Sick, of Hamburg, are very significant in regard to this matter. He found that in 2,163 cases occurring in the practice of 10 European surgeons, the left breast was affected 1,088 times and the right 1,075. The difference is too small to consider.

The occurrence of carcinoma in **both breasts** is rare, although it is probably more common than many have been led to believe as the result of individual experience. Personally I have seen only two cases. A review of the literature of this subject has been of great interest to me, and as some of the statistics of well-known surgeons may not be without interest to the reader, I will quote a number of series of cases here.

Out of 132 cases of mammary carcinoma which came to operation in the Göttingen surgical clinic between the years 1875 and 1885, Hildebrandt states that there were six in which both breasts were affected. A like number was found out of 250 cases reported from Esmarch's clinic at Kiel. Out of 228 cases operated on at the Augusta Hospital in Berlin there were only two in which both breasts were affected. In a report of 200 cases treated at the General Hospital at Copenhagen between the years 1870 and 1888 Poulsen states that the disease was present in both breasts in 11 cases. Thus it is seen that there is no uniformity as to the percentage of cases in which the disease is bilateral.

Unfortunately details in regard to the involvement of the second breast are not sufficiently reported in these series of cases to permit a careful analysis to be made. It would be most interesting to determine the average time at which disease appeared in the second breast after the first one became affected. I have been able to secure only meager information concerning this matter. Albert describes a case in which both breasts were apparently affected simultaneously, and Poulsen mentions another in which each breast presented a tumor of equal size, both of which were said to be of one year's duration. Anton Beck in his Munich Thesis, 1904, mentions two cases occurring in the service of Prof. Klausner in which the tumor in each breast was said by the patient to have appeared simultaneously; in one of these cases the growths were of two years' duration, in the other of three months' duration. Thus it is seen that there are apparently authentic cases in

Adenocarcinoma.—(*Maurice H. Richardson.*)

which both breasts become diseased at the same time, but of course a certain allowance must be made for the accuracy of the patient's observation. In the two cases of Klausner there was a decided difference in the size of the tumors in the two breasts. Albert's case did not come to operation and so, of course, positive data as to the size and nature of the tumors could not be obtained.

While it is of course possible that the carcinomatous process might begin simultaneously in both breasts, I am of the opinion that one is always affected before the other and that the involvement of the second breast is metastatic, the disease being conveyed by the lymphathics. It will be remembered that there is a set of superficial lymphatics over the sternal half of the gland which pass through the second and fourth intercostal spaces to discharge their contents into the nodes of the anterior mediastinum. Some of these vessels occasionally interlace with those of the opposite side, so that virus from a tumor adherent to the skin over one breast might be transmitted to the other. Direct permeation of the disease through the fascial lymphatic plexus might also occur.

The term bilateral carcinoma has also been applied to those cases in which recurrence of the disease took place after amputation had been performed and the disease later developed in the second breast, as well as in those in which the second breast became affected after amputation of the first had been performed and was not followed by local recurrence. To the frequency of the latter occurrence Rotter has called particular attention. Out of 35 recurrences he found that 6 took place in the other breast. Late involvement of the second breast is of course explained by transference of the cancer elements through the lymphatics.

In conclusion, I would plainly state that despite the fascinating theories advanced and the information derived from the study of large numbers of statistics, I still remain an agnostic, denying that any theory yet advanced gives entire satisfaction to one viewing the subject from a liberal point of view.

That race, environment, temperament, habits, trauma, and possibly diet may have some influence in the etiology of cancer may be allowed, but it would seem that more than one cause is influential, the primary or essential causes yet remaining unknown.

Pathology.—Carcinoma can be divided into adenocarcinoma, medullary and scirrhus carcinoma, carcinoma simplex, gelatinous carcinoma and carcinomatous cyst. All arise from the epithelium lining the acini, but are classified under different heads because of the arrangement of, and the varying relations of the connective tissue stroma to, the tumor cells.

Adenocarcinoma was first described by Halsted in 1898, and since that time it has come to be recognized as a definite pathological and clinical entity. This form of the disease represents the first step in the deviation from typical epithelial proliferation.

Adenocarcinoma grows comparatively slowly, but steadily, to a rather large size, when the skin breaks down and a fungating mass is formed, which is soft to the touch and often overhangs the skin edge of the growth; that is, exhibits a tendency to become pedunculated. This is quite characteristic of the growth. The lymph nodes are rarely invaded until very late in the disease, when the tumor has been converted into one of the other forms of carcinoma. When enlarged nodes have been found in the earlier stages, the enlargement was invariably due to endothelial hyperplasia.

On section through the breast, the cut surface of the tumor resembles the other carcinomata, especially the simplex, being softer than and not quite so infiltrating as the scirrhus, though usually not quite so soft as the medullary carcinoma. On sec-

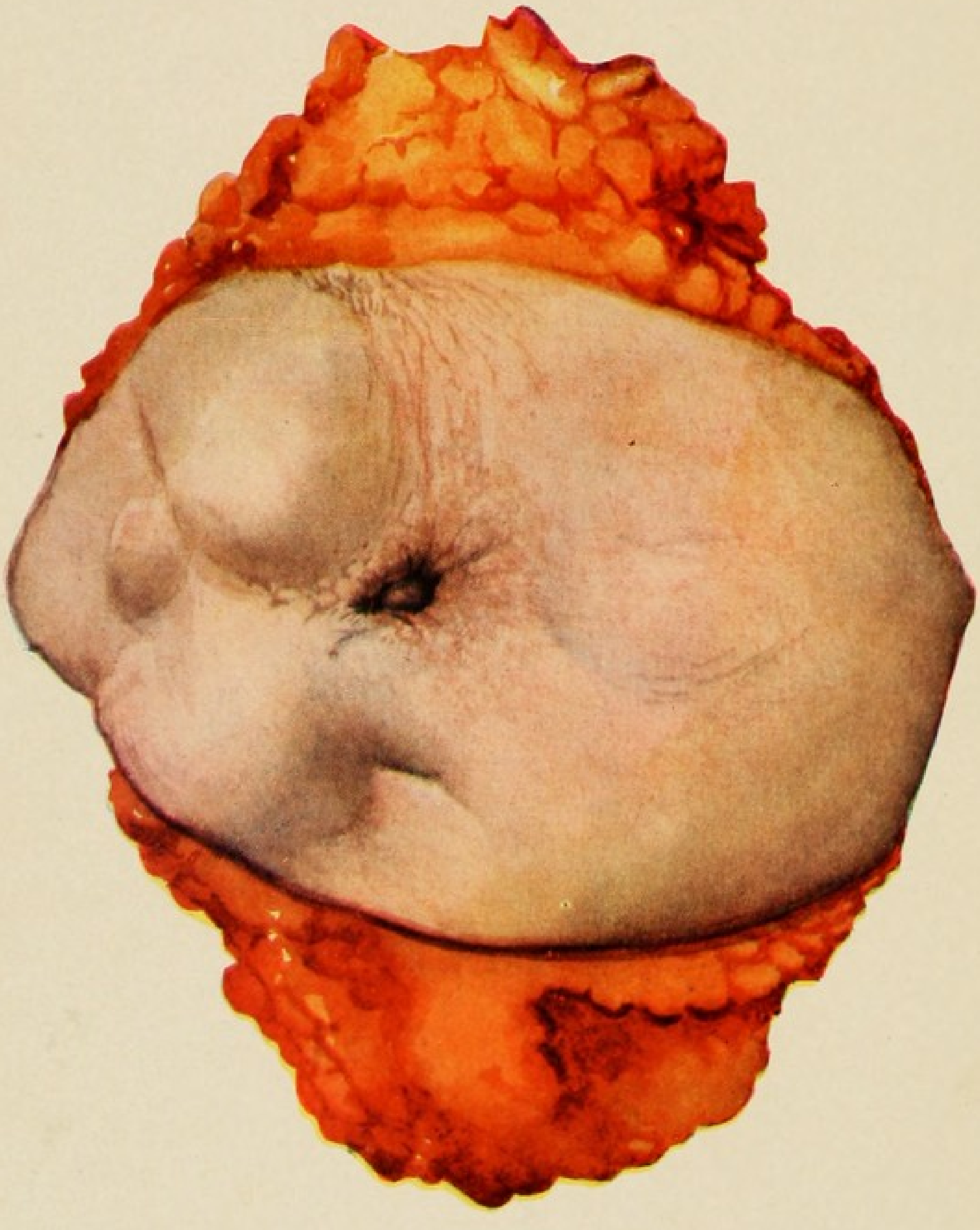
Adenocarcinoma.—(*Maurice H. Richardson.*)

PLATE XXVI.

Adenocarcinoma. Microscopic appearance.

PLATE XXVII.

Section showing areas of adenocarcinoma and medullary carcinoma.



Medullary Carcinoma. Showing appearance of breast and tumor when removed.—(*Maurice H. Richardson.*)

tion it does not usually bulge, but some sections exhibit slight cupping, and on pressure extrude small, yellowish, worm-like plugs of epithelium.

Microscopically, typical portions of the tumor show abnormal acini formation, the acini forming large tubular spaces lined with epithelium, which, in places, is very thick. As described by Halsted, the cells in some areas form combinations which result in the formation of gland-like figures, circles, tubes, columns and minute papillæ. Even when the tubes are completely filled and there is no lumen, the cells exhibit the same tendency to make definite figures and cell combinations. Sometimes the different figures anastomose in such a manner as to make a rather open meshwork.

The above description applies only to the typical portions of the tumor. Many tumors show all stages and gradations from the above type, varying from sections closely resembling the adenomata to simplex and scirrhus carcinomata of the most atypical variety. In certain areas, the cells can be seen to be breaking through the basement membrane and entering the connective tissue stroma, to be carried along in the lymph spaces, there to set up an atypical form of growth or possibly become localized and form a small nodule, the cells of which exhibit the same tendency to form figures as the parent growth. Halsted has also described a bitypical form in which the ordinary carcinoma is seen to be infiltrating the stroma separating the tubes of a typical adenocarcinoma.

Although adenocarcinoma marks the first step in the deviation from typical epithelial proliferation, it is one of the rarer forms of carcinoma. As a rule when atypical proliferation of the epithelium once begins, it loses all semblance to glandular formation and multiplies rapidly in preformed connective tissue or lymph spaces, its shape being determined by the rapidity of the growth and the space in which it proliferates.

These more atypical forms of cancer have been divided into

medullary or soft cancer and scirrhus or hard cancer. The **carcinoma simplex** is an intermediate form, not as hard as the scirrhus nor as soft as the medullary. From this it will be seen that the only differences are based upon the relative amounts of connective tissue and tumor tissue present.

Macroscopically, the **medullary carcinoma** usually appears as a large, soft, more or less localized nodule of a pale or yellowish red hue, which may be hyperemic and may show areas of hemorrhage. It is usually quite rapid in growth and, when it approaches the skin, tends to ulcerate, forming large, soft, flabby granulations. Its borders, while not encapsulated, ordinarily can be readily distinguished from the surrounding healthy tissue. On section, the growth offers but little resistance to the passage of the knife, the cut surface of the tumor bulging above the surface of the normal tissue. On expression or scraping with the knife, the so-called cancer juice may be obtained, consisting of the degenerated centers of the carcinomatous cell nests.

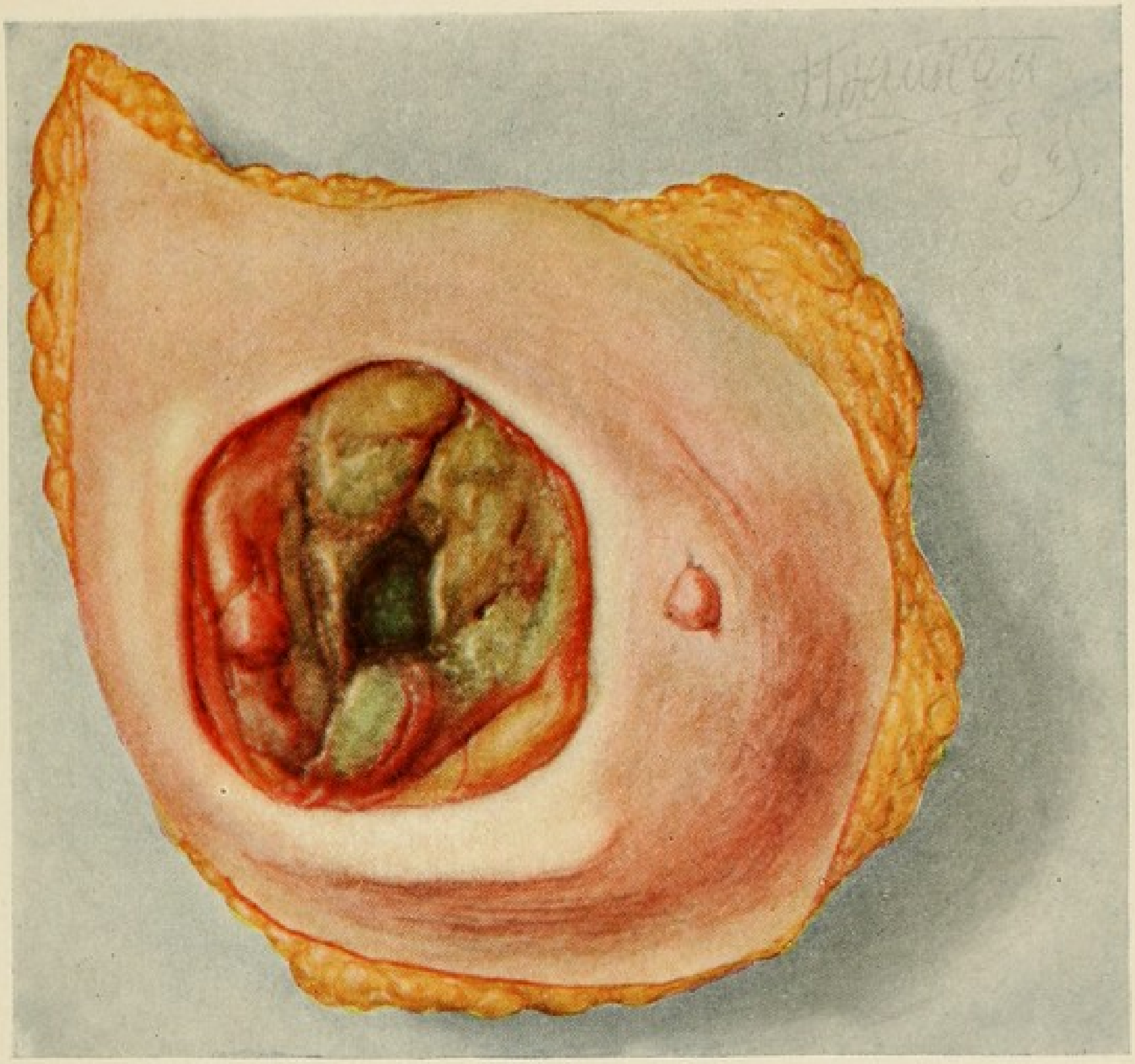
Microscopically, the growth can be seen to be composed of large, irregular masses of carcinomatous cells surrounded by delicate trabeculæ of connective tissue. In this form of carcinoma the cell masses are more or less polygonal in shape, while the cells themselves are also irregular, owing to mutual compression. The striking characteristic of the growth is the great preponderance of the epithelium over the connective tissue stroma.

Owing to the large size of the cancer nests and the small amount of stroma and consequently poor blood supply, the centers of the carcinomatous masses are prone to degeneration, so that they frequently show necrotic cells in addition to infiltrated leucocytes. The stroma of the tumor, especially at the edge of the mass, shows a definite round-cell infiltration.

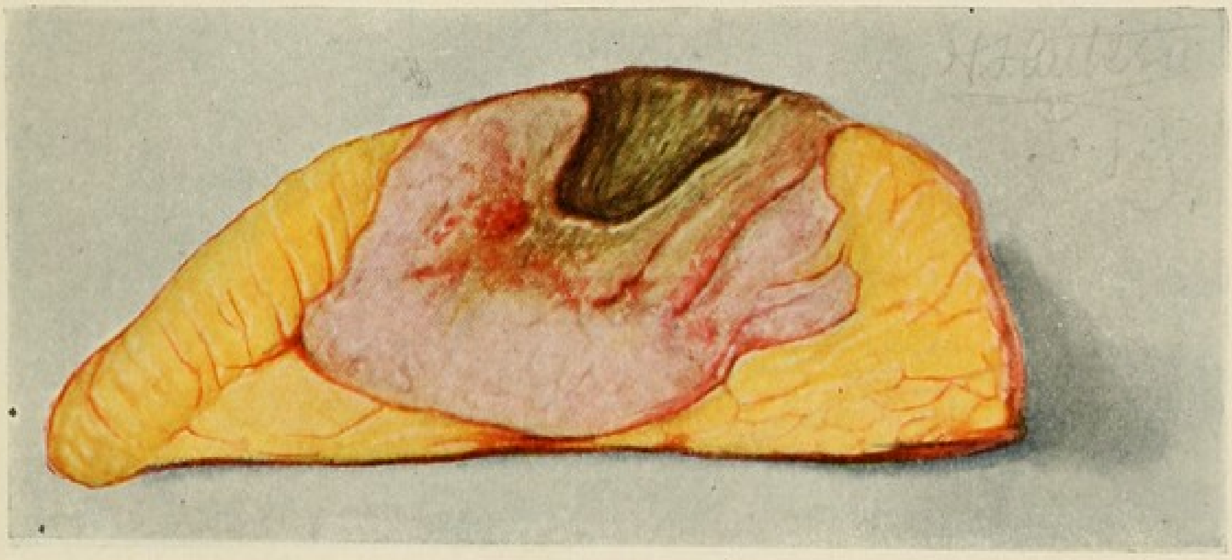
Carcinoma simplex, occupying as it does an intermediate position between medullary and the scirrhus carcinoma, may

PLATE XXIX

A

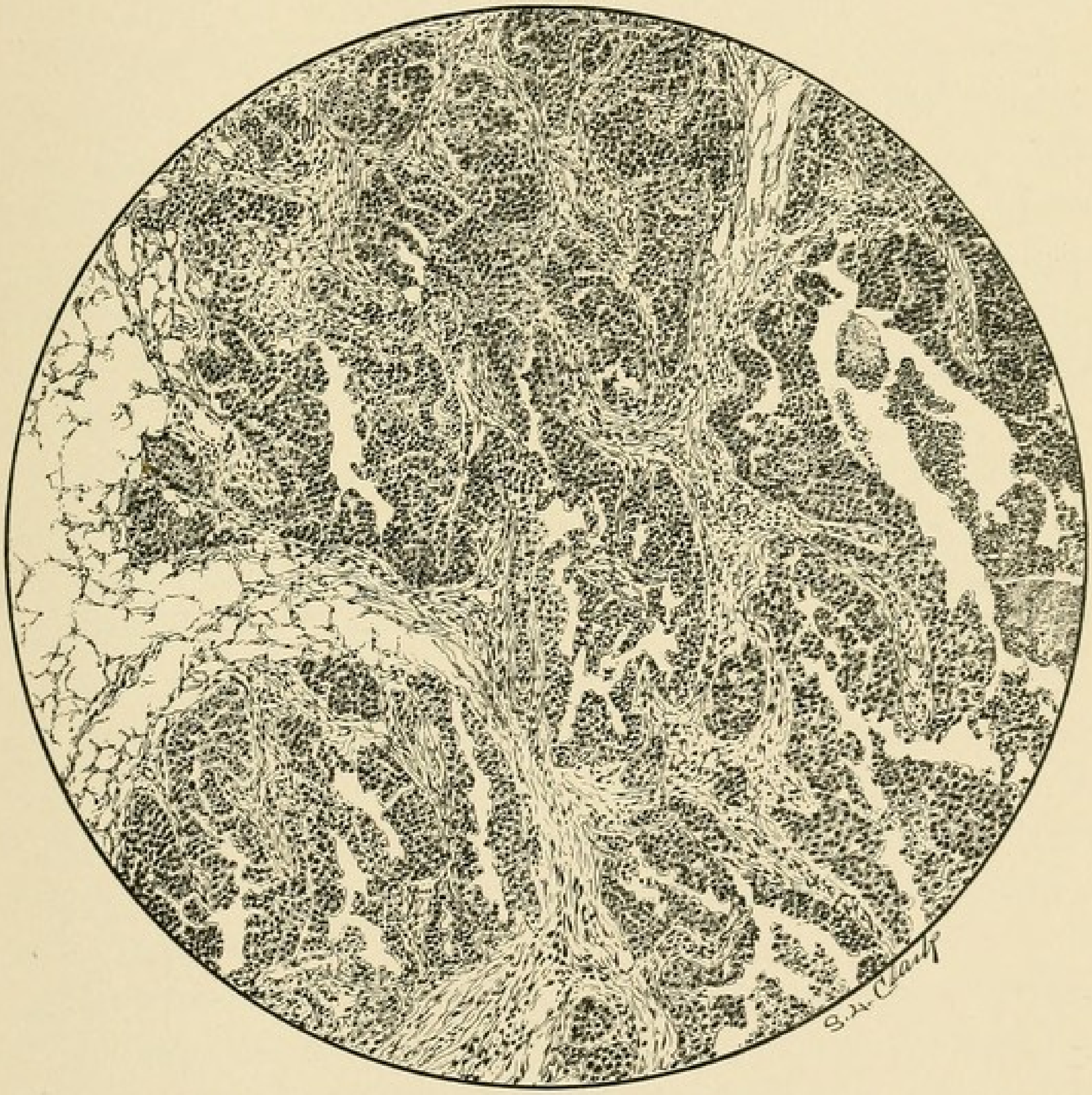


B



Medullary Carcinomata. A. Ulcerating Tumor. B. Section through breast and tumor.—(*Maurice H. Richardson.*)

PLATE XXX.



Medullary carcinoma. Microscopic appearance.

resemble either, according to which form predominates in the microscopical picture. It is, however, never as soft as the medullary nor quite as hard as the scirrhus. It usually exhibits more of an infiltrating appearance than does the medullary, resembling the scirrhus in that particular.

Microscopically it is characterized by the more equal distribution of the carcinomatous and connective tissue. The connective tissue trabeculæ are thicker and the cell nests smaller. The form of the nests may vary, some being polygonal in shape, as in the medullary, and others forming wide, elongated clefts or tubes, the so-called tubular carcinoma of Billroth. The one tumor may show three different stages of growth, namely, medullary, scirrhus and the intermediate stage described above. It is much more common than is the true medullary growth.

Scirrhus carcinoma is characterized by contraction of the stroma and atrophy of the epithelium. The growth presents as a hard, irregular mass, usually adherent to the skin and not sharply outlined. To my students I have often likened this tumor when cut into to an unripe pear or a turnip, so firm and hard it is and so resistant to the knife. Upon section it creaks, a circumstance due to the abundance of its stroma. As the morbid process progresses, adherence to the pectoral fascia occurs, as the result of which the growth becomes firmly fixed to the thoracic wall.

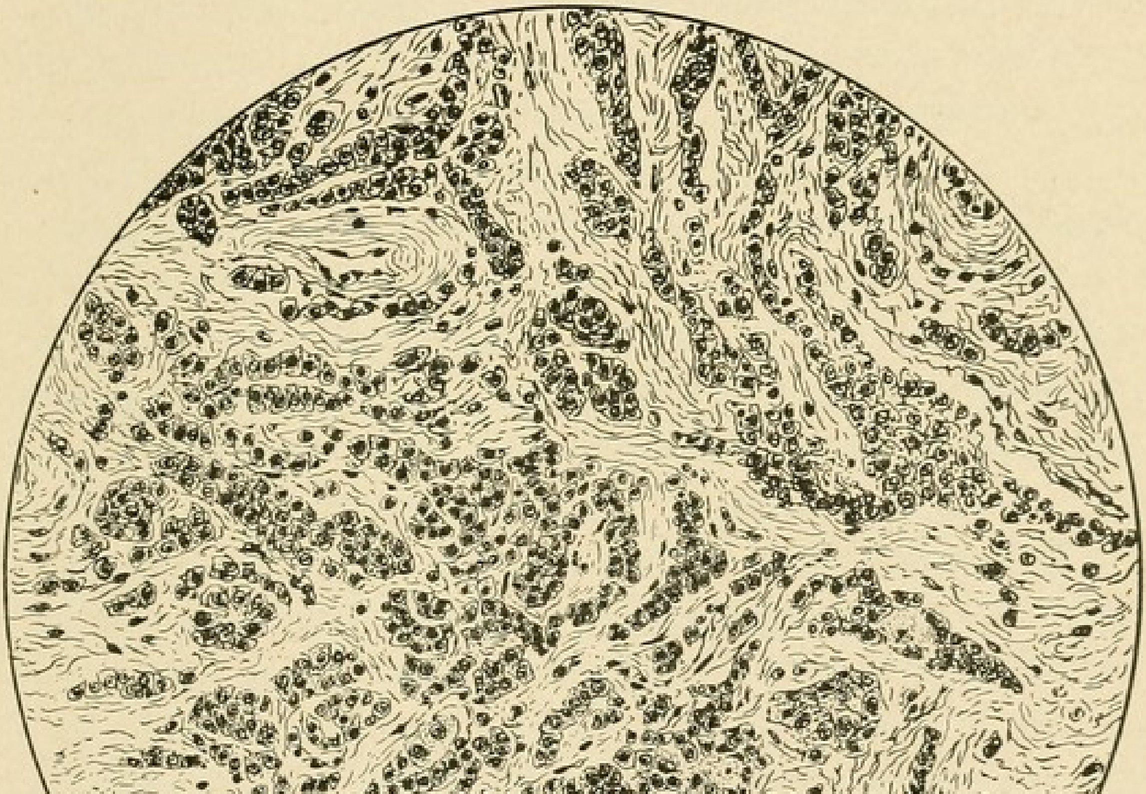
In scirrhus there is sometimes an associated dense infiltration of the skin around the primary growth which may become so extensive as to involve the entire thoracic wall. Microscopic examination of the thickened, indurated integuments may fail to reveal cancer cells, although as time passes the malignant nature of the process is manifested by the formation of nodules in the skin, and in some cases by ulceration. This condition, to which the term cancer *en cuirasse* is applied, has long been thought to be due to invasion of the superficial lymphatic channels by cancer cells. Recently, however, W. S. Handley, of London, has compared it, in its early stages at least, with the brawny thickening of the integuments of the arm which often occurs in mammary carcinoma, and asserted that it is identical with the pachydermia which occurs in elephantiasis. He believes the condition to be dependent upon obstruction to the return of lymph from the skin, which obstruction in turn is due to cancerous permeation of the deep **fascial lymphatic plexus** or to actual destruction of the vessels by perilymphatic fibrosis. This theory, which is based upon careful microscopic examination of tissues taken from the infiltrated thoracic wall, is worthy of consideration, particularly since it has been long known that cancerous epithelium may not be found even after the most careful examination of serial sections taken from tissues removed early in the course of the infiltrative process. It is interesting to note that in examining sections of cancer Handley has never observed involvement of the deep cutaneous plexus. He states, however, that the dermis close to subcutaneous cancer nodules is often slightly or not at all infiltrated by the growth.

In other cases of scirrhus the tumor undergoes complete or almost complete fibrosis. Here the epithelium is no doubt destroyed by the constantly increasing stroma. In some cases of this kind shrinkage may take place in a well-developed tumor, so that only a tough, dense mass corresponding to what was originally the center of the growth may remain. In other cases in which the formation of fibrous tissue has been more rapid from the beginning than the proliferation of epithelium, a contraction of the glandular elements and of the skin, which is usually fixed to the structures beneath, is the only morbid gross alteration perceptible.

The results of microscopic examination of such a scirrhus carcinoma, to which the name **atrophic** or **withering** has been given, are in strict accord with the macroscopic characteristics.

(Scirrhus Carcinoma.—(*Maurice H. Richardson.*)

PLATE XXXII.



Scirrhus carcinoma. Microscopic appearance.

Compact bundles of fibrous tissue, with here and there a few scattered epithelial cells, or in some sections none whatsoever, are revealed.

Naturally the dissemination of the malignant elements of carcinoma from such a growth will be slower than in the other varieties of scirrhus, just as it is slower in ordinary scirrhus than in the medullary variety. For this reason the course of withering carinoma is very protracted, so that a person affected with it may live for years. Allusion to this circumstance will be made again under the subject of prognosis.

Gelatinous carcinoma (Billroth) or **mucoid carcinoma,** which is frequently incorrectly called colloid carcinoma, is a very rare form of cancer in which the cells have undergone complete mucoid degeneration, so that when seen microscopically little more than the connective tissue stroma can be distinguished surrounding rather large spaces which contain a mucoid material. Here and there small clusters of a few carcinomatous cells can be found undergoing mucoid degeneration. The growth shows very little tendency to infiltrate, and is one of the most benign of all the carcinomata of the breast. It should not be called colloid carcinoma because true colloid material is not formed.

Another very rare form of mammary carcinoma is the **carcinomatous cyst,** a malignant cystic tumor the walls of which are infiltrated with carcinomatous epithelium. Hard carcinomatous masses have also been observed growing from the inner wall of the cyst. Papillary excrescences, however, are never present, a circumstance which distinguishes the neoplasm from papillary cystadenoma which has undergone cancerous degeneration. Very frequently the carcinomatous process extends from the cyst wall to the surrounding tissues, with the result that a considerable degree of induration is produced. Involvement of the anatomically associated lymph glands occurs as in the other forms of mammary carcinoma. A peculiar charactistic of these cysts is that the contents is almost invariably bloody.

Bloodgood, who has studied the subject carefully, believes this to be the rarest form of cancerous disease affecting the breast.

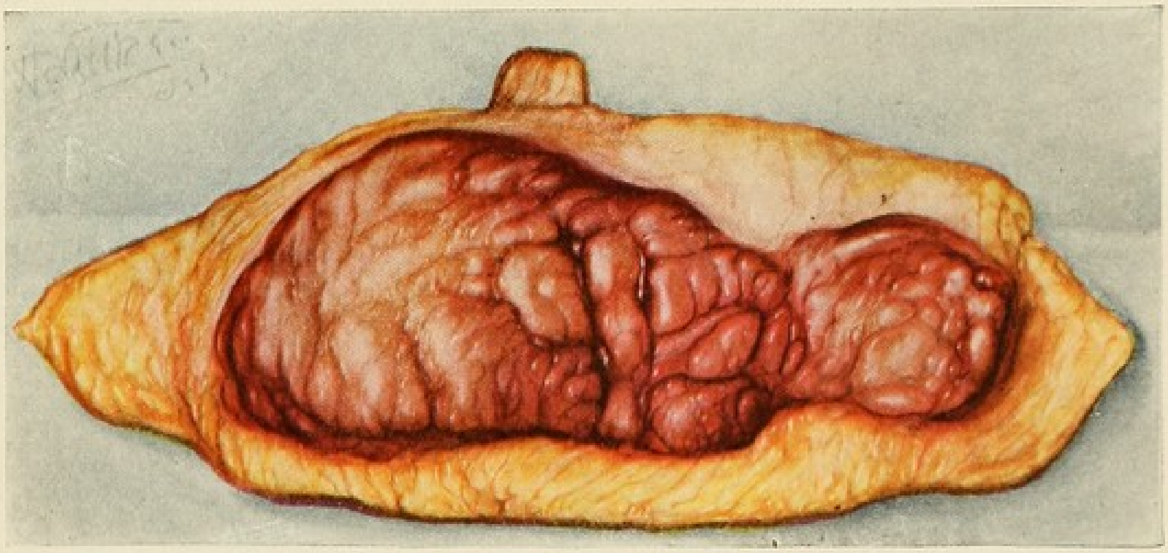
Carcinomatous cysts grow rapidly, but develop signs of malignancy slowly.

It has already been stated that carcinoma may originate in a breast affected with chronic mastitis (see page 40). In such cases the macroscopic appearance of the gland corresponds to that of the primary morbid changes, and it is only upon microscopic examination that the carcinomatous epithelium is found embedded in the dense fibrous stroma. The malignant process sometimes invades the surrounding tissues, in which case it may be seen to follow the lymphatics. I recently amputated a breast which was riddled with small abscesses, and which I took to be tuberculous. Upon microscopic examination, however, Dr. McFarland found no signs of tuberculosis, but "an associated medullary carcinoma, growing without stroma, its cells being mingled with the pus-cells of the abscess."

Dr. McFarland states that this is one of the most interesting tumors he has ever seen (Fig. 28).

The **dissemination of carcinoma** is one of the most interesting subjects in pathology, and one also upon which rational curative treatment must be based. The increased percentage of cures of mammary carcinoma obtained in the last few years is due essentially to our increased knowledge of the normal and pathologic anatomy of the lymphatics which drain the breast, or in other words to the manner in which a primary carcinomatous focus in the mamma may invade contiguous and remote structures of the body.

Three routes of dissemination will be discussed here: namely, (1) **transference of cancerous cells directly through the**



Gelatinous Carcinoma.—(*Maurice H. Richardson.*)

main lymph channels; (2) direct extension of the carcinomatous process by growth of cells along the minute lymphatic vessels; (3) dissemination through the blood current.

Early in the course of mammary carcinoma the anatomically associated lymph glands of the axilla become infected, the

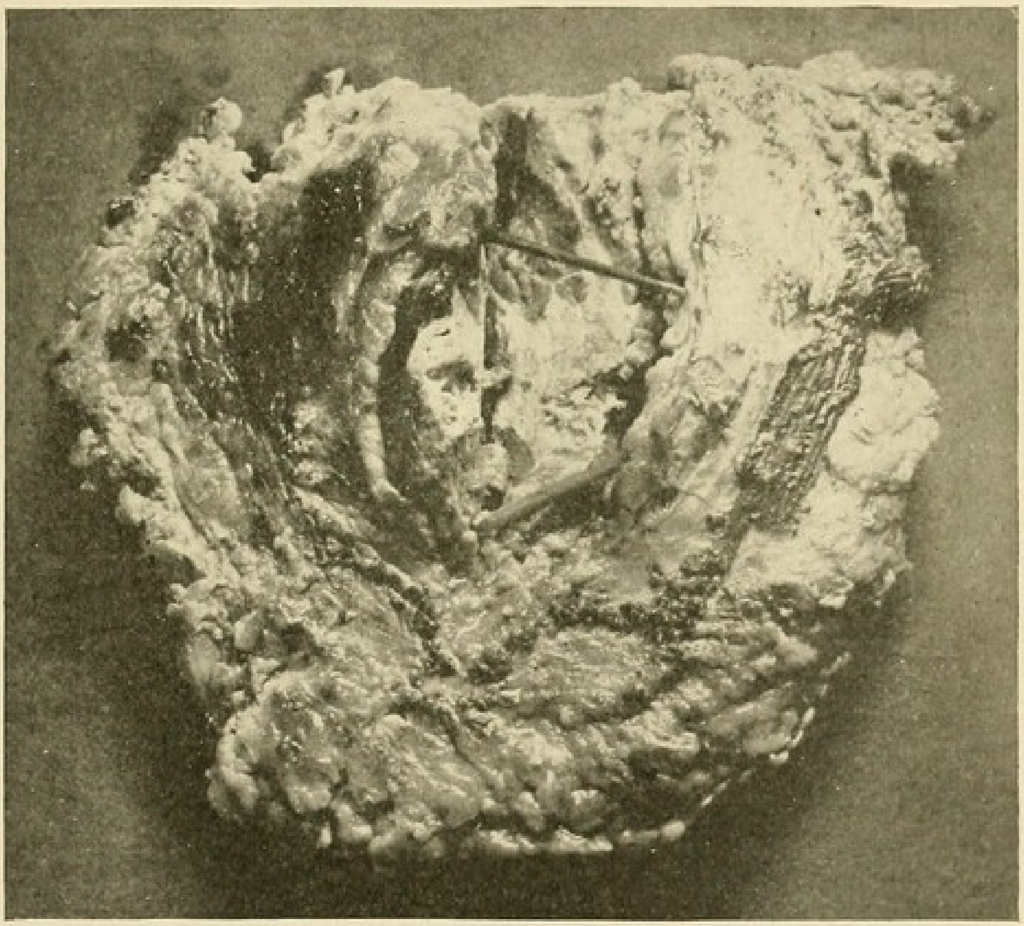


FIG. 28.—Carcinoma associated with multiple small abscesses of the breast, the latter evidently being primary.

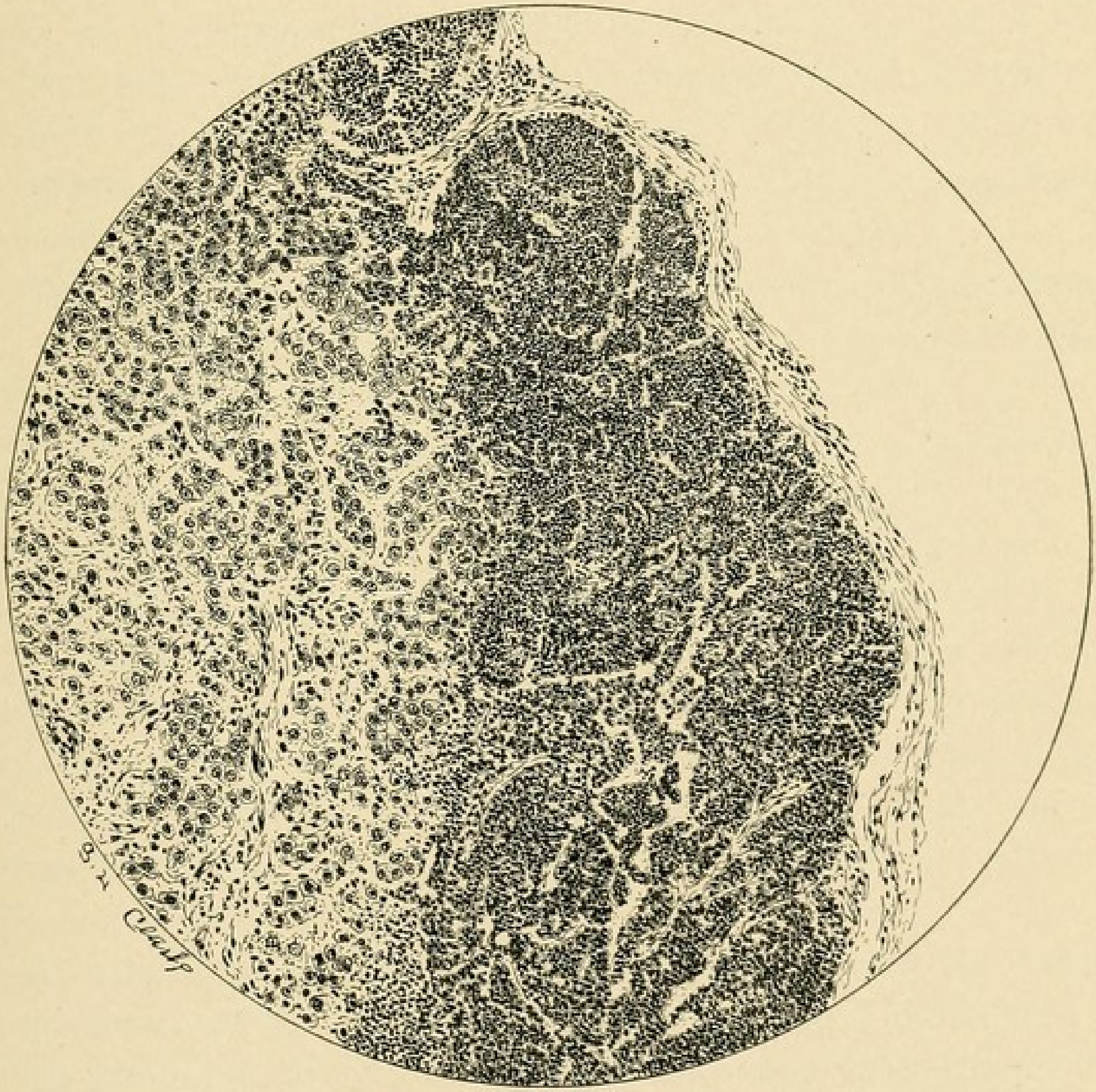
morbid elements being undoubtedly transmitted directly through the main lymphatic channels of the breast. It will be remembered that not only does the main set of superficial lymphatic channels described by Sappey empty into the axillary glands, but that a deep set originating in the mucous membrane of the ducts and acini of the outer half of the gland also reaches the axilla, where it unites with the superficial plexus to form an extensive network which extends upwards around the axillary vein (see page 10).

A gland examined microscopically during the early period of its invasion will show a few epithelial cells in the subcapsular lymph sinus at the point of entry of the afferent lymphatic vessels (Stiles). (See Plate XXXIV.) Gradually the process of proliferation extends until finally the whole gland becomes carcinomatous; if the fibrous capsule is broken through, as not uncommonly happens, the adjacent tissues become infiltrated with cancer cells. Here gland and surrounding tissue form a firm immovable mass. Adherence to the integuments, and later ulceration, often occur. The different chains of glands may become infected one after another, either by direct advance of the morbid process or by transference of cancer cells through the communicating lymphatic vessels, or in both ways.

Involvement of the axillary glands on the opposite side is an occurrence of considerable frequency, and one which is prone to occur in late cases. It has been customary to explain this phenomenon by assuming that infection takes place through the superficial lymphatics which drain the inner half of the mamma, some of which occasionally interlace with those of the opposite side. Handley, however, attributes it to involvement of the trunk lymphatics of the opposite side, due to permeation of the malignant process beyond the middle line, the disease advancing along the minute vessels of the fascial lymphatic plexus. He believes involvement of the opposite breast to take place in the same way. Handley's statistics concerning the occurrence of this phenomenon are very instructive. Out of 422 cases which he studied involvement of the second breast took place in 66, or 15 percent. "It was present in 18 percent of the Middlesex Hospital (late) cases, and in only 5 percent of the Guy's Hospital (early) cases." Thus it is seen to be a late occurrence in the life history of the disease.

The supraclavicular glands may become infected through

PLATE XXXIV.



Lymph node in which carcinoma has replaced normal tissue except at the periphery.

the efferent lymphatic channels from the axillary glands or by way of the set of cutaneous vessels recently described by Poirier and Cuneo, which drains the upper half of the breast and passes directly over the clavicle to empty into the glands above that bone.

The mediastinal glands may become implicated through that set of deep lymphatics which drains the inner half of the breast, and after perforating the second and fourth intercostal spaces empty directly into these glands. This set, moreover, is joined by some superficial vessels which likewise pour their contents into the mediastinal glands.

The same changes which have been described as occurring in the axillary glands take place in these. They may become so much enlarged as to press the sternum forward.

The deep set of vessels just mentioned communicate with the lymphatics of the liver; hence invasion of this organ may be explained by reason of lymphatic dissemination. This matter will be referred to again in discussing visceral dissemination.

Involvement of the spinal cord may also be explained by lymphatic invasion, the cancerous elements being transmitted by that set of lymphatics draining the middle of the base of the mammary gland and the retromammary tissues. A portion of these vessels perforate the intercostal spaces and accompany the blood-vessels to the spine.

Mention has already been made of adherence of the carcinomatous mamma to the pectoral fascia. (See Plate XXXV.) That lymphatic involvement of the fascia may occur before the breast becomes adherent to it is a well-known fact, but one I believe to which too little attention has been paid. Heidenhain, however, called attention to it as long ago as 1889. In twelve out of eighteen cases he found cancerous lymphatics passing from the mamma to this fascia.

The lymphatics of the pectoral fascia are merely a part of the deep fascial lymphatic plexus already described (see page 11).

In addition to the various results of lymphatic infection already mentioned, it is easy to understand why involvement of the inguinal glands as well as the axillary and supraclavicular occurs, if it be borne in mind that the main trunks of this plexus emptying into these glands may become contaminated by way of the minute vessels which connect them as a network with the larger channels nearer the region of the breast.

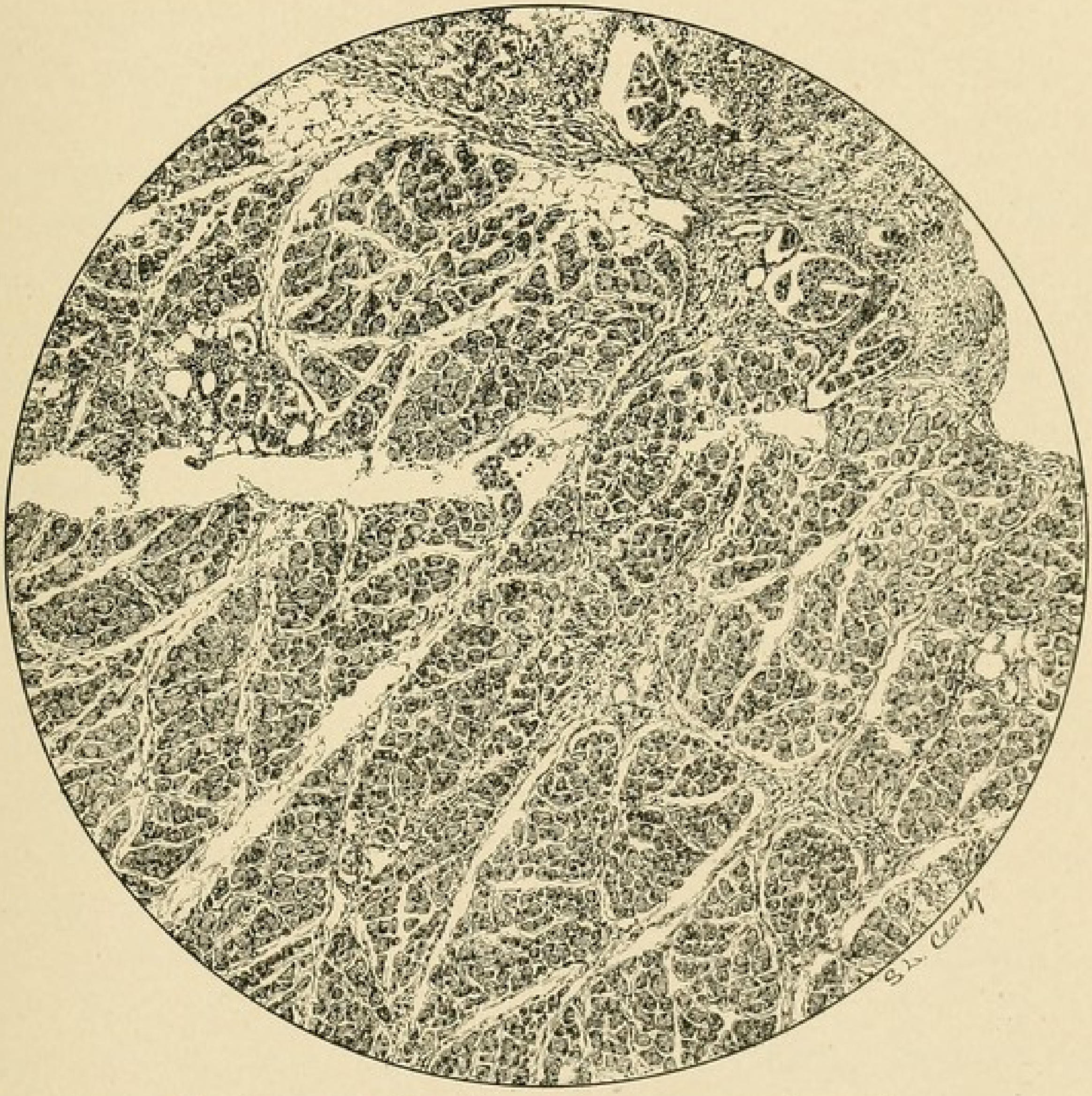
The fascial lymphatic plexus is the anatomical basis upon which Handley's theory of permeation, or extension of the carcinomatous process by direct growth through the minute lymphatic vessels, is founded.

Before entering upon a discussion of this theory, however, I shall say something concerning a method of dissemination known as retrograde lymphatic embolism. It has been asserted that obstruction of a set of lymph glands would result in the production of a reflux current in the vessels emptying into them, so that the cancerous elements would be transferred in the opposite direction and carried to the glands of the unaffected axilla, the other breast, the inguinal region, etc. Such a supposition I believe to be untenable for the reason that the lymph stream is at its best weak, even in the larger trunks, and particularly so in the minute plexus into which the branches of the trunks divide. Furthermore the circumstance that the larger trunks contain valves render the occurrence of regurgitation even more improbable.

Mr. Handley, of London, who has recently published a complete report of his studies on carcinoma,* believes that cancer spreads in the parieties by direct growth through the vessels of the fascial lymphatic plexus, and that the cancer cells are not transmitted as emboli through the larger lymphatic trunks until late in the course of the disease. To this process he has applied the term **permeation.** His researches

* Cancer of the Breast and its Operative Treatment, John Murray, London, 1906.

PLATE XXXV.



Carcinomatous invasion of the great pectoral muscle.

show that secondary deposits first appear in the region of the primary focus, but that as the disease progresses they occur further and further away from the site of the original neoplasm. In late cases he often found that though no permeated lymphatics could be detected in the near vicinity of the original tumor, examination of long radial sections of the skin and subjacent tissues revealed the presence of the disease, which had invaded the minute vessels of the fascial lymphatic plexus. Thus the boundary of the malignant process, that is, the microscopic growing edge of the carcinoma, is found far beyond the limit of macroscopically perceptible disease. "The absence of permeated lymphatics in the area intervening between the annular microscopic growing edge and the primary neoplasm is due to the destruction, after a time, of the cancerous permeated lymphatics by the defensive process of perilymphatic fibrosis." It was found, however, that isolated nodules in the skin and muscles may be present in the area in which lymphatic involvement has disappeared. These lesions are attributed to failure on the part of the tissues to produce, at isolated points, a protective zone of fibrosis around the lymphatic vessels. Thus, although the permeated lymphatics along which the morbid process extended become obliterated, the isolated carcinomatous lesions nevertheless arise in continuity with the primary neoplasm.

Mr. Handley also believes that visceral dissemination takes place as the result of permeation along the fine anastomoses which connect the fascial lymphatic plexus with the subendothelial lymphatic plexuses of the pleura and peritoneum and with the mediastinal and portal glands. The cancer cells, he thinks, then escape into the pleural and peritoneal cavities and become implanted upon the viscera, in this manner giving rise to the metastases which have usually been thought to be due to dissemination through the lymph and blood currents.

This theory of Mr. Handley's, particularly in so far as it relates to invasion of the parieties, seems to be founded upon accurate observation. That extension of the malignant process along the lines of the minute lymphatic vessels is an actual occurrence, he seems to have demonstrated by careful microscopic study of the diseased tissues. Moreover, it is plausible that when permeation has extended to the epigastric triangle, where only a layer of fibrous tissue separates the cancerous lymphatics of the deep fascia from the subserous fat beneath, still further progress of the cancerous disease may take place through the minute lymphatics of the separating layer of fascia.

I am not, however, prepared to accept this theory of visceral dissemination nor to adopt it in explanation of the involvement of the axillary and mediastinal glands and the opposite breast, for I believe that our knowledge of the anatomy of the larger lymphatic channels enables us to explain not only the invasion of the latter structures but infection of the liver and the portal glands as well. Allusion has already been made to the fact that a set of deep lymphatics which drain the inner half of the breast communicate with the lymphatics of the liver. This anatomical relation seems to me to afford an adequate explanation of the presence of cancerous nodules in the latter organ, particularly in cases in which extensive parietal invasion has not occurred and in which the pleura is found to be free from secondary deposits. The fact that the liver, as is generally conceded, is the viscus most frequently affected by metastases, lends weight, I think, to my belief that lymph-embolism may be held responsible for its participation in the malignant process originally beginning in the breast.

In this place it is apposite to remark that the old theory of abdominal invasion being secondary to thoracic involvement is certainly erroneous. I have seen cases in which careful postmortem examination showed no thoracic lesions whatever and yet marked abdominal disease was present. Handley also calls attention to this fact, and his statistics concerning the matter are most valuable. Thus, out of 422 cases, there were 70 which showed abdominal metastases, but no thoracic ones. In many cases intrathoracic growth is also present, particularly enlarged glands in the mediastinum. That detachment of cancer cells from the secondary deposits in the liver may take place and result either in infection of other viscera by the blood stream or by direct implantation upon neighboring structures, is, I believe, in the light of our present knowledge, not to be doubted. Possibly direct growth from the surface of the liver to the peritoneum may lead to further involvement of the abdominal organs.

Dissemination by the blood stream was long considered to be the primary factor in the dissemination of mammary carcinoma. Years ago when it was thought that there was a specific carcinomatous virus it was customary to attribute the formation of secondary deposits to the transmission of this poison to the affected organs by the blood stream. Such a theory, however, finds no support at present. It is maintained instead that cancer cells detached either from the primary or secondary neoplasms enter the veins and become deposited in remote parts of the body. It has been supposed that the morbid growth invades the veins directly, first becoming attached to the sheath and then gradually invading its different coats until finally it perforates the intima and grows into the lumen of the vessel as a fungous mass from which particles are detached and swept away by the blood stream, to be deposited in other organs where they serve as foci of development for secondary neoplasms. As the small veins in the vicinity of the primary growth are often found involved in the morbid process, and as apparently trustworthy observations have shown the presence of these embolic cancerous masses in the blood-vessels between the primary growth and secondary deposits, it is not surprising that credence was given to the theory of dissemination by direct invasion of the vascular system from the original focus of disease. So, too, its invasion indirectly through the lymphatic system by way of the thoracic duct has been held responsible for the production of cancerous deposits in regions remote from the breast. The thoracic duct itself has been found blocked with cancerous masses, and of course in such a condition it is safe to assume that particles of the same substance would be transmitted to the innominate vein and thence swept onward by the venous current.

That this method of dissemination may and does occur I do not doubt, but I am not inclined to attribute so much importance to it as has been given it by some writers. That it may be the means of producing remote metastases late in the course of the disease I am willing to admit for want of a better explanation of their occurrence, but there are certain weak points about the theory which must cast doubt upon its validity. Thus, nearly twenty years ago, Mr. Stephen Paget pointed out that embolism is a process which should affect all organs alike and not show an affinity for certain ones to the practical exclusion of certain others. He called attention to the fact that out of 735 cases of mammary cancer there were metastases in the liver in 241, whereas in only 17 were there metastases in the spleen. In 340 cases of pyemia, however, abscess of the liver occurred 66 times and abscess of the spleen 39 times. Again, one would naturally suppose that cancerous emboli passing from the great veins in the neck to the right side of the heart and thence to the lungs would produce secondary growths in the lungs more frequently than in more remote organs. It is known, however, that such is not the case. Thus, in Mr. Paget's statistics, they were affected in only 70 out of 735 cases. Moreover, it is well-known that carcinoma originating in certain organs shows a special predilection to invade other organs with secondary metastases. The frequency with which the bones are affected in carcinoma of the breast and the prostate gland is a matter of common knowledge, as is also their almost complete immunity in carcinoma of the stomach.

It is apparent, therefore, that a theory of mere mechanical distribution is not sufficient to completely account for the formation of the various metastases. Mr. Paget was inclined to attribute a special predisposition of certain tissues and organs to the malign influence of the cancerous elements. Roger Williams also considers that some organs are better able to destroy the cancer emboli than others. Such explanations, however, are merely putative, and to my mind afford no help in enabling a better understanding of the manner in which distant metastases occur.

That cancer cells are readily destroyed by the blood has been recently demonstrated by M. B. Schmidt (Die Verbreitungswege der Carcinom). He has shown that the tendency of these foreign bodies is to excite thrombosis, with the result that the original nucleus, that is, the cancer embolus, is destroyed by contraction of the thrombus. In view of this liability of the cancerous emboli to be destroyed, I am of the opinion, as already stated, that the importance and frequency of blood-dissemination has been overestimated. That in some cases the emboli survive, grow in the tissues in which they are deposited and thus produce secondary neoplasms, I am willing to admit, for I believe that such an occurrence is not only possible but probable. In comparison with lymphatic dissemination, however, I believe it to be very uncommon. In conclusion I would state that I am not prepared to accept as entirely satisfactory any of the theories of dissemination thus far advanced, for the reason that there are cases in which remote metastases occur which cannot be adequately explained by any of them. In other words I believe it yet remains to be shown how certain secondary growths originate.

In regard to the frequency with which various organs are affected with secondary deposits, available statistics are not of much value because they are based upon too small series of cases. To be of any value in showing the comparative frequency with which those organs rarely involved, such as the thyroid gland and pancreas for instance, become affected, deductions should be drawn from thousands of cases, and not from a few hundred. Moreover, the subject of these rare metastases is of no practical importance.

Among the organs most frequently affected are the liver, the pleura, the lungs, the bones, and the brain. Reference has already been made to involvement of the liver through the lymphatics, it being the viscus most commonly attacked by secondary deposits.

The **pleura** may be infected by direct growth from the primary neoplasm in the breast, from the mediastinum, from the supraclavicular glands by extension of the growth directly downwards through Sibson's fascia, and no doubt in cases in which the lungs are involved still further dissemination to the pleura may take place from these latter organs. That the last-named method of dissemination is rare, however, must be admitted, the pleura usually being invaded before the lungs are attacked. Handley found secondary nodules on the pleura in 38 percent of 422 cases.

Statistics relative to the frequency of **pulmonary metastases** vary greatly. Thus, for example, out of 423 autopsies collected from various sources Gross found the lungs affected in 49.9 percent, whereas Handley in 422 cases found them involved in only 25 percent. These figures certainly show the futility of placing reliance upon statistics based upon a small number of cases.

I am inclined to attribute considerable importance to blood-embolism in the production of metastases in the lungs on account of the fineness of the pulmonary capillaries.

The frequency with which mammary carcinoma produces metastases in the **bones** is well-known. The sternum and ribs may be invaded by direct extension of the malignant process from the primary neoplasm. Attention should also be called to the possibility of the humerus being invaded by direct extension of the morbid process from the axilla.

The weight of opinion seems to favor blood-embolism as being the cause of metastases in the other bones. Although statistics show that certain bones, such as the femur and the humerus, are particularly liable to be attacked, I am not inclined to place much faith in this supposed predilection for the reason that autopsies are not complete as far as examination of the osseous system is concerned. In life a cancerous bone may not produce any symptoms either subjective or objective to lead the patient or her medical attendant to suspect its existence, and, therefore, when postmortem examination is made a careful search for cancerous deposits in the bones is almost always omitted from the routine examination. As spontaneous fractures of the femur and humerus often occur, and thus attract attention to the fact that lesions may be present in the osseous system, it is natural that these bones should have often been considered the ones most subject to metastases. Certainly fracture of the cranial and pelvic bones and of the scapula could not be expected to take place even though they were much affected by cancerous deposits.

A comparison of certain series of cases is very interesting in this respect. Thus in 336 necropsies conducted by Török and Wittelshöfer the cranial bones were examined in nearly every case, with the result that they were found diseased in 33 cases, or 9 percent of the total number. In the combined cases of Munn and Williams, in which the cranial bones were examined only when evidence of disease had been present during life, they were found affected in only 1.8 percent of the cases. Statistics recently compiled by Mr. Handley from the Middlesex Hospital cases—329 in number—seem to show that the bones nearest the primary neoplasm are most frequently invaded. The clavicle, however, showed an exception to this rule. Moreover, I am inclined to believe that if the sternum and ribs were excepted, and complete examination of the other bones made in a large number of cases, this rule might be still further invalidated. As already stated, the trouble with statistics relating to such subjects as the one now under discussion is that they are based upon a comparatively meager series of cases. I cannot but believe that if routine examination of the radius, ulna, tibia and fibula were made in a considerable number of cases many new instances in which deposits were found in them would be added to the isolated ones now on record. Herbert Snow, who examined the osseous system in 12 unselected cases of mammary cancer, found fibrotic induration in the marrow of various bones; and, on microscopic examination, the typical characteristics of scirrhus cancer were revealed. All these 9 cases were insidious; no tumor of bone or fracture had been witnessed during life (British Medical Journal, March 12, 1892).

In regard to the site of the deposits in the femur and humerus it is interesting to note that the upper portion of the bone is invariably attacked. Handley states that the base of the great trochanter is the point where the morbid process begins in the femur, but that owing to the thickness of the bone there fracture takes place below. With increase of the deposit pressure atrophy occurs, and it is this condition, no doubt, which leads to fracture. A free formation of callus around the fracture sometimes results in union of the broken ends of the bone.

The **vertebræ** are also affected with comparative frequency, deposits being found in them in 9 out of the 336 cases examined postmortem by Török and Wittelshöfer.

The **brain** and its membranes are also probably more commonly involved by secondary deposits than they have been supposed to be. No doubt further careful examinations will prove this statement to be true, just as I believe they will show the bones to be more frequently attacked than present statistics show them to be.

The **pelvic organs,** according to available statistics, show disease in about 5 percent of all cases. Gross found the **uterus** invaded in 5.2 percent of the cases which he studied. In the cases studied by Handley metastases were present in the **ovary** in 4.8 percent of the Middlesex Hospital cases, and in 8.6 percent of the Guy's Hospital cases, that is in 5.6 percent of the total number. In Guy's Hospital, where the higher percentage was found, the average age of the women admitted for cancer of the breast is considerably less than that of the Middlesex Hospital, where there is a ward for incurable cancer patients. Handley is of the opinion that the greater frequency of ovarian metastases in the former class shows that the ovary is more likely to become affected before the menopause than after it, that is, at a time before retrograde structural changes take place. This theory is certainly very plausible.

Symptoms.—The evolution of mammary cancer is very insidious, so that as a rule its onset is not marked by subjective symptoms. So slow may be the growth of the primary neoplasm that the patient's attention may not be attracted to it until it has become of considerable size, when it is discovered accidentally.

In my experience the majority of women affected with this disease have sought advice merely for the reason that they have found a mass present in the breast, and not because the mass has given rise to any subjective disturbances. This absence of suffering in the earlier stages of the disease is a circumstance which cannot be too strongly impressed upon the general practitioner, who, though he sees comparatively few cases, usually sees them earlier than it is the good fortune of the surgeon to encounter them. It is equally important for the physician to impress upon female patients in general the folly of disregarding the presence of a tumor in the breast, and particularly of concealing it from relatives, friends, and the family physician.

•It is a well-known fact that women who will not delay in seeking advice as soon as they suspect the presence of an abdominal tumor, and who willingly submit to a local and even vaginal examination, will carry a tumor in the breast until it has advanced far beyond the stage of operability. Why this is so surpasses the bounds of human understanding. In some cases it may be due, for a considerable length of time at least, to the absence of pain and soreness so characteristic of the earlier stages of the disease, and as a result of which it may be considered of a trivial nature. At all events the importance of having patients consult a surgeon as soon as a neoplasm is discovered cannot be too strongly emphasized.

Another explanation of this strange conduct on the part of women may lie in the circumstance that tumors of the breast are considered by the laity as synonymous with cancer and that cancer is believed to be the equivalent of death; and that it is sometimes due to a desire of a noble, self-sacrificing woman to suffer mutely rather than cause anguish to husband, children, or family.

In still another class of women the fear of mutilation and disfigurement may be the motive which restrains them from revealing their infirmity.

In fact, this disposition to conceal mammary tumors is so common in all circles of life that I have come to look upon it as a symptom of the disease.

I once treated an elderly woman for a fracture of the left humerus; union was surprisingly slow in taking place, and after sufficient callus had been thrown out to make reasonably good union, refracture, without traumatism, suddenly occurred.

The patient having a cachectic appearance, my suspicions were aroused, and when I asked her if she had uterine or other disease she reluctantly showed me an advanced scirrhus carcinoma of the mamma, which she had concealed from me by refusing to expose the breast when the fracture-dressings were applied.

Other women have come to me with a tumor of the breast which they have carried for years, saying that no one knew of it and requesting that I deny its existence to their nearest relatives. Such a case occurred in a maiden lady of about fifty-five years of age, the daughter of a prominent surgeon, the sister of a physician, both of whom she declined to consult. She came to my office with a married sister, but would not permit her to come into the consultation room during the examination. She presented a large tumor in the right breast which was evidently sarcomatous, although it was undoubtedly originally benign. An immediate operation was advised, and although the advice was accepted she did not allow her family to know her condition until she entered the infirmary. No local recurrence took place but internal metastasis eventually caused death. Metastasis to the right femur was plainly visible in six months. A large tumor also developed in Scarpa's triangle.

A third case I saw in consultation with a former colleague in Louisville, Kentucky. A most intelligent maiden lady, about fifty years of age, a well-known teacher in the female high school, and the daughter of a former distinguished professor of surgery, consulted a surgeon for a tumor of the breast which she had concealed from her sister, with whom she lived, and to whom she was greatly attached. An engagement to marry caused her to seek surgical advice, and at the time of doing so the growth was found so far advanced as to be well-nigh inoperable.

I could mention other cases where the concealment has been practised, but these are sufficient to serve as illustrations. Similar cases have been reported by other writers, notably by Mr. Sheild, of London.

Cancer of the breast begins as a small nodule, usually, though not always situated in the upper outer quadrant of the gland.

It gradually increases in size, is adherent to the gland, and is freely movable with the latter. It cannot, as a rule, be isolated, for the reason that it is intimately connected with the glandular parenchyma. It is hard and firm in consistency, and can be readily palpated, although as just stated no distinct line of demarcation between healthy and diseased tissue permits it to be distinctly isolated. This diffuse nature is distinctive of carcinoma. As the morbid process advances the tumor becomes adherent to the skin in front and to the pectoral fascia behind. The skin loses its smoothness and softness and becomes slightly corrugated. This corrugation is particularly noticeable when the skin is picked up between thumb and finger and slightly compressed. This appearance of the skin has been likened by French writers to that of orange peel, and the comparison is one which is not at all inappropriate.

If the neoplasm is situated near the center of the gland, retraction of the nipple may take place, owing to traction on the fibrous bands which connect it with the deeper portions of the gland. Gross observed this phenomenon in 108 out of 207 cases, or in a little more than 50 percent. Thus it is seen that the sign is far from constant, so that too much dependence must not be placed upon it. It was formerly considered one of the cardinal signs of malignancy, but we now know that such is not the case (see Fig. 29).

Later in the course of the disease firm fixation of the breast to the pectoral fascia occurs, or the substance of the muscle itself becomes invaded. If the arm be abducted so as to put the pectoral muscles on the stretch, it will be found that the breast will not move in the direction of the muscle-fibers; when the arm is adducted again so that the muscles are relaxed, the breast then moves with them. At an earlier stage of adherence partial fixation to the deep fascia may be demonstrated by abducting the arm and then moving the breast up and down and from side to side with one hand while the elbow is held with the other and the patient makes an effort to carry her arm to the side of the body. During these manipulations it can be readily determined whether the mobility of the gland is diminished.

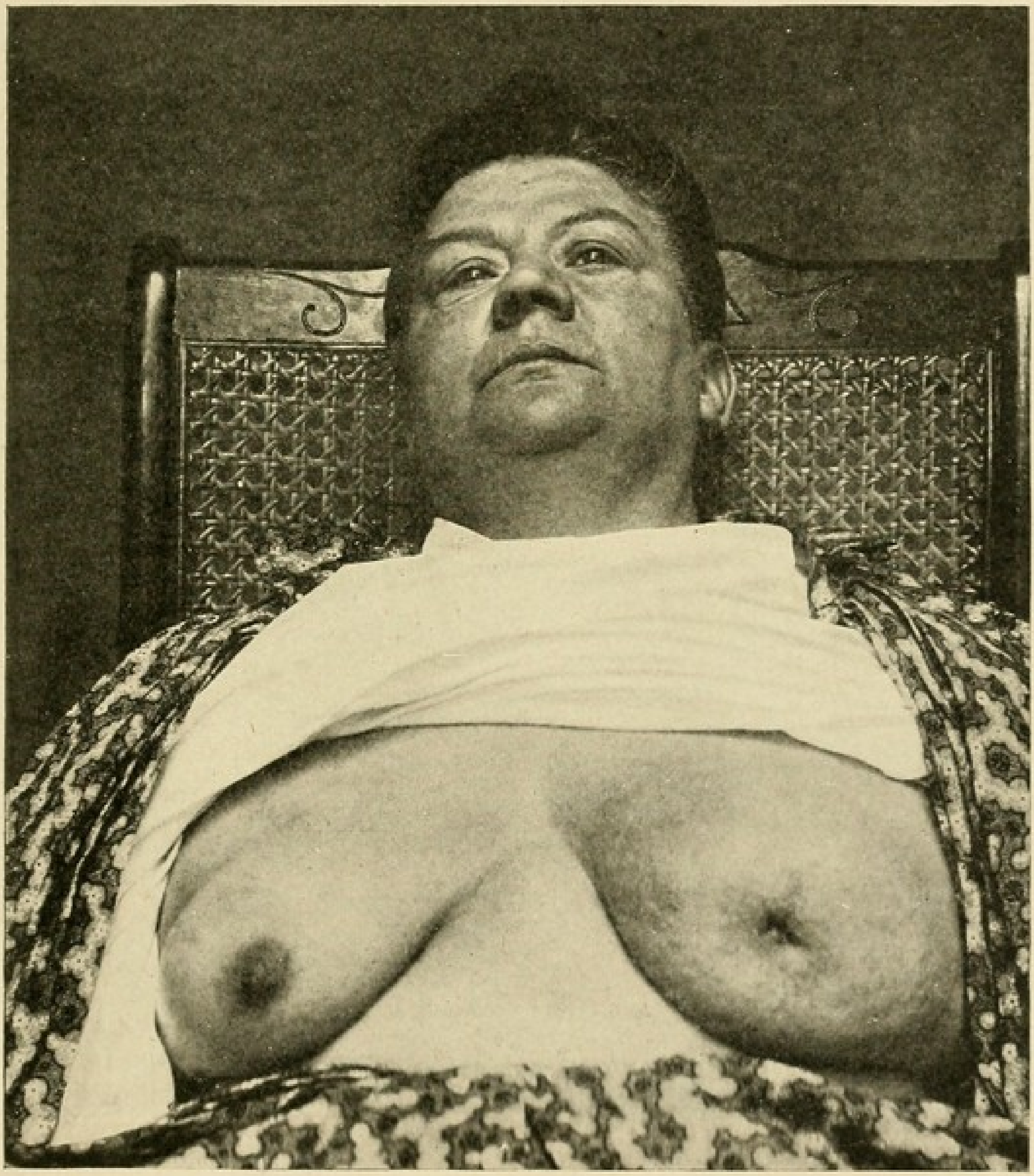


Fig. 29.—Scirrhus carcinoma. Note retraction of the nipple.

Women presenting all these signs may feel perfectly well and look strong and healthy, a circumstance which goes far to prove that mammary cancer *per se* is a strictly local affection.

Adherence of the skin may in time be followed by ulceration, but as a rule the latter occurs late in the course of the disease.

Dissemination of the cancer virus through the lymphatics undoubtedly begins at a comparatively early period in the evo-

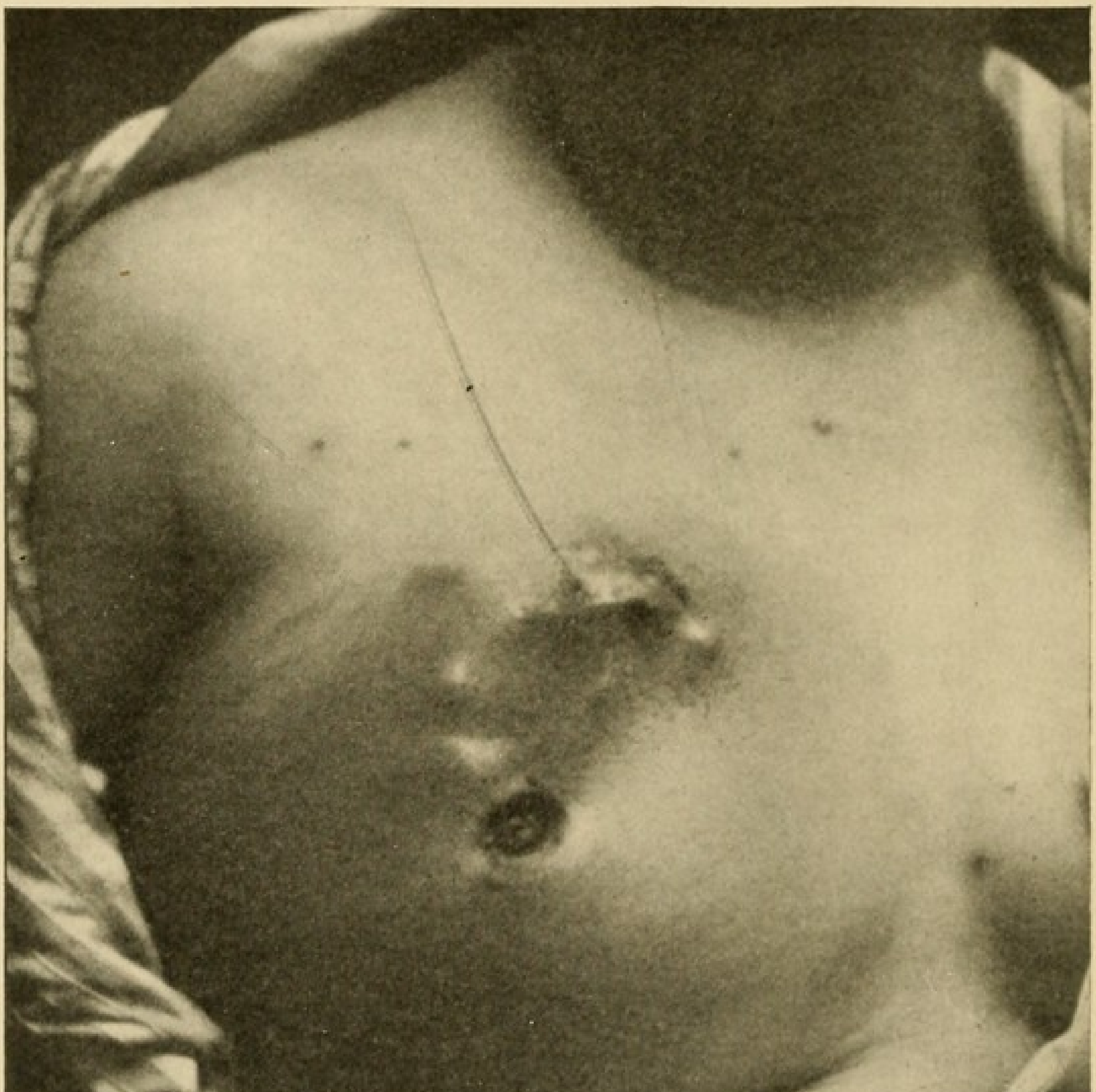


FIG. 30.—Typical scirrhus carcinoma of the upper and inner quadrant of the breast.

lution of the neoplasm, with the result that the lymph glands, which receive lymph from the channels passing through the breast, become diseased. Those in the axilla usually first show signs of involvement, and then those in the subclavian triangle. In a patient whom I recently operated upon two enlarged glands were found between the pectoral muscles. This was the first case in which I had observed enlargement of these glands, although I had read of instances in which they had been found (Rotter, Grossmann).

In regard to the exact time at which glandular involvement occurs, it may be stated that statistics show that palpable enlargement may be demonstrated between the eleventh and eighteenth months. Such statistics are of very little, if any, value for the reason that glands may be diseased and still not be perceptibly enlarged. Much credit is due to Gross, Banks, Gussenbauer, Kermisson, and a number of other surgeons who first called attention to this fact. It is a matter which the general practitioner should not fail to remember. By bearing it in mind he may be led to refer cases to the surgeon which otherwise he might keep under observation for a longer period, to the manifest detriment of the patient.

Bull's statistics show that 65 percent of all patients present signs of palpable enlargement of the axillary glands when first seen by the surgeon, and I believe it would be safe to say that even a higher percentage are thus affected, as at operation, however early it may be performed, there will almost invariably be found metastases to the lymph nodes. In but a single case have I failed to demonstrate it.

The glands which first become palpably enlarged are, as a rule, those along the external margin of the great pectoral muscle. They may be readily felt by insinuating the finger-tips beneath the lower portion of the anterior axillary wall and running them up and down along the borders of the muscle.

As the disease makes greater and greater inroads the local condition becomes much more appalling in appearance. As already stated ulceration frequently follows adherence to the skin. The tumor becomes livid and purple, the veins dilated, the skin perforated, and a fissure forms which becomes larger and larger; its edges become everted and somewhat undermined, although their base is hard and firm. From this surface a purulent, malodorous discharge is given off, and as the ulcerative process encroaches more and more upon the contiguous areas of the breast, hemorrhages may occur, owing to erosion of the vessels. Though usually slight they may occasionally be so severe as to alarm both patient and physician. The ulcerative process may also extend to the axilla. In addition to these ulcerative changes in the breast and axilla subcutaneous cancer nodules may be present in various portions of the thoracic wall, in some cases being confined to the regions adjoining the breast, in others extending over a wide area. They have been known to invade the shoulder, the back, and the abdomen; they not uncommonly undergo ulceration in these remote areas, but as a rule it is those near the primary neoplasm which show this change.

With the supervention of these extensive local disturbances the general health manifests signs of impairment. The patient loses flesh and strength, and enters upon a decline which has an invariably fatal progression. The ulceration becomes more extensive, the secretion more abundant, the hemorrhages more frequent and more profuse. Owing to compression of the axillary vein edema of the upper extremity may supervene, although this symptom is not very frequent. I doubt if I have observed it in more than 5 percent of my late cases. The cachectic appearance and extreme emaciation presented by the unfortunate subjects of advanced cancer is so well-known that it would be futile to portray it in detail. Happily they are not seen as often now-a-days as they were in the past. Before death puts an end to the suffering of these patients signs of generalization of their disease usually plainly manifest themselves. Thus nodules in the liver or uterus may be palpated, spontaneous fractures occur, or signs of pulmonary metastases break out. Pleural effusion may occur, although in my expe-

PLATE XXXVI

Large fungating carcinoma of the breast.

rience it is one of the rarest complications. Allusion has already been made to the occurrence of paraplegia, owing to dissemination of the disease to the spinal column by way of the lymphatics. This is a late symptom also, and one which I have not often seen.

There is considerable difference in the mode of evolution and duration of the various forms of cancer of the breast, and although these differences have been described under pathology it may not be amiss to say something concerning them here, and particularly to call attention to the rare, so-called acute form of cancer.

Thus it is apparent that ulceration will take place earlier in the encephaloid forms than in scirrhus, in which the tendency to contraction is so great. It is in ulcerating carcinomata of this form that fungous masses, such as are shown in Plate XXXVI, develop. Naturally such a tumor will destroy life in a shorter time than will ordinary scirrhus.

The tendency to early ulceration in adenocarcinoma has already been alluded to.

The slow progress which **atrophic scirrhus** makes has already been mentioned under pathology. The most marked characteristic of this form is its invariable tendency to produce contraction of the tissues. It often produces a decided depression of the surface of the breast, so great is the contraction of the tissues beneath. In fact the breast affected is much smaller than its fellow. In a case recently operated upon the cancerous breast was less than half the size of the healthy mamma. The nipple may be so retracted as to be scarcely perceptible. Ulceration occurs only after years, if indeed it happen at all. Despite the slow evolution of the malignant process, it is always progressive. Patients may live for ten, twelve, or fifteen years, however, before they succumb. It may be well to emphasize in this place the fallacy of allowing patients affected with this form of mammary cancer to go on from year to year without operation. The slowness of its growth and its comparative benignity constitute good reasons for successful removal of the affected tissues and the eradication of

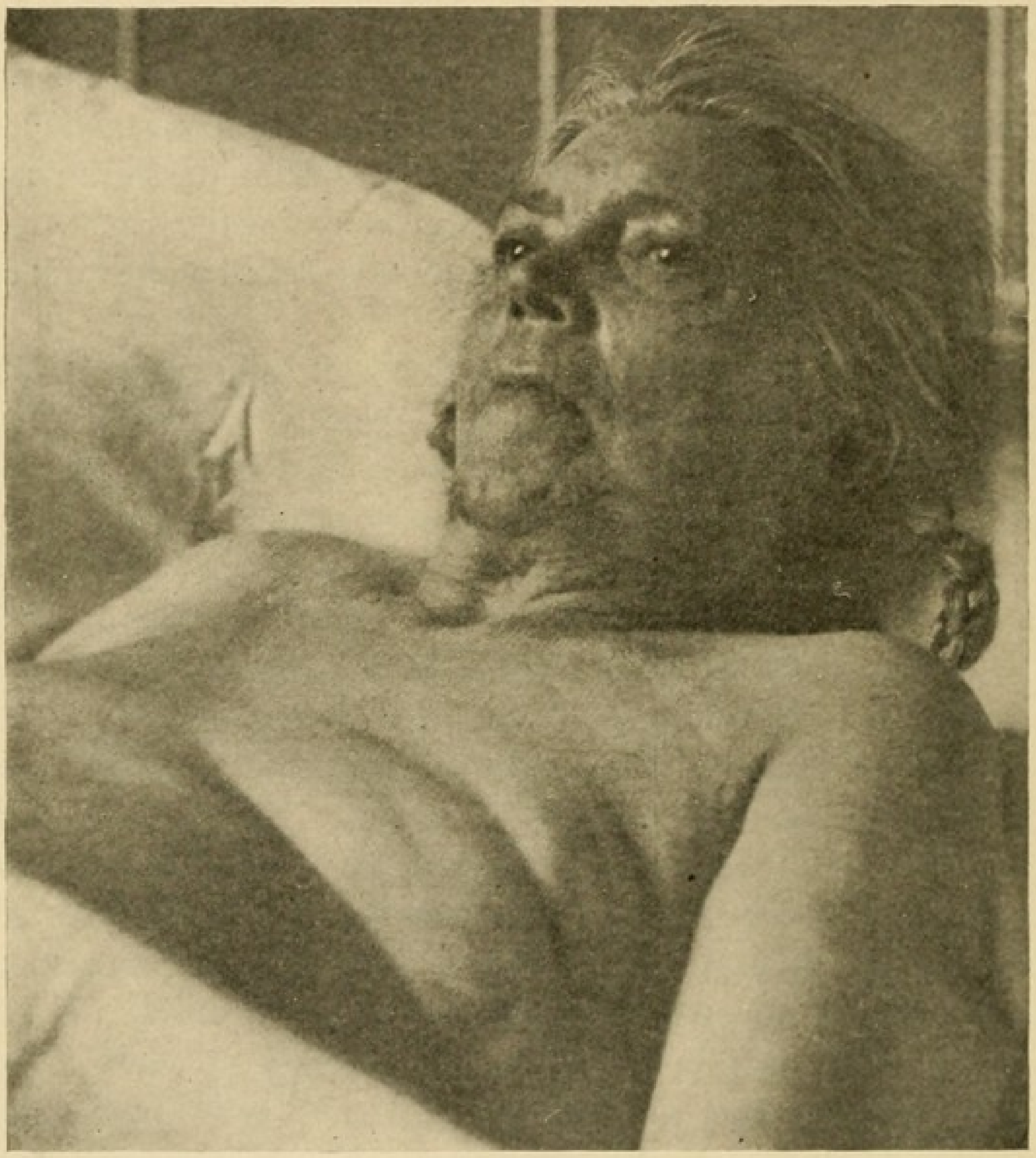


FIG. 31.—Atrophic or withering scirrhus. Observe the complete disappearance of the nipple and shrinkage of the breast.

the morbific elements which spread therefrom. It is certainly reprehensible not to operate in cases of this kind as soon as the diagnosis is made. (See Fig. 31.)

The so-called **acute cancer** which has been described by

Billroth, Volkmann, Paget, Gross and a few later writers, notably Delbet, may destroy life within a few months after its onset. This form of the disease, which is fortunately rare, often begins during pregnancy or lactation and so rapidly involves the entire gland that it may well be referred to as carcinomatous mastitis, as suggested by Volkmann. The affected

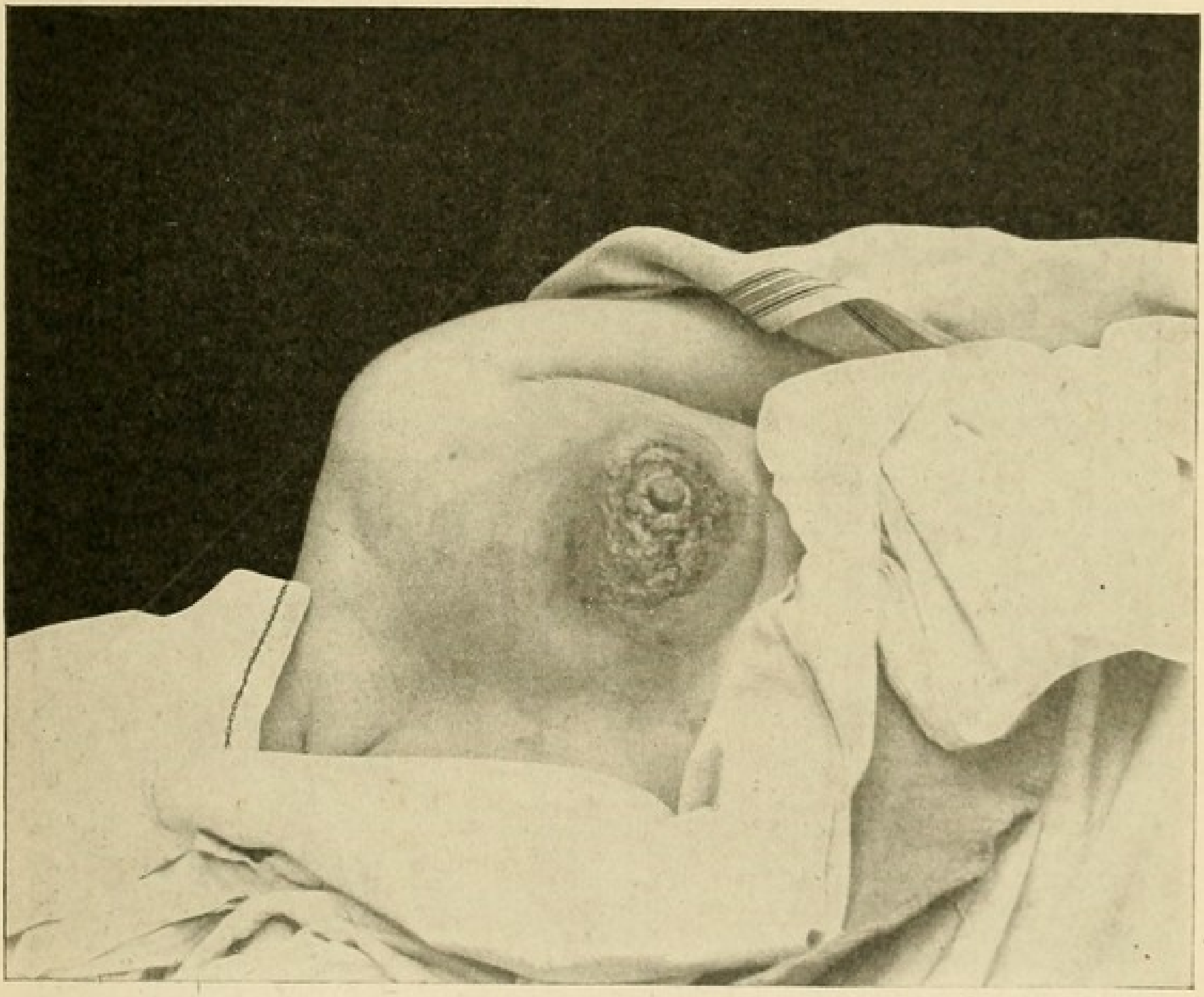


FIG. 32.—Advanced carcinoma.

breast begins to increase in size without any subjective disturbances being experienced by the patient. The enlargement is diffuse in contradistinction to that which characterizes the ordinary forms of mammary cancer; consequently upon palpation no distinct mass can be outlined in the breast, the organ being enlarged in its entirety and being firm and hard to the touch. The skin soon becomes reddened and adherent, and ulceration quickly supervenes. Pronounced cachexia early manifests itself, and the patient dies from exhaustion or possibly from repeated hemorrhage from the ulcerated areas of the breast. Remarkable instances in which both breasts have been attacked have been reported. One of the most interesting cases of this kind which I have found is one reported by Billroth. It was

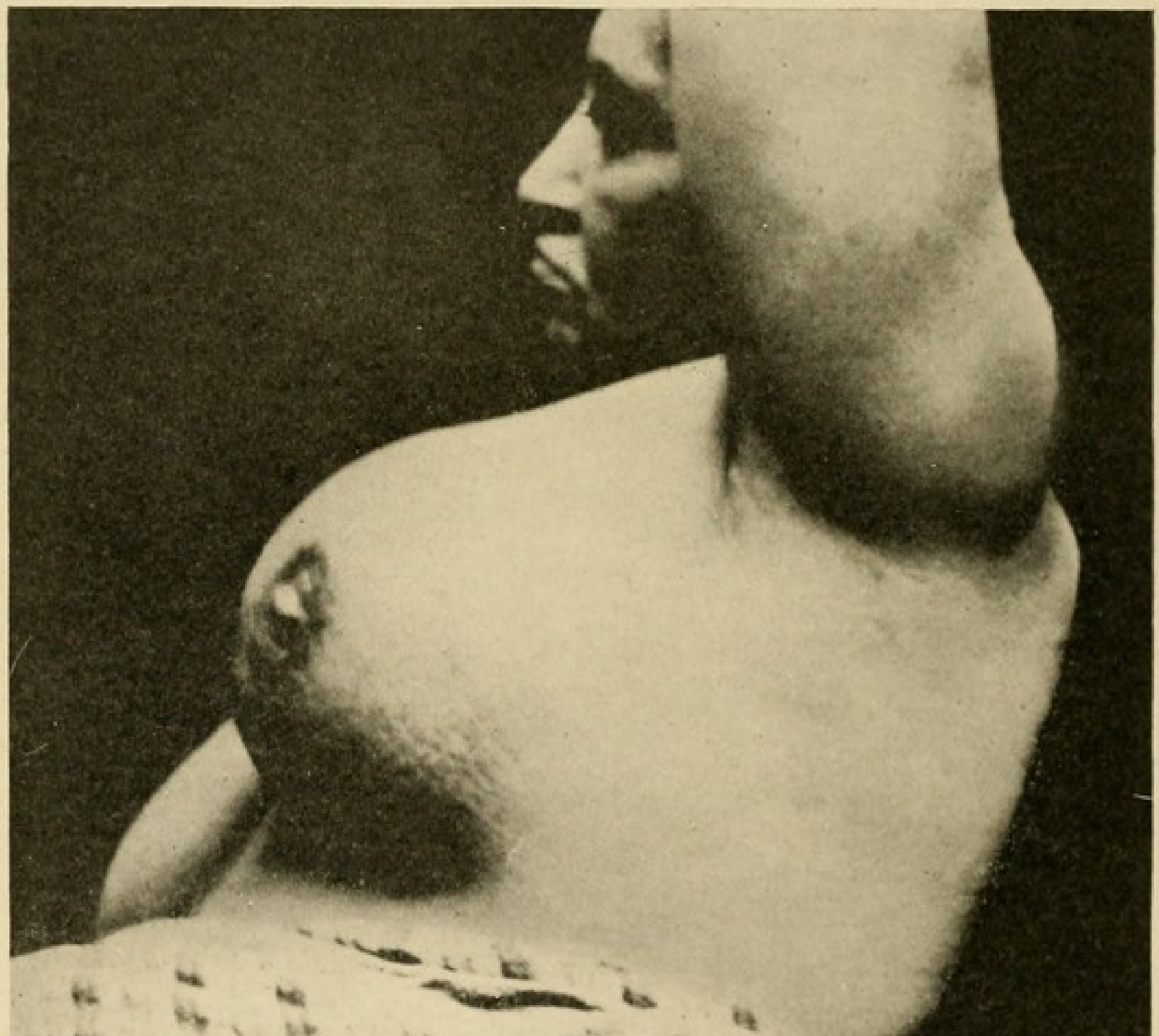


FIG. 33.—Inoperable carcinoma.

that of a lady who was attacked five weeks before delivery of her eighth child, and who died seven days after an easy and natural labor. Postmortem examination revealed metastases in the liver, kidneys, omentum, thyroid gland, and pericardium. Both breasts were enormously enlarged, although the entire duration of the disease as noticed by the patient was only six weeks.

Another interesting case observed by the late S. W. Gross, and also affecting a pregnant woman, was one in which the disease apparently began as a nodule in the sternal portion of the mamma, and then within two weeks had diffused itself

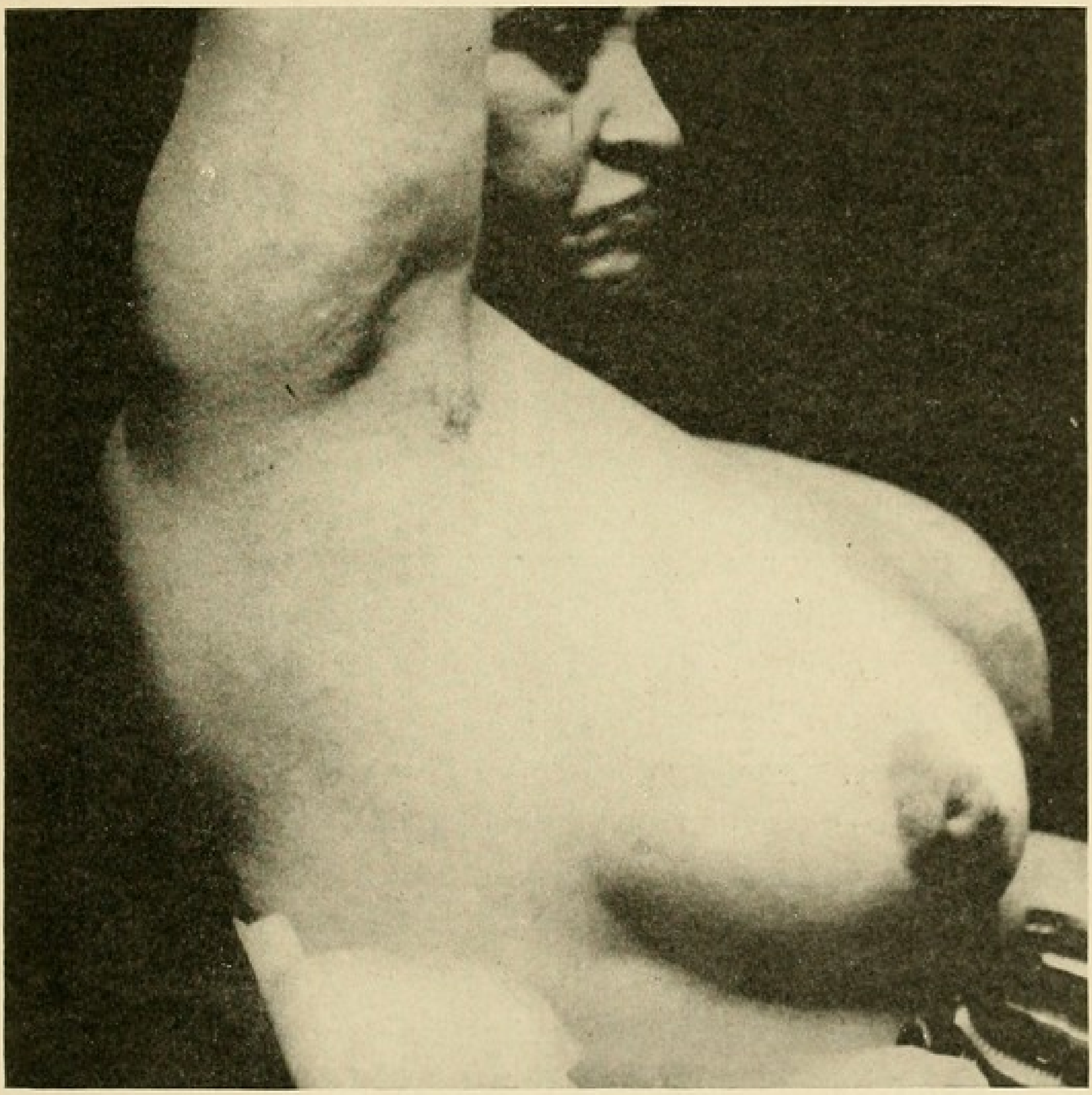


Fig. 34.—Inoperable carcinoma. Showing enlarged glands in right axilla in left sided mammary disease.

throughout the substance of the gland. Gross, who saw the patient three months after the first manifestations of her disease, found the breast firmly adherent to the chest-wall; the skin adherent to the breast, and thick, hard and brawny; the axillary glands extensively diseased, and the supraclavicular glands also involved.

This case seems to indicate that the disease may occasionally at least be discrete in its inception, but even though this circumstance be correct it is not important, for the reason that the progress of the disease is so rapid that it soon assumes a diffuse character.

In a case reported by Klotz the patient succumbed three months after the onset of the disease; and in another recorded by Schmidt six months after its beginning.

Although frequently associated with pregnancy and lactation, acute mammary carcinoma may develop independently thereof. Thus, of four cases which have come under the observation of Delbet, two occurred irrespective of pregnancy, one during pregnancy, and one during lactation. Schmidt also observed a case in a non-pregnant and non-lactating woman.

The peculiar mode of onset and evolution of this form of mammary carcinoma together with its rarity, has very naturally resulted in its being mistaken for other diseases, particularly abscess and sarcoma. Of course, as it progresses, differentiation from abscess can be readily made, but distinction from sarcoma is not so easy. In view of its rapidly fatal course every case in which its presence is suspected should be considered operative and at once referred to the surgeon.

The clinical aspect of **cancer en cuirasse,** a form the pathology of which has already been discussed sufficiently to impart a fair idea of the ravages which it may produce, is one of the most terrible afforded by any variety of cancerous disease to which the mammary gland is subject.

Velpeau, who gave the first accurate description of this variety of the disease in the year 1838, related the case of a lady whose suffering was so great that she begged to be given a poisonous dose of opium that she might be relieved of her misery by death. Cases equally distressing have been ob-

PLATE XXXVII

Cancer en cuirasse.

served since by many surgeons whose experience with the disease has been considerable.

In some instances the lesions affecting the thoracic wall may appear before any tumor in the breast has been detected, but as a rule there is a mammary neoplasm present before the changes in the skin over the mammary and pectoral regions manifest themselves. They may also first appear after the diseased breast has been removed. That these variations in the onset of the disease exist, will not be confusing if the pathology be borne in mind, particularly Handley's theory of permeation through the deep fascial lymphatic plexus; and, likewise, if individual differences in the power of resistance to disease be considered.

Whatever may be its chronological relation to the mammary neoplasm, the first manifestations of the disease make their appearance as red spots in the skin over or near one or both breasts. These spots gradually thicken until they become converted into disc-like nodules, varying in size from a pinhead to a filbert. As ordinarily observed in the earlier stages of the malady they are about the size of a split pea or a coffee bean. It is not unusual for them to give rise to an itching or burning sensation as they continue to enlarge. As a result of the scratching and rubbing resorted to by the patient to relieve these sensations eczema may be found associated with the lenticular lesions.

Some of these thickened spots may be distinctly elevated, so that they resemble tubercles; others, however, may be depressed.

There is a tendency for the discrete lesions to become confluent, the nodules becoming aggregated into patches, or some being arranged in linear series. Pari passu with these changes there occurs a dense, brawny infiltration of the remaining mammary and adjoining tissues, which may extend upwards as high as the clavicle, downwards onto the abdominal wall, and laterally as far as the posterior margin of the axilla. The veins become dilated, areas of melanotic deposit are formed, and in some cases pearl-like miliary bodies are observed here and there over the affected surface.

The infiltrated tissues may assume a dusky or even a brown hue. Velpeau compared the skin thus affected to leather, and Erichsen, who had observed certain portions of the infiltrated areas covered with crusts, likened it to the bark of a tree.

It is stated that ulceration may also occur, and hemorrhages of varying degree have resulted from erosion of superficial blood-vessels. In the many cases I have seen ulceration has rarely if ever been observed.

In regard to the age incidence of this form of cancer I find that it may affect women at all periods of life. Concerning its predilection for the dark-skinned I have not been able to obtain any information. I am inclined to consider it merely fortuitous that nearly all my own patients were brunettes.

Almost always there is great swelling of the upper extremity, which gives rise to much pain. The most distressing symptom, however, is the compression of the thorax produced by the superjacent infiltrated tissues. This compression may not only be so great as to interfere with the ordinary movements of the chest and arms, but also to impede respiration, fastening the unfortunate patient in a vice, so to speak.

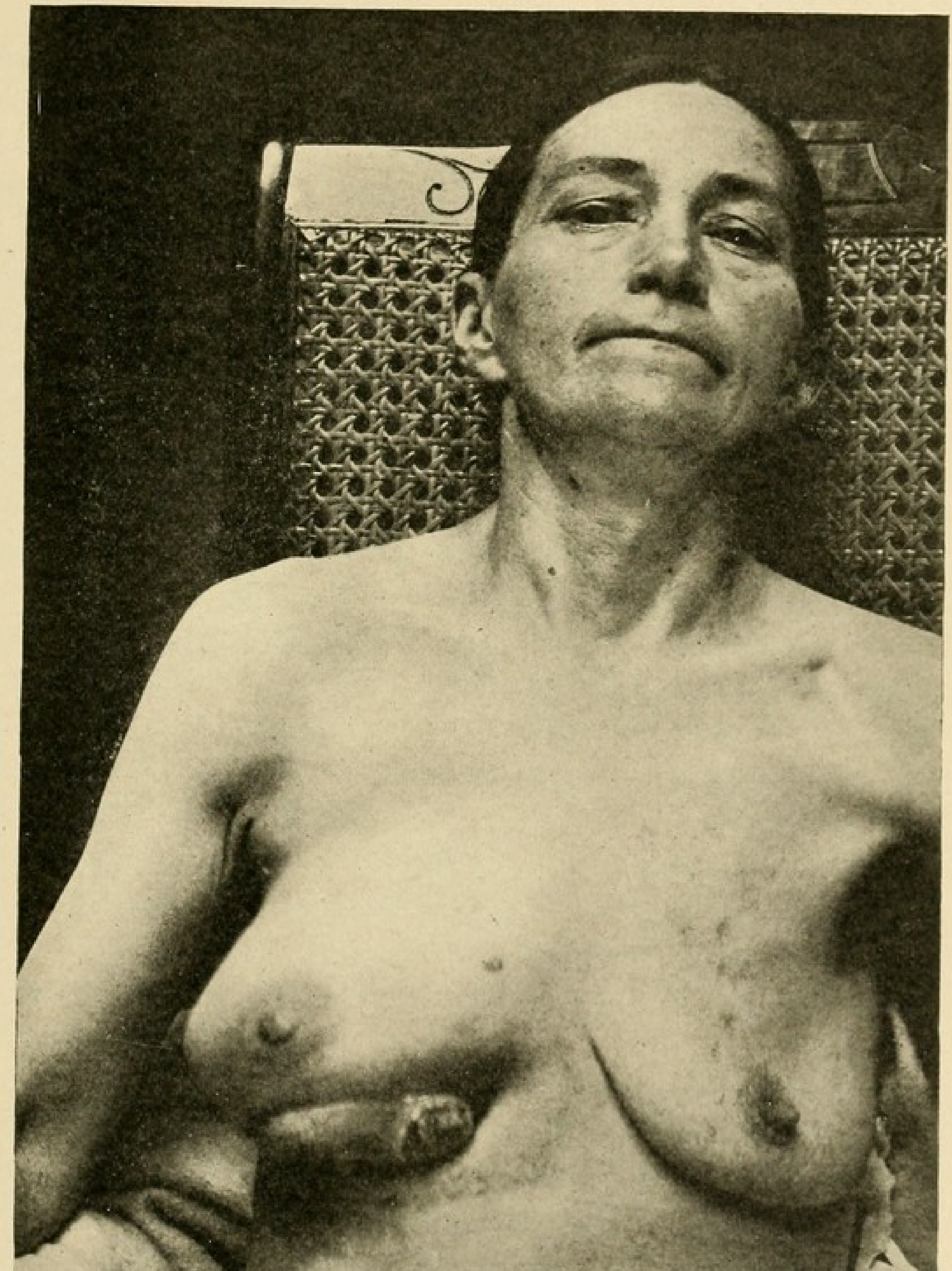
The extension of the malignant process is in some cases very rapid, as, for example, in one reported by Esmarch, in which its progress was so rapid on portions of the chest as to remind one of lymphangitis or erysipelas. Such a mode of extension, however, must be unusual. As a rule the disease advances at a moderate rate, although it usually destroys life within twelve or eighteen months. I know of one case in which the patient lived two years and a half after first noticing the disease.

The very nature of this affection unfortunately renders operative treatment futile. In those of my cases which came

PLATE XXXVIII

Cancer en cuirasse. Observe recurrence in the cicatrix and the nodule above the clavicle.

PLATE XXXIX.



Inoperable carcinoma. Large fungating mass.

to autopsy internal metastases were invariably present in addition to the extensive superficial cancerous lesions.

Diagnosis and Prognosis.—As I have pointed out on several occasions, whatever better results may be obtained from the operative treatment of mammary carcinoma will depend upon earlier and more accurate diagnosis rather than upon improvements in technique or more extensive procedures.

If the general practitioner, who as a rule first sees the cases, could be taught to remember that 80 percent of all mammary neoplasms are malignant, and also be prevailed upon to forget the erroneous teaching of a past era relative to the hopelessness of mammary carcinoma, there is not the slightest doubt that the percentage of radical cures by operation would be increased materially during the next few years. It is desirable, as Sir William Banks pointed out nearly thirty years ago, to operate on a cancer of the breast when it is no larger than a pea, if patients would apply to us at that time or if diagnosis could be made. Unfortunately this teaching failed to fall upon fertile soil, and the family physician, and even the consulting internist, have continued to distribute that death-dealing advice "wait and see if it is malignant." Worse than this they have complacently continued to advise against operation even after the malignant nature of the disease has manifested itself in unmistakable signs, in the meantime repeatedly plastering the affected breast with antiphlogistine, ichthyol, or belladonna ointment.

This lack of faith in the power of surgery to cure is not so much to be wondered at in view of the teachings formerly promulgated by many surgeons of repute. The pity is that the work of modern investigators and operators has not been more closely followed. Rarely a month passes that the unfortunate experience and still more regrettable teachings of a late illustrious professor of surgery in Philadelphia are not quoted to me by some of his pupils. It seems exceedingly strange, however, that the more advanced and better teaching of an equally illustrious contemporary is not more generally remembered, for it was through him that the complete operation and teachings of Moore, of London, were first practised and inculcated in America.

My statistics based on 5,000 cases show that in any given case of mammary neoplasm the chances are more than 5 to 1 in favor

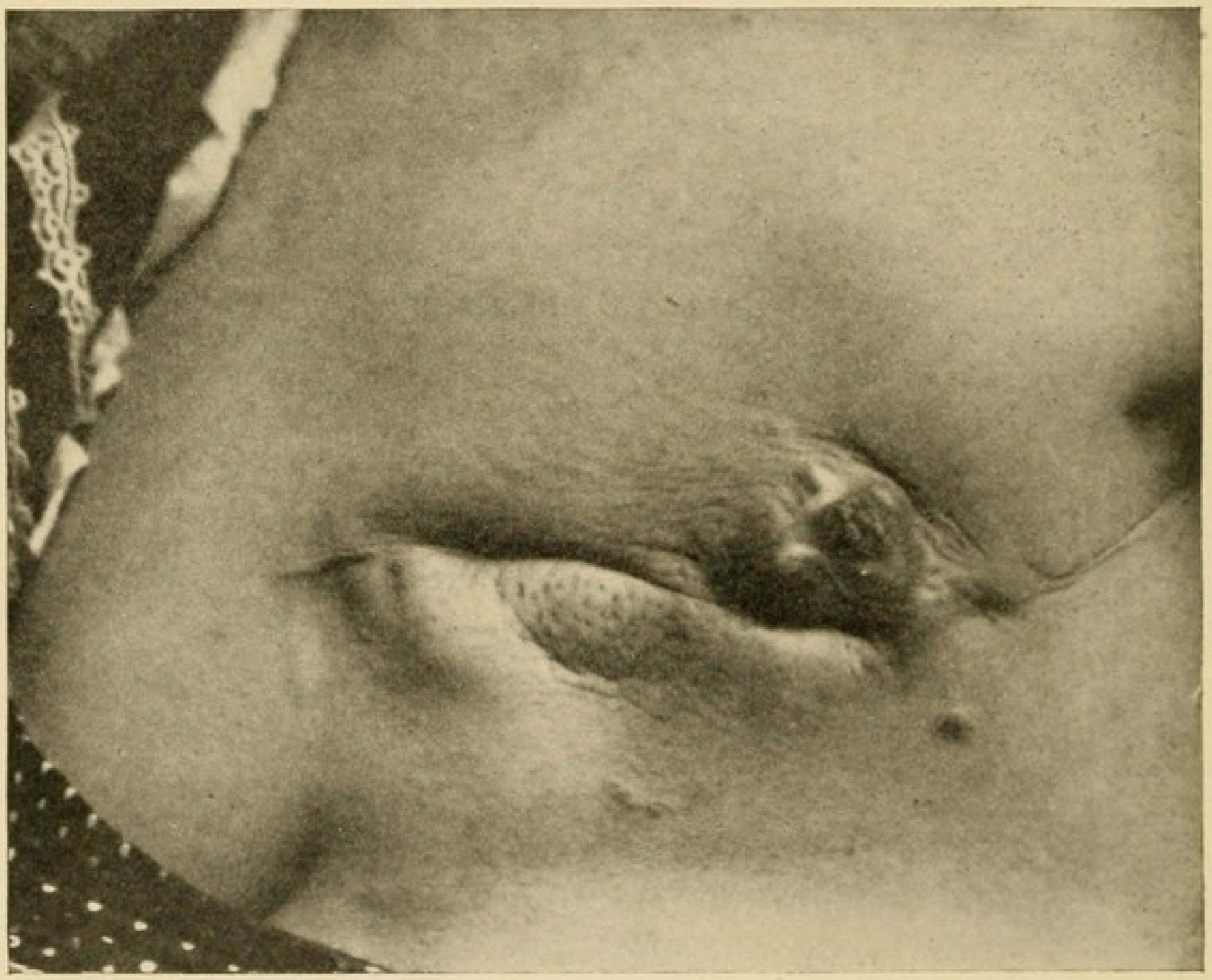
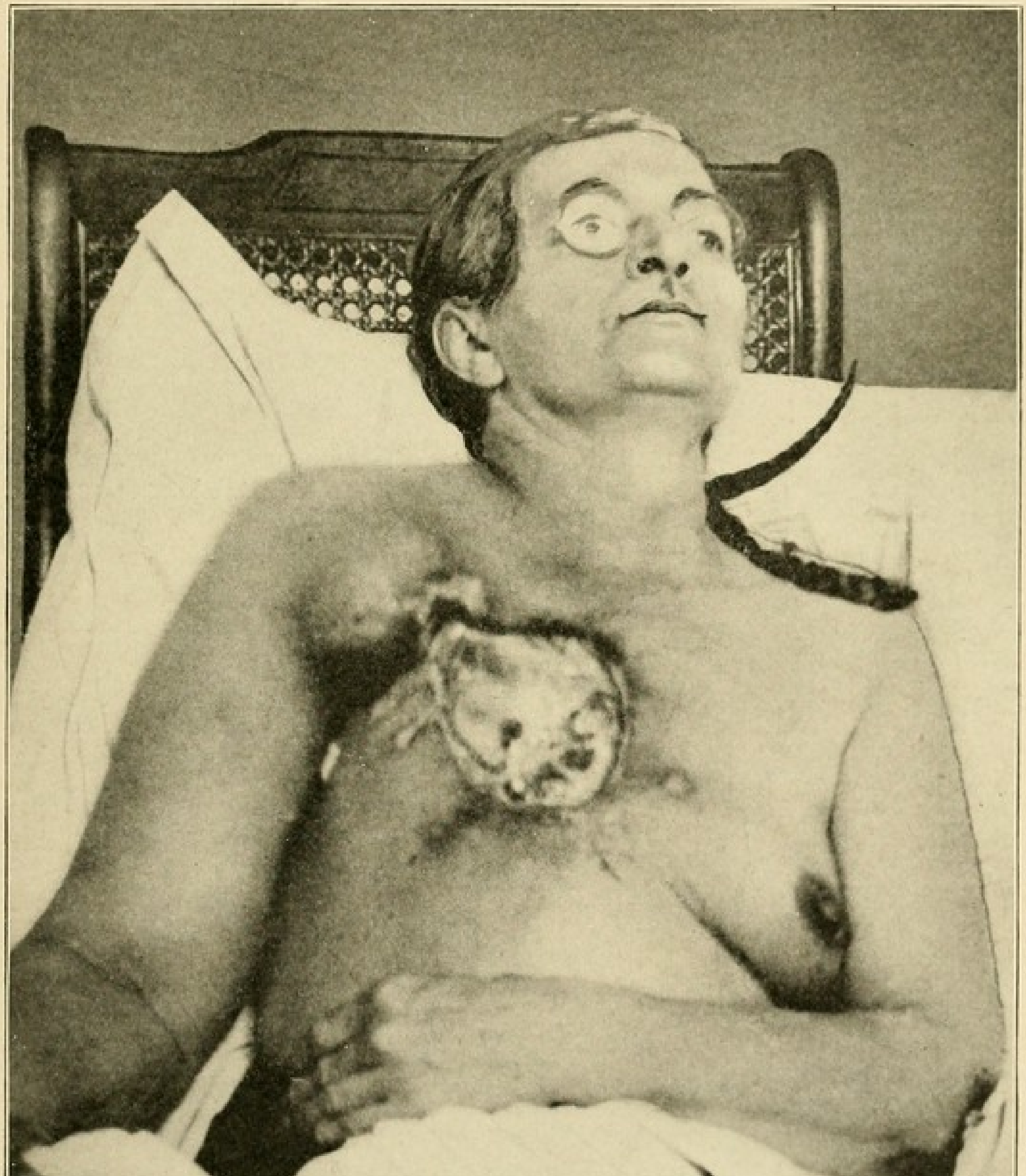


FIG. 35.—Recurrent carcinoma.

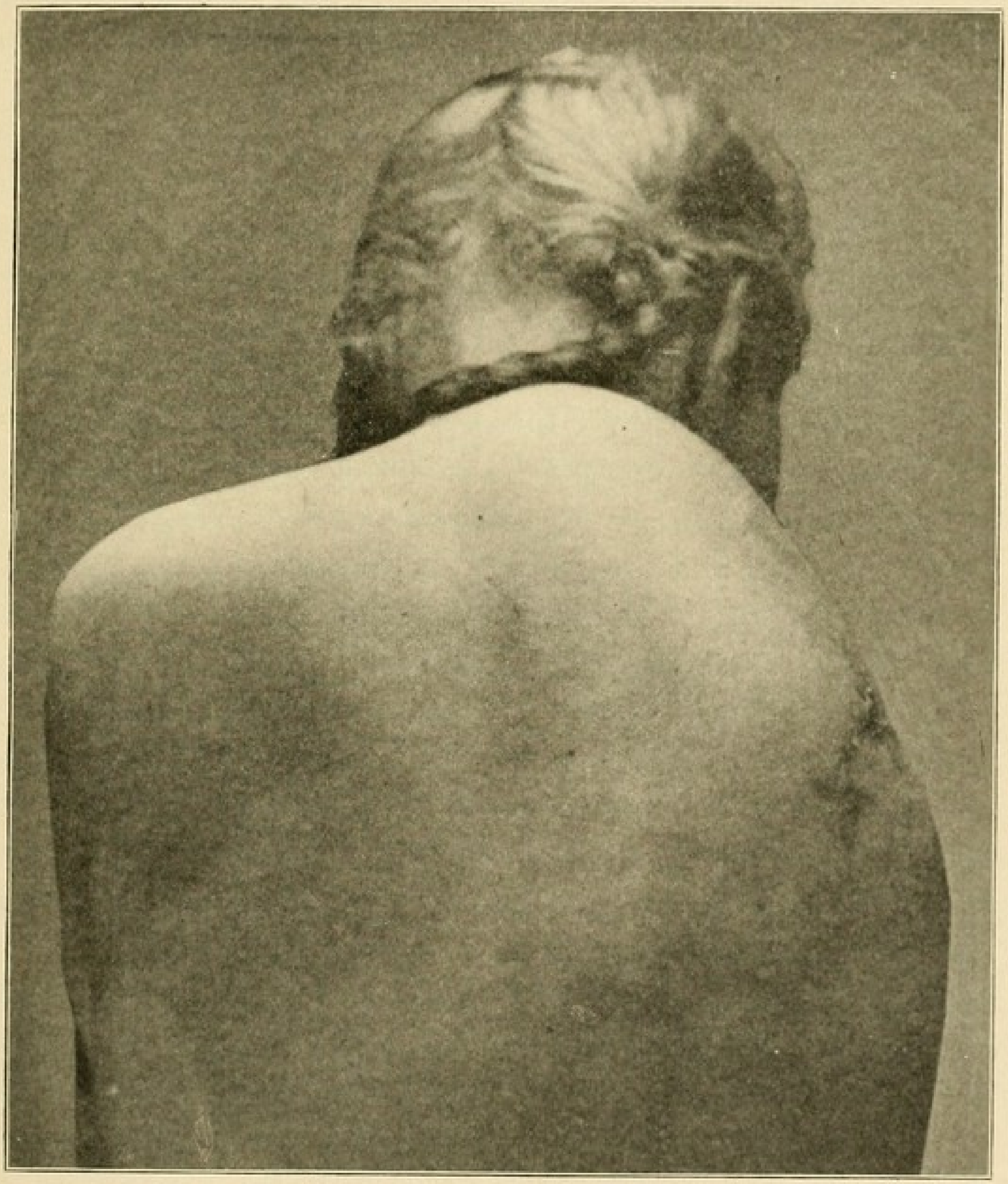
of malignancy. If conditions were reversed, and the chances only 1 in 5 in favor of malignancy, the dilly-dally policy so often adopted could only be justified on the ground that a surgical operation promising relief is more dangerous to life than the disease itself. But such is not the case. My statistics based on 2133 operations performed since 1893, by twenty-one American surgeons, show the operative deaths to be less than 1

PLATE XL.



Recurrent carcinoma. Observe edema of the arm. Interscapulo-thoracic amputation was performed.

PLATE XLI.



Patient shown in Plate XL after interscapulo-thoracic amputation had been performed.

percent. In view of the fact that all malignant disease untreated by surgical means must sooner or later end in death, this slight mortality following operation is scarcely to be considered. What consistency, I ask, is there in advising a woman with a small ovarian cyst or myoma of the uterus—neither of which has a tendency *per se* to shorten, much less to terminate life—to travel hundreds of miles that a specialist may do a laparotomy, and the same day, perhaps, admonish her sister or friend with a mammary tumor that she must calmly and resignedly await a lingering, painful and loathsome death, rather than submit to a less dangerous operation curing permanently all benign growths and at least one-third of the malignant ones?

Certainly none whatsoever, and it is worse than folly to adopt such a course. The first class of cases are operated on largely for convenience, such as relief of pain, mental anxiety, deformity, and possible danger to life by accident. They should be operated by all means, but are, as I have said, largely operations of election; whereas a tumor of the breast being very generally malignant should demand an immediate operation to save life itself. The fault is, in part at least, a divided one, falling somewhat upon the patient as well as the doctor, owing to the tendency, already mentioned under symptomatology, which women show to conceal a growth in the breast.

After these preliminary considerations, the importance of which I cannot lay too much stress upon, it is my purpose to explain as best I can the manner in which mammary carcinoma may be the most certainly recognized, and to contrast its manifestations with those of other diseases of the breast with which it may be confounded.

The article on symptomatology has, I trust, portrayed the general aspect of the disease. Here I shall refer to and elaborate those symptoms and signs which are the most distinctive.

The method of **examining a patient** in whom a mammary neoplasm is suspected is most important. It is always necessary to have the patient remove all clothing covering the thorax, so that thorough inspection of both breasts can be made and any asymmetry, either natural or acquired, noted. Most of the women I have examined have, unless otherwise requested, merely loosened their clothing sufficiently to expose the affected breast. It is my custom at present to ask them at once to prepare for a thorough examination of the entire thoracic region. This enables the surgeon to examine the axillæ, the supraclavicular region, and the opposite breast, as well as the one of which the patient complains; and also to detect at once any involvement of the integument over the lateral thoracic walls or epigastric region.

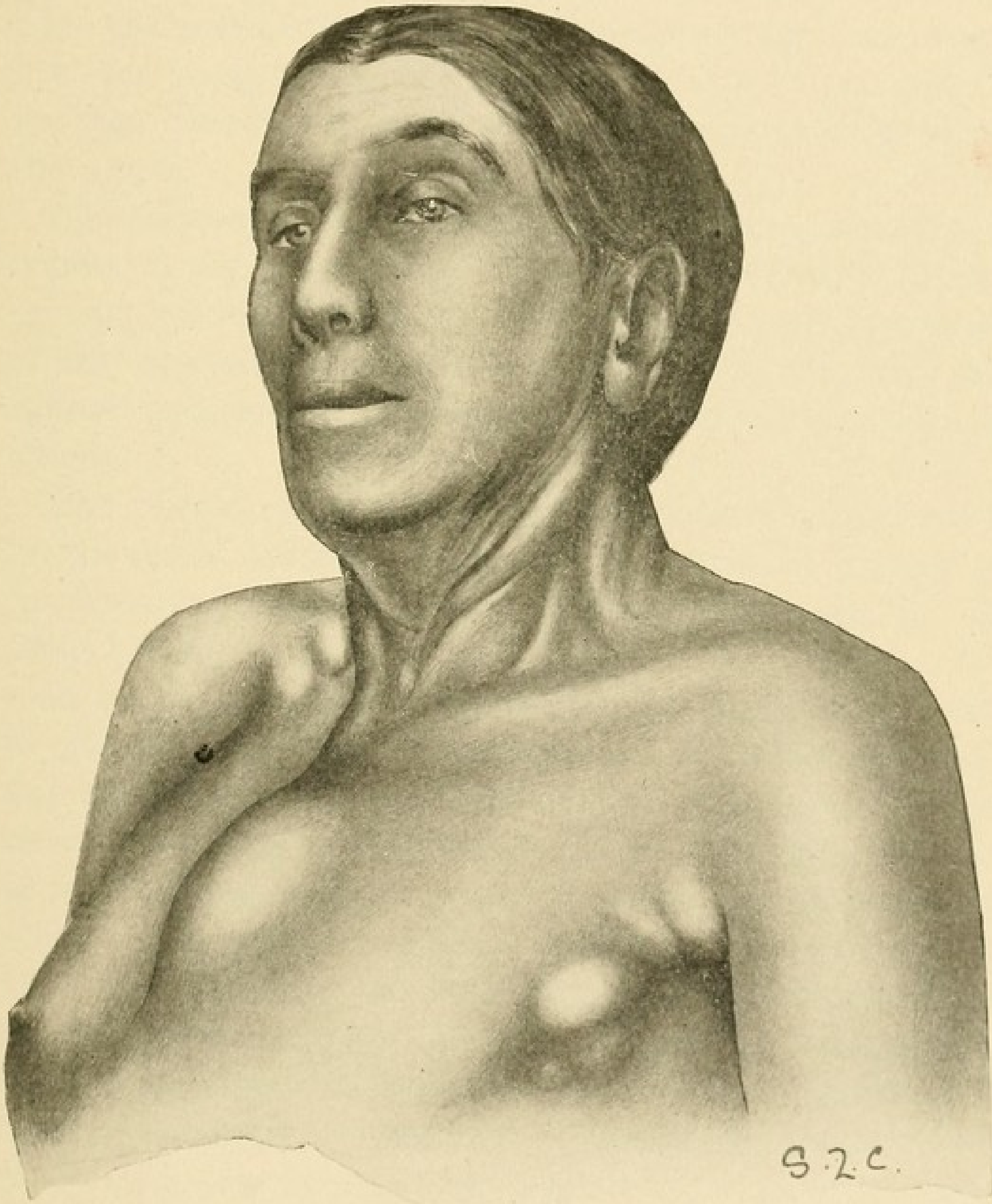
In cases much advanced the thorax should be carefully percussed and auscultated for evidences of pleurisy, and the liver examined, to determine, if possible, the presence of cancerous nodules. The respirations should be counted, and if at all increased in frequency, inquiry should be made in regard to the existence of dyspnea.

All portions of the breast should be examined, the tissues being not merely picked up between thumb and fingers, but the flat of the four fingers being passed over every portion of the gland, so that differences in hardness, contour and mobility may be the better determined. In this manner the firm, indurated, ill-defined mass characteristic of beginning or early carcinoma may be accurately made out.

In fat women this method of examination will not yield satisfactory results as readily as it will in those who are thinner. In the former class a scirrhus growth of considerable size may produce simply a dimpling or puckering of the skin over it, and exceedingly deep palpation with thumb and fingers will be necessary to detect any induration in the gland itself.

The **location** of a tumor is of considerable significance from a diagnostic standpoint, malignant growths being most common in the upper and outer quadrant, lower or axillary quadrant, and

PLATE XLII.



Ster nal symptom. (*Herbert Snow.*)

behind the nipple. Benign growths on the contrary are most frequently found in the upper and inner quadrant or sternal half of the gland. When situated beneath the nipple, it is to be remembered that they produce contraction of this structure, a phenomenon which is an important diagnostic sign. Its absence, however, must not be misconstrued in favor of benignity, for the sign will not be caused by tumors remotely situated from the nipple.

The location of the neoplasm is also of some importance in regard to the distribution of metastases. Thus a tumor in the upper hemisphere is more likely to cause early involvement of the supraclavicular glands, while one in the inner hemisphere predisposes, I believe, to infection of the mediastinal glands.

The sternal symptom of Snow has already been alluded to in this latter connection. It will, of course, be present only in advanced cases. Indeed, I have rarely seen it. (See Plate XLII.)

In regard to subjective symptoms, it is important first of all to bear in mind that **the onset, as a rule, is not marked by any suffering.** Contrary to the popular opinion and one, too, which I am sorry to state still continues to be shared by many members of the medical profession, mammary carcinoma may attain a well-advanced degree of development before it produces any pain. It is only when the tumor attains considerable size or compresses nerve-trunks—either of itself or through its associated glandular involvement—that a sense of heaviness and weight in the first instance and of lancinating pains radiating to the arm, shoulder and back, in the second, will be experienced. Adhesion of the tumor to the skin may also give rise to pain, and ulceration naturally causes much suffering.

I have rarely seen a case in which the slight twinge or pang like the prick of a needle was experienced around the thorax or down the arm very early in the course of the disease, although this is a symptom upon which Mr. Sheild places considerable dependence. The late S. W. Gross also believed it to be a valuable sign.

Pain when present is almost always of a neuralgic or intermittent character, and I have observed in many cases that it is much worse in damp weather. Another point of importance is that the carcinomatous breast is rarely painful to manipulation.

In advanced cases associated with edema of the upper arm, there is also much pain experienced, but the associated phenomena of the disease when it has reached such a stage are so distinctive as to render the trouble in the arm insignificant from a diagnostic standpoint. The same is true of the girdle pain which occurs in cancer en cuirasse. In the comparatively rarer forms of the disease, such as acute cancer and cancer cysts, the symptoms and signs are likewise so pronounced that they overshadow pain and tenderness, which at best are insignificant in any form of the disease so far as their diagnostic value is concerned.

It is timely that physicians should realize this fact and more frequently combat and endeavor to dispel the erroneous idea generally entertained by women that because a growth is painless it is not dangerous. A woman often remarks to me with evident surprise that she can hardly believe a tumor is cancerous because it has never hurt her, and this despite the fact that there is a decided tendency among women to regard all tumors in the breast as cancers.

Age is without doubt one of the most valuable guides, as carcinoma is by far most common after the fortieth year, when the functional activity of the breast is ceding to retrograde changes or when such changes have already become established. It has already been pointed out under symptomatology, that young women are far from exempt, and therefore the presence of an otherwise suspicious growth in the breast should not lead one to discard the opinion that it may be carcinoma merely because the patient happens to be young in years. My statistics, based upon 5,000 cases, show that 9 percent occurred in women between the ages of twenty and thirty, and 11.5 percent between the ages of thirty and forty. These figures certainly show the folly of dismissing from consideration the possibility of a growth being malignant merely because it affects the breast of a young woman. It is true that the majority of hard tumors of the breast occurring in women under thirty are of the fibro-epithelial group of benign neoplasms, but still, in view of the considerable percentage of carcinomata occurring in young women, the possibility of a tumor being carcinomatous must be reckoned with.

In doubtful cases of this kind, and also particularly in cases where it is difficult to differentiate between carcinoma and chronic mastitis (abnormal involution), the **microscopic test** is a most valuable means of diagnosis. Instead of making, as many advise, an incision into the growth for diagnostic purposes, and then closing the wound—a practice not altogether satisfactory, and certainly not free from danger—I prepare for and get the consent of the patient for a complete operation. A competent microscopist is present with his apparatus, prepared for rapid yet accurate work. If the chances strongly favor benignity, the tumor and its capsule only are removed and submitted for an immediate examination and opinion. Usually in less than ten minutes the report is returned. If there is a strong suspicion of malignancy, a portion of the growth near the center is removed, the wound at once plugged with gauze and nothing further done until the pathologist reports. If the piece thus removed proves malignant, the complete operation is immediately performed. I have followed this practice for fourteen years and have never known a mistake to be made in diagnosis, nor have been made to suspect that harm had resulted from the liberation of cancer cells which affected adjacent healthy tissue. I think, however, that the wound thus treated should be left entirely alone until the breast and the muscles have been removed. Therefore, it would seem that the danger can be minimized if not actually prevented, and the slight risk incurred is as nothing to the definite information gained. I can point to women, happily married and with practically perfect breasts, where everything might have, probably would have, been different had not this precaution been taken in operations for benign growths before marriage. Further, I have been prevented from mistakes in at least six malignant tumors.

When operating apart from a well-appointed hospital and its pathologist, the macroscopic appearance of the tumor, its color, consistence, resistance to the knife, and, above all, the presence or absence of a capsule, will as a rule prevent a mistake in diagnosis. Stiles's nitric-acid test may be applied to the tumor with advantage. Every growth removed from the mammary gland should, of course, be examined with the microscope as soon as practicable.

The history of **trauma, mastitis, and discharge from the nipple** is of little, if any, value, as it is about as commonly obtained in benign growths as in malignant ones. The same is true in regard to the social condition of the patient, for the reason that carcinoma is frequent enough in women who have never borne children to render the diagnostic value of a history of parturition and lactation relatively unimportant. In any large series of cases there is found a certain percentage in which these etiological factors can be excluded.

It is the same in regard to **heredity.** Although I believe a peculiar predisposition to carcinoma may be inherited, the absence of a history in parents, grandparents or other relatives should not be taken into account when there are good reasons for thinking a tumor is malignant. A positive family history is of course to be regarded as strengthening the probability of malignancy. A negative history, however, does not weaken the likelihood of malignancy, provided that other circumstances point to it.

In regard to differential diagnosis, the principal conditions from which carcinoma is to be distinguished are **benign tumors, chronic mastitis or abnormal involution, tuberculosis, sarcoma, and cysts.**

The **tumors of the fibro-epithelial group,** with the exception of the papillary cystadenoma, will as a rule present no difficulties of diagnosis. Their usual location in the sternal half of the gland, their distinct encapsulation, the absence of axillary involvement, their slow growth and their usual occurrence in young women render their recognition easy, as a rule. Whenever doubt exists the microscopic method above described should be employed. The papillary cystadenoma is hardly likely to be mistaken for carcinoma, although it may undergo carcinomatous degeneration in its later stages. Macroscopically it resembles sarcoma rather than carcinoma.

Differential diagnosis from **chronic mastitis or abnormal involution** may be impossible without the aid of the microscope. In those cases in which the chronic inflammatory process persists as a relic of acute disease the liability to confusion with carcinoma is not so great as it is in those in which the disease more truly represents an abnormal process of involution. Some cases also develop rapidly with pain and swelling, and naturally would not be mistaken for any of the ordinary forms of carcinoma. From acute cancer they differ in that marked glandular involvement, rapid progression to ulceration, and profound constitutional disturbances are absent.

In nearly all cases of abnormal involution pain of varying degree is a prominent symptom. This pain, too, is frequently worse at the menstrual period. Thus a condition rarely if ever present in early carcinoma is very constant in chronic mastitis. It is those cases in which pain is absent that are most difficult to distinguish from beginning cancer.

In the discrete form of **tuberculosis** areas of induration will be found in various parts of the breast, and in some cases they can be distinctly separated from the surrounding tissues. This condition is never found in carcinoma. In both varieties of tuberculosis—the discrete and the confluent—the earlier involvement of the axillary lymphatic glands, their more rapid growth, and the not uncommon development of suppuration will afford a valuable differential diagnostic sign. Later in the course of the disease fistulæ, through which the contents of tuberculous abscesses are discharged, may be found over various portions of the breast. In advanced carcinoma ulcerations rather than fistulæ communicating with the parenchyma of the gland are present.

Finally, it is to be remembered that in mammary tuberculosis, the lesions can often be demonstrated in other organs of the body.

Syphilis should not present difficulties of diagnosis when appearing as a primary lesion or as gummata, although the latter have sometimes been mistaken for malignant neoplasms. As a rule evidences of syphilis will be found in other parts of the body. Gummata have a marked tendency to soften if left untreated, and as this softening develops it imparts an elastic feeling to the mass upon palpation. When softening has progressed to such an extent as to cause breaking down of the mass, the resulting ulcer is decidedly excavated and sharply defined in contradistinction to the more irregular ulceration of carcinoma. Even after a gumma has sloughed there may be practically no involvement of the axillary lymph-nodes. Another difference between gumma and carcinoma is that the former may attain a large size before becoming adherent to the skin. In such cases, however, the skin will often be found slightly discolored.

The diffuse form of syphilis, which resembles chronic mastitis, may, like that affection, be mistaken for scirrhus, and in absence of history or evidence of syphilis be quite impossible to diagnosticate. The microscope may be required to prove that the disease is not carcinoma, and even then its true nature may fail to be revealed, as there is nothing characteristic of this form of fibrosis.

Finally, it must be borne in mind that large doses of the iodides cause a rapid change for the better in late syphilis of the breast as in like lesions of other organs. Cases have been reported in which large gummata almost completely disappeared within a week after the use of this remedy was begun. In suspicious cases this therapeutic test should always be tried.

To the experienced surgeon **sarcoma** will present few difficulties of diagnosis from carcinoma, and even to those who see but comparatively few cases of mammary disease differentiation should not be difficult. Their possible encapsulation, their rapid growth, and the circumstances that they do not become adherent to the skin or retromammary tissues constitute important diagnostic differences. Involvement of the lymphatic glands in the axilla is also rare in sarcoma and constant in carcinoma. When it does occur in the former the glands do not present that fused, matted characteristic which is invariable in the latter. When sarcoma becomes large the veins in the overlying skin become much distended, and thus furnish a sign which is not present in carcinoma. Finally, when the stage of ulceration is reached the protrusion of fungous sarcomatous masses will make the nature of the disease apparent. It has always been customary to state that sarcomata occur most frequently in women who have not reached middle life, and to consider their supposed predilection for those young in years as a diagnostic sign of value. My statistics, however, show that more cases occur in elderly than in young women. Hence it would seem that age incidence is not so important as it has been considered to be.

Cysts have frequently been mistaken for carcinoma and their true nature revealed only at the time of operation. Although cysts of any material size usually impart a sensation of elasticity to the palpating fingers, there is a small percentage in which this attribute is wanting, as a result of which they have been erroneously thought to be cancers, particularly in those cases in which they have occurred in the breasts of elderly women. The circumstance that suppuration of the cyst contents has led to some enlargement of the axillary nodes in many of these cases has strengthened the supposition that this disease was carcinomatous. Of course, in those cases in which the suspicion of a cyst is present, aspiration will settle the question.

The involution cysts are the ones which give rise to most difficulty, and as they may terminate in carcinomatous degeneration their recognition becomes the more important.

I am of the opinion that in the majority of these cases the microscope will be required to differentiate between simple abnormal involution, involution cysts, and beginning carcinoma.

The more serious of these conditions cannot be separated clinically from simple abnormal involution, and the small cysts are so compressed by the fibrous tissue in the breast that they may readily escape detection until the knife has laid them bare. Several portions of the gland should always be turned over to the pathologist, so that a thorough examination can be made.

Under the microscope differences are seen which cannot be detected macroscopically. Thus it can be learned whether the epithelium is proliferating, whether minute papillary outgrowths from the cyst-wall are present, or whether the cysts represent merely a dilatation of the ducts and acini. Cancerous change can, of course, be detected in this manner when it is present.

Adenocarcinoma is to be differentiated from the adenomata by its tendency to infiltrate, its larger size, its constant, steady growth which finally terminates in ulceration, and microscopically by the atypical formation of the acini, combined with the great thickness of the walls and the breaking of the epithelium through the basement membrane.

Prognosis.—Untreated, cancer of the breast will almost invariably result in the destruction of the patient within three years. The percentage of patients living after this time is so small that it may practically be disregarded. That the disease is strictly local in its beginning, and therefore amenable to early and radical surgical treatment, is a fact which I wish most strongly to emphasize.

At the present day it hardly need be said that the earlier the operation can be performed the greater are the chances of recovery. This fact was well attested by the statistics of some of the older surgeons whose observations were recorded before the more thorough methods of operating had come into vogue. Thus, Winniwarter found the average duration of life after operation, in cases in which the operation was done before gross involvement of the axillary or supraclavicular glands had occurred, to be 22 months; whereas in those in which such glandular involvement had taken place it was only 13 months. Naturally much depends upon the thoroughness with which the diseased structures are removed. It is most gratifying to note the greater percentage of patients who remain free at the end of three years since the extensive operative methods practised by Halsted, Meyer, Rotter, Stiles, Warren, Lennander, myself and others have come to be more generally employed. Although the results obtained by different operators show considerable variation, the highest percentage of cases remaining free from recurrence at the end of three years is attained by those surgeons who do the complete operation. This is a percentage varying from 40 to 50, and should serve as a conclusive argument in favor of the extensive removal of all accessible tissue which can possibly be diseased.

This estimate coincides with the statistics of Marggraff, compiled independently of any material upon which I based my opinion. In his Wurzburg dissertation, 1904, he analyzed 860 cases and found that recurrence took place in 430. The longest period of immunity in these cases was 11 years.

Other series of cases, however, do not show such favorable results, the percentage of freedom from recurrence at the end of three years varying from 20 to 30. Some of these series of cases have been compiled from the operations of many different surgeons, and it is only fair to assume that the methods of operating and the selection of cases for complete operation have varied sufficiently to account for the differences in the ultimate result of operation. **I still maintain that surgery should cure one-half of all cases provided that they can be subjected to the complete operation early in the course of the disease.**

In a series of twenty-one private cases, all that I had between the years 1898 and 1904, and every one of which has been followed accurately up to July 1, 1907, fourteen patients, or 66⅔ percent, remain free from any sign of recurrence whatsoever, either regional or internal. That I am prepared to expect recurrences in some of these goes without saying. Realizing fully, however, the extent of the operation done in each case, I shall be much surprised if more than one or two develop trouble. Since 1904 I have operated on a much larger number of patients who have gone a year, a year and a half, two years, and two years and a half, without recurrence, but of course they cannot be included in the series. I may state here, however, that I have never encountered among my own patients any case recurring after two years and seven months.

I have made no effort to include any of my hospital cases, as it is impossible to follow them in all instances and is manifestly unfair to include a portion of them known to have been favorable.

Naturally those cases in which the axillary glands are grossly diseased, in which the tumor is firmly adherent to the skin, and in which ulceration has occurred, offer a less favorable prognosis than those in which these phenomena are not present. Those in which ulceration has taken place are the most unfavorable of all. Of thirty-one patients operated upon after ulceration had taken place Wunderli reports only two living at the end of three years. Cases in which the supraclavicular glands are involved also offer a poor prognosis, but I do not consider them inoperable unless the glands in the higher triangles of the neck are affected. Although I cannot state that I have ever cured a patient who had neck involvement, I had one who went four years without recurrence above the clavicle even though recurrence took place in the breast incision within three years. I therefore believe that life may be prolonged and rendered tolerable by operating upon patients who have involvement of the lower cervical glands.

A question of importance relative to the prognosis in cases which have been subjected to operation is, "when may a patient be considered to have passed the danger of recurrence?" While all recognize that Volkmann's three-year limit is too short and should be extended to at least five years, it is nevertheless a fair working rule, inasmuch as 80 or 85 percent of all patients who pass this limit remain free from subsequent trouble. After five years probably less than 10 percent of all cases show recurrence. Of twenty recurrences analyzed by Marggraff twelve took place during the third and fourth years and four during the fifth and sixth years. These figures are very significant. A five year limit is of course far from being absolutely protective, but a limit which is so cannot be set, inasmuch as recurrences have been known to take place after ten, fifteen, twenty and even twenty-five years.

The subject of late recurrence has recently been investigated by Ransohoff, of Cincinnati. He collected thirty-seven cases in which recurrence took place after seven or more years. Of these twenty-six were clearly local, and eleven were doubtful. Warren, Carson, Bevan and Senn have each had a case after eight years. Shepherd has had one after nine and eleven years respectively; Moore and Vanderveer each one after twelve years; McLaren one after thirteen years; Armstrong and Bloodgood each one after fifteen years; Coley one after seventeen years; Ransohoff one after twenty years; Deaver one after twenty years; Matas one after twenty-five years. Ransohoff states that he was unable to find any case in literature in which the interval between the time of operation and the recurrence of the disease was as long as twenty years. The cases of Deaver and Matas were reported to him in personal communications. (See Ransohoff's paper in *Transactions of the American Surgical Association*, 1907.)

My belief is that nearly all such reported late recurrences are really not recurrences at all, but fresh outbreaks in subjects with a demonstrated susceptibility to the disease. This I believe to be particularly true in regard to recurrence in the viscera and bones. It is difficult to understand how cancer-cells could lie dormant in internal organs for so many years without giving trouble. Certainly internal cancer affecting such organs as the stomach and rectum, for instance, where there is no direct lymphatic connection with the mammary gland, can be better understood and explained on the theory of a fresh outbreak than by supposing them to be directly the result of a carcinoma of the breast antedating them by a decade or longer.

Do we believe that cancer of the liver, stomach, uterus and other internal organs runs such a quiescent course that patients live without symptoms for many years? By no means! And yet we must suppose that such is the case if they are secondary growths following a primary focus in the breast which was removed years before, and which itself has shown no signs of recurring.

If local recurrence takes place, then it is presumable that cancer-cells were left behind at the time of operation. But even in such cases is it not conceivable that we may have malignant degeneration in a cicatrix, which we know is prone to occur in other parts of the body in non-carcinomatous patients? Much more likely is it to occur in those with known predisposition to the disease.

Of all the factors influencing prognosis the variety of the neoplasm is the most important. Medullary carcinoma is the most malignant, adenocarcinoma the least. Scirrhus occupies an intermediate position, and, as already stated, withering or atrophic scirrhus is less virulent than the ordinary form. The rapidly fatal course of acute cancer has also been alluded to, and the hopelessness of cancer en cuirasse set forth.

As regards age, I believe that mammary carcinoma pursues a more fatal course in young persons than in old, for the reason that in the former class the lymphatics are both more numerous and more patent.

Concerning operative mortality, my statistics collected three years ago are significant. These statistics, based on 2133 operations, performed between the years 1893 and 1903, by twenty-one American surgeons, show the death rate to be less than one percent. This seems almost incredible when contrasted with the fifteen to twenty-five percent mortality following incomplete operations in pre-antiseptic days.

[Since the above went to the printer, Halsted's most recent article* has appeared. It particularly emphasizes the desirability of operating before axillary or other lymphatic involvement. Of 64 such cases operated, 80 percent were free from recurrence and apparently well at the end of three years. It is true that many of these cases were adenocarcinomata, in which there is little tendency to lymphatic involvement. Therefore, early operation should be insisted upon, for if

*Annals of Surgery, July, 1907.

done before axillary involvement, four out of five may be cured.

Halsted's statistics also show that where there was involvement of the axillary glands, there were only 24.5 percent of cures; so with axillary involvement the chances of cure are about one in four, without axillary involvement, four in five. No stronger argument could be made for prompt interference in any suspicious growth of the breast.

It also appears from this publication that in at least two instances Halsted encountered decided axillary involvement when the primary focus in the breast was so obscure as to escape notice.

Halsted still insists upon the neck operation, doing it in 119 cases of the 232 reported. In 44 patients the glands of the neck as well as those of the axilla were involved. "Three of these (or 7 percent) were, it seems, definitely cured."

It will, therefore, be seen that the statistics of the Johns Hopkins Hospital (232 cases covering a period of more than 15 years) indicate that 27 percent of the patients at the time of operation were free from axillary involvement. Halsted himself evidently thinks that this showing is too favorable, as he says very properly: "We must bear in mind, however, that surely in some and probably in many, if not in most of the axillæ recorded as negative, there was disease."

In my own series of 21 private patients where this feature was carefully noted and recorded, but two of them, one of adenocarcinoma and one of scirrhus, showed negative axillæ at the time of operation. It is my invariable custom to submit all axillary tissues removed to the microscopist and never to wholly depend upon macroscopic appearances.

It is evident, that my cases were at least of average, if not more than average, severity. One of them had been operated upon twice before by other surgeons for an infiltrating scirrhus; at the time I operated there was little hope for a radical cure, although I did a very extensive operation and almost lost the patient from shock. She has now been well ten years.]

Treatment.—There is but one treatment for cancer of the breast—operation—and the earlier and more radical it is, the better. It should be a work of supererogation, at this time to insist upon the fact that operation, and it only, is of the least avail in this frequent and distressing malady. In dealing with cancer pessimism is so easy, optimism so difficult, that we can hardly expect any but the younger medical men to diagnosticate and refer their cases for early operation. The false teaching of a past era still abides with many of the older practitioners, and they can neither make an early diagnosis nor appreciate the necessity of sending their cases to some one who can.

The internist should definitely refuse to treat neoplasms of the mammary gland, for all of them are strictly surgical; they are generally malignant, and, therefore, amenable only to operative procedures.

He has learned, or is fast learning, his lesson in appendicitis, strangulated hernia, and other such acute affections having a rapid and tragic end without surgical intervention; but in gall stones we still hear much of olive oil and in gastric ulcer too much about diet and drugs, which, valuable as they are, frequently are persisted in until either hemorrhage or perforation rings in the last scene to the drama. But in cancer of the breast, stomach, and other organs where there is absolutely no excuse for delay, and where the course of the disease is relentless and certain, the same responsibility is not felt on account of the chronic nature of the disease. It is, however, undoubtedly a far greater responsibility, for in acute disease nature may bring amelioration, if not relief; whereas in cancer the neglect of the family physician, who first sees the case, may condemn his patient to the most painful, lingering, and loathsome of deaths.

The law holds a practitioner responsible for failure to report certain infectious diseases, as the welfare of the public requires correct and prompt action on the part of medical men. That we are nearing the time when probably the law, but certainly public sentiment, will hold one responsible for a failure to give the proper advice to patients with cancer, there can be little doubt. It is, in my judgment, no longer justifiable to deceive patients as to the nature of their disease, for, by so doing, they are lulled into a false security and prevented from doing that which they are nearly always willing to do when the matter is properly and intelligently put before them. Rarely have I had a woman decline interference for cancer of the breast when the risk of the operation and the hazards of delay were fairly and relatively set forth. As long as cancer was synonymous with death, a want of candor was pardonable, perhaps humane; but now that early operation rightly done will cure at least one-third, probably one-half, of mammary carcinomata, patients and their friends should be plainly told the truth, delicately and with consideration, of course, but the truth nevertheless.

The public understands fairly well the possibilities of surgery in certain diseases and it is not to be questioned that it will look for and discover those who have, and whose results give them a right to have, a reasonable amount of optimism in the surgery of malignant disease.

I count myself fortunate, along with many others, to have had the privilege of listening to the teachings and to have followed as house surgeon in the wards and operating room of Jefferson Hospital, that brainy, aggressive, and prescient surgeon, Samuel W. Gross, who was curing a definite, though a small percentage of mammary carcinomata at a time when others looked upon operation as little short of leading a forlorn hope, and spoke of this Apostle of a new faith as a misguided optimist. An equally illustrious surgeon and teacher in this city was, at the same time, declaring that he had removed a "cart load of breasts for cancer and had not obtained a single cure." The teaching of these two men is felt in Philadelphia to-day, and is in a measure exemplified in the practice of their respective pupils, though a generation has passed. The one greatly advanced the cause of surgery of the breast, the other as much retarded it.

Latterly it has become somewhat the custom with practitioners to recommend a course of X-ray treatment before operation. The practice cannot be too pointedly condemned inasmuch as it has been productive of little, if any, good even in a minority of cases, and in all wastes valuable time—possibly allowing internal metastases to occur before operation is instituted. I regard the practice of using X-rays, or other local treatment before operation, as always injudicious, often positively injurious and, therefore, highly censurable. I shall later speak of this remedy as supplementary to operation and in the treatment of inoperable growths.

Before any operation in mammary cancer, we should always, so far as possible, eliminate the probability of internal metastasis. The liver, the lungs, and bones should be carefully interrogated, as these organs are most often the sites of secondary foci. That it will be clearly impossible to recognize beginning infection in any of these is, unfortunately, true; but gross or palpable invasion should prevent an operation for the removal of the primary focus unless it be undertaken simply as a palliative procedure and with no hope of a radical cure. Such operations do but little good and discredit both the operator and surgery.

One has only to follow the operation for cancer of the breast through its various evolutionary stages, to be convinced that the radical procedure, as we now understand it, is as much better than the partial operations practised before Halsted's epoch-making paper in the Annals of Surgery in 1894, as these were better than the caustics, electricity and internal medication of former days. The argument often made that extensive operations are not justifiable in cases seen early is entirely erroneous. Truth to say, early cases are the very ones where a complete operation should be done, as there is for them a substantial hope of a permanent cure. Moreover, it is impossible to determine by any examination, however carefully conducted, the exact limits of a growth that is always unencapsuled and infiltrating in its nature, such as cancer. Therefore, it is always safe to assume that there is a more extensive zone of infection than is apparent, and that it is wise to remove enough tissue to insure its probable complete eradication, inasmuch as this can be done without increasing the operative mortality or lessening the future usefulness of the patient. To do this one must constantly keep in mind the fact that carcinoma generalizes through the lymphatics, and that early, very early, in the disease the axillary lymphatic glands become involved, so that in any operative procedure the primary focus in the breast, the axillary nodes, and the intervening lymph-bearing vessels containing cancer cells must be simultaneously removed. Hence the utter inadequacy of treatment by caustics, which at the most can only reach the primary focus in the breast, and can only do this in small, discrete growths at the expense of great pain, sloughing, and probable sepsis.

Caustics.—The treatment of cancer of the breast by various *pastes* or *caustics* has no place in surgery and should not for a moment be countenanced. Valuable as they are in certain squamous epitheliomata of the face, where there is little tendency to glandular infection and where it is desirable to avoid disfigurement, they are wholly inadequate to cope with acinous carcinoma in an organ like the breast. I feel like offering an apology for dignifying them by mention and only do so because they, along with the Roentgen rays, are still given an amount of credit altogether out of proportion to their deserts.

The *trypsin*, or *trypsin-amylopsin*, treatment of carcinoma, based upon Beard's theory that wandering embryonal cells develop into malignant neoplasms owing to the fact that they have escaped the destructive action of certain enzymes, is mentioned here for the purpose of condemning it as a curative measure. The practitioner should guard himself well against the acceptance of such extravagant assertions as have been made by a few enthusiasts in favor of this treatment.

This is not the place to discuss Beard's theory of the causation of cancer. It will suffice to say that his ideas have not been accepted in their entirety by those best qualified to judge of the matter.

Concerning the trypsin treatment itself, a complete analysis of the clinical evidence obtainable, such as has been recently made by several investigators, notably Dr. Ellen C. Potter, of Philadelphia, shows that no specific action is exerted by the ferments. Dr. Potter very appropriately calls attention to the circumstance that changes in malignant growths similar to those supposed to have been produced by trypsin have occurred in tumors which were not subjected to any treatment whatsoever, and have also been observed in those treated with bacterial vaccines.

As a palliative measure in inoperable cases, and in those in which operation is refused, the treatment may be employed. It is stated that ulceration has been limited or arrested, that gain in weight has taken place, and that improvement in the general condition has occurred under its use. These considerations, if true, are important. At all events they are encouraging, as they offer a possibility of adding somewhat to our measures of relief for inoperable cases.

To employ such a novel and fanciful method of therapy in lieu of operation would be highly injudicious, indeed censurable.

Oöphorectomy, which was first recommended by Mr. Beatson, has occasionally been performed as a therapeutic measure in inoperable mammary cancer. As I have had no experience with it, I cannot do better than quote Mr. Hugh Lett, who has made an exhaustive study of the subject, based upon ninety-nine cases.

His conclusions are as follows:

(1) There was a very marked improvement in 23.2 percent, and distinct, though less marked, improvement in 13 other cases; that is, 36.4 percent of all cases operated upon were materially benefited by the operation. If the patients who were more than 50 years old are omitted, of the remaining 75 cases 29.3 percent showed very marked improvement, and nine others showed distinct improvement; that is 41.3 percent were benefited by the operation.

(2) In successful cases the benefit has been great, and is mainly shown in relief from pain, marked improvement in health, diminution or even disappearance of the growth, healing of ulcers, and prolongation of life.

(3) The duration of the improvement is not very often stated, but in 15 cases the improved condition was maintained for more than twelve months and four other patients had good health for 4½ years or more.

(4) Oöphorectomy does not cure the disease, for in all the cases in which the growth has disappeared after the operation it has subsequently reappeared, locally or elsewhere, with the exception of one patient, who is alive and free from recognizable cancer at the present time, five years after oöphorectomy.

(5) The most favorable age for operation is from 45 to 50; in relatively young patients it should be given a further trial, but after 50 it is rarely worth doing. The fact that the patient has passed the menopause does not contraindicate the operation.

(6) Thyroid extract is not a necessary factor in the treatment, although the results have been slightly better when it has been given.

(7) Secondary growths in the viscera contraindicate the

operation; rapidity of growth, or an early recurrence after the primary operation, makes the prognosis unfavorable.

(8) The mortality in this series of cases is high—a little over 6 percent. It should be noted, however, that the actual cause of death in several of these cases may be regarded as accidental; in two the fatal issue was due to pulmonary embolism and in one to acute mania.

Since the somewhat tardy acceptance and adoption of radical operative measures by surgeons in general, the number of cures has not only doubled, but quadrupled. While it is true that occasional permanent cures were recorded before Moore's paper in 1867, they were accidental and fortuitous and must have been in favorable cases with only a primary focus in the breast, and without extensive cutaneous, muscular, or axillary involvement. Further, it is not unlikely that many of the cases supposed to have been cured were non-cancerous, as the custom before Moore's paper was not so general as it is now of submitting all tumors, after their removal, to the microscope. Still, a careful study of the work and teachings of Astley Cooper and Velpeau indicates strikingly their familiarity with the anatomy of the breast and its outlying rudiments, the gross pathology of the disease, and their appreciation of the necessity for a free excision for its complete eradication. That their work in mammary cancer stands out in bold relief from that of their contemporaries is nothing more than should be expected of two such masterful minds, making as lasting an impression upon the surgery of their respective countries, and the world, as it is given to men to do.

Sir Astley, who is still quoted by the anatomists for his original work on the Anatomy of the Mamma, shows in his writings an accurate knowledge of the pathology of cancer: "The scirrhus tumor is not all of the disease; there are roots which extend to a considerable distance. When you dissect a scirrhus tumor you see a number of roots proceeding to a considerable distance; and if you remove the tumor only, and not the roots, there will be little advantage from the operation."

The great clinician, Velpeau, spoke positively and authoritatively in the early fifties, reporting a score of cases which had not only passed the three year limit, which is required to-day, but had all even passed a five year limit; some of the patients had lived without recurrence for twenty-five years after the operation. It is refreshing to read such words as these from this surgical master written more than half a century ago. "Des Observations tirées de ma proper pratique démontrent, sans contestation possible, l'existence de guérisons radicales par l'operation." These words are in strange contrast with the teachings of the elder Gross, Paget, and Virchow, his contemporaries in America, England and Germany, and other leading surgical pathologists of their time.

As long as the constitutional origin of cancer was adhered to, nothing but pessimism could permeate those who contemplated its removal by local means.

History of the Operation for the Cure of Mammary Carcinoma.—The author of the modern, or complete operation, as we understand it to-day, is unquestionably Mr. Charles Moore, formerly a surgeon of the Middlesex Hospital, London, who, in 1867, published a paper, remarkable for its foresight and keen observation, "On the Influence of Inadequate Operations on the Theory of Cancer."*

That others, Velpeau for instance, had suspected much that was true cannot be doubted, but it remained for Moore to enunciate clearly and distinctly principles which are to-day accepted everywhere. In fact his views were so much at variance with the prevailing English opinion of their time, that his teaching became an "accepted tradition only at the Middlesex Hospital,"† being rejected elsewhere in England

*Trans. Royal Med. Chir. Soc., Vol. I, 1867.

† Handley's Carcinoma of the Breast.

until it was strenuously advocated in 1882, fifteen years later, by Sir Mitchell Banks, of Liverpool. Meantime, however, the Germans, Danes, and Austrians had been actively at work in putting into practice the teachings of Moore, and are undoubtedly entitled to the credit of popularizing the complete operation. In this work Volkmann was foremost.

S. W. Gross, in America, was quick to appreciate the excellent work of German surgeons, and in the late seventies began to teach and practice the principles laid down by Moore. I personally assisted him in such operations during my service as interne in the Jefferson Hospital during 1879–80.

Moore's teaching, while often referred to, is not as thoroughly understood even by surgeons and teachers as it should be, for it was he who shattered and utterly demolished the constitutional theory of cancer, which had been accepted by the profession, and had made operative advance wellnigh impossible. He insisted that the entire breast should be removed and with it all involved structures such as skin, fat, pectoral fascia, pectoral muscle, and enlarged lymphatic glands. Moreover, he emphasized that it should be done in such a way that the growth was neither cut into nor seen, which means that the diseased structures should be removed en masse—a detail much insisted upon of late without giving credit to Moore.

Volkmann was probably the first to remove the pectoral muscles—major in a series of 38 cases, minor in a much smaller number. His results in this series, though the cases were more advanced, with cancerous infiltration of one or both muscles, were much better as far as regional and local recurrences are concerned, than in his milder and altogether more favorable cases where the muscles were not removed because apparently healthy.

Heidenhain recommended that the fascia covering the pectoralis major, along with the most superficial fibers of the muscle itself, be removed. He believed this to be enough, as he demonstrated that the lymph current was from and not in the direction of the fascia. It should not be forgotten, however, that S. W. Gross advised and practised removing the pectoral fascia in 1879, and that Volkmann had done so in 1875. Thus Heidenhain only emphasized the previous teachings of Moore (1867), Volkmann (1875), and Gross (1879), supplementing them with careful microscopical studies and a better understanding of the lymph currents. More credit than the facts warrant has been given to him by English and American surgeons.

To Halsted, however, is due the credit of advising the removal of the muscles in every case regardless of infection. I quote from his paper of 1894: "The pectoralis major muscle, entire or all except its clavicular portion, should be excised in every case of cancer of the breast, because the operator is enabled to remove in one piece all of the suspected tissues. The suspected tissues should be removed in one piece, (1) lest the wound become infected by the division of tissues invaded by the disease, or of lymphatic vessels containing cancer cells, and (2) because shreds or pieces of cancerous tissue might readily be overlooked in a piecemeal extirpation."

Willy Meyer* about the same time advised the removal of the great pectoral and urged in addition that the lesser pectoral be also removed so as to insure a more complete axillary dissection.

Recent investigations by Grossmann and Rotter indicate clearly the wisdom of removing the muscles always, as the major muscle is involved in fifty percent of all cases, and it is simply impossible to remove infected tissue—lymphatic vessels and glands between them—without doing so. Further, Rotter insists that in one-half of all cases there will certainly be found enlarged lymphatic glands between the muscles which cannot be recognized with the pectorals in situ. Gross-

* Medical Record, 1894.

mann succeeded three times in thirty subjects in injecting a lymph-bearing vessel from the mammary gland, which perforated the great pectoral, running between it and the pectoralis minor, to empty finally into the subclavian or topmost axillary glands. It is along the course of this vessel that Rotter found enlarged glands.

I have during the past year operated upon two cases with well marked retro-pectoral enlarged nodes, calling the attention of my assistants to them, and to the observations of Rotter. I am convinced that the nodes would have been overlooked in both cases had not the great pectoral been removed. The experiments of Grossmann and Rotter demonstrate the wisdom of Halsted's and Meyer's suggestion, that the muscles be removed in every case regardless of infection. The great pectoral is so frequently diseased as to be a menace if left behind; the small pectoral, while less frequently infected, is a barrier to one, if not the most essential step, of the operation, namely, a thorough axillary dissection. I hold that it is exceedingly difficult, if not impossible, satisfactorily to clear the space of Mohrenheim—between the upper border of the tendon of the pectoralis minor and the clavicle—of fat, glands, and the fascia covering the vessels without injury to the latter if the muscles are in situ. The retention of the muscles is of no special value, so far as the future usefulness of the arm is concerned, and their removal or division is a necessity for thorough and accurate work.

I know there are some who conscientiously think that they do a perfect axillary dissection by the skilful use of retractors—without division or removal of the muscles. I was thus deceived for several years, but now fully realize that my work was incomplete, and, moreover, understand recurrences which were at the time both disappointing and disheartening.

There are from three to twelve lymphatic glands in Mohrenheim's space, and when infected these nodes receive afferent vessels from all of the axillary glands below. These glands are intimately associated with the axillary vein, lying to its inner aspect at the point where it receives the cephalic vein. When these glands are enlarged or adherent to the vessels, injury is easily done to the axillary or cephalic vein, unless their removal is accomplished by careful dissection. To leave them behind would doom inevitably any operation to failure.

Another reason for removing the lesser muscle is the occasional presence of enlarged glands between the vein and the artery, which can only be reached by lifting up the vein and displacing it inwards. This can easily and safely be done by means of a small retractor, provided the muscles have been removed or divided and then retracted.

Removal of the fascia surrounding the vessels is also desirable, and presupposes the removal of the muscles. This step certainly requires that the vessels be not only exposed, but seen in a good light.

I have, I trust, given satisfactory reasons for believing that the muscles should preferably be removed in every case, and have shown how recent anatomic investigations and experiments demonstrate forcibly the correctness of the teaching and clinical judgment of Halsted as expressed in 1894.

That the removal of the muscles is necessary in every case no one will or should maintain, as nearly all doing work in this line have indubitable cures to their credit where the muscles were spared, the patients having long since passed the period of probable danger. These, however, were early and favorable cases, and the removal of the muscles has simply become a natural, logical, I may say, inevitable step in the evolution of the operation.

Supraclavicular Glands.—In 1892 Halsted first practised removal of the supraclavicular glands, and in his paper of 1894 advised that it be done as a routine procedure. Prior to this time it had never been done and, moreover, enlarged cervical glands were unanimously considered an absolute bar to operation. In short, such a case was thought hopeless. Halsted's suggestion has not been generally adopted by American surgeons, and few outside of Johns Hopkins Hospital have removed the glands of the neck unless palpably enlarged or unless there was macroscopical involvement of the topmost axillary glands. Twenty-five American surgeons to whom I addressed the question, "Do you explore the supraclavicular space?" answered that they did not unless there was palpable involvement. Two believe that it should be done more often, on account of recent anatomical discoveries. In this opinion I distinctly concur, and have made it an invariable rule to explore the subclavian triangle if the tumor is a peripheral one in the upper hemisphere, since the discovery by Poirier and Cunéo of a set of lymphatic vessels which drain the upper half of the breast, thence passing over the clavicle to empty into the supraclavicular lymphatic glands. As carcinomata are so often located in the upper and outer quadrant of the breast, I should say that it would be safer to explore the neck in a majority of instances, and I have done so for the last four years. I have but infrequently found it involved; still I do not feel that my duty has been accomplished until the incision—the work of a moment—is made.

Halsted and his associates at the Johns Hopkins Hospital are removing the glands of the neck in a decreasing number of cases, and it is equally true, I think, that other American surgeons are operating upon the neck in an increasing number; so that Halsted's original position, while possibly extreme, has been productive of good and brought the rest of us up to the mark. I do not question the wisdom of the procedure if there is noticeable enlargement of the supraclavicular glands, if the subclavian chain of the axillary glands are at all enlarged, or without such enlargement in all cancers of the upper hemisphere.

Therefore, recent discoveries entirely support Halsted in his contention that the neck should be often explored. To give his exact position I quote from a letter from him: "Of 76 cases cured three or more years, the supraclavicular glands were involved (and of course removed) in 7 (9 percent). The involvement of the supraclavicular glands is, of course, much greater than 9 percent, where all cases in which the complete operation has been performed are included. The proof, then, is definite and ample that the supraclavicular operation is indicated in many, perhaps most, cases of carcinoma of the breast."

I cannot say that I have cured a patient with neck involvement, yet one lived for four years after operation without regional recurrence in the neck, but had lethal recurrences in the breast incision. Though this patient was not cured, her case at least taught me that very decided enlargement of cervical glands low down—they altogether made a mass as large as a small lemon—does not necessarily mean inoperability. If glands in the higher triangles are involved, the case is clearly inoperable.

Skin Incision.—The early, frequent, and extensive involvement of the skin in mammary cancer demanded, and should have received, in the incipiency of its operative treatment, a free removal of the integument covering the affected breast. This is particularly so as the principal lymph channels draining the breast are known to be in the skin; Sappey and other early anatomists believed that nearly all such vessels were to be found there. Yet in spite of anatomy, pathology and successful surgery calling for a free removal of skin as the prime consideration—even of greater moment possibly than a complete extirpation of the gland and its outlying rudiments—we still often see practised the antiquated elliptical incision of our forefathers. So little of the infected integument is removed by these incisions that subsequent steps in the operation, however well planned and carried out, are necessarily futile.

I wish to state positively my belief that the excellent results of Gross and Banks must have been due to the free removal of skin practised by each, for neither of them sacrificed the muscles—the former dying in 1889, five years before Halsted suggested it as a routine procedure and the latter, though living until 1904, never believed removal of the muscles necessary.

I was the guest of Sir Mitchell in 1904, saw him brilliantly do his last two operations for mammary cancer, and afterwards discussed freely with him the value of removing the muscles. He could not be convinced that he had for so many years omitted an important step in an operation which he did so much to perfect and with which his honored name must forever be associated. In a letter written me a few days before his death he reviewed his work, spoke hopefully of the operative treatment of cancer, and especially insisted upon a large ring incision. His operations reminded me of Gross's "dinner plate incision."

To give some conception of the magnitude of Gross's operation, I may relate that I was assisting him one day when he remarked to a friendly guest present, "I will show you my dinner plate incision." It was an enormous breast, the wound made unusually large, and when he had finished, the astonished onlooker said "dinner plate, h—l, it looks more like a cartwheel." We all had a good laugh over the remark, and I shall never forget the surprise of his friend and the gratification of Gross, for he was immensely pleased that the size of his incision had been emphasized even with language more forcible than elegant.

Gross cured 21.5 percent of his cases; Banks 21 percent, and, as neither did what is to-day regarded as a good axillary dissection, because neither removed the muscles, their results must have been largely due to their wide removal of skin. Banks usually succeeded in closing his wound, or the greater portion of it, by extensive undermining of the skin. Gross allowed his wounds to heal by granulation. I have never seen two surgeons operate so similarly as did Banks and Gross in their breast work, and it is shown in their results, 21 and 21.5 percent of cures respectively.

Halsted makes a large wound—almost as large as that of either of the above mentioned surgeons—and supplements it by skin grafting—a distinct improvement and advance. The more I graft the better am I satisfied with my work, for there is no fear of probable failure to secure primary union—a fear which I believe always more or less fetters one when making any of the flap or plastic operations. That the best of them may often succeed admirably in meeting all requirements, pathological and surgical, there is no question; but that they sometimes fail, on account of infected skin being retained, is certain.

In large tumors with extensively adherent skin, the ring or dinner plate incision supplemented by skin grafting, preferably at the same operation, will be safer.

The disposition of some to graft later when the wound has begun to granulate has little to recommend it, as it necessitates a second anesthesia and is not so likely to succeed as when done primarily. That there is somewhat of a prejudice against grafting both on the part of patients and profession is quite true. The scar it leaves is certainly unsightly; but it is supple and not inclined to contract and bind the arm as nearly all of the plastic procedures do. I distinctly favor it and am resorting to it in an increasing number of cases.

The next decided step in advance was the removal of the fascia covering the pectoralis major muscle. As already stated the credit for this is generally ascribed to Heidenhain, who undoubtedly did much to popularize the procedure, and made experiments showing that the lymph current was from and not in the direction of the fascia. In removing the fascia he also shaved off the superficial fibers of the pectoralis major. While giving full credit for his work, I have shown that others preceded him in this step of the completed operation. Moreover, that he overestimated the value of removing the fascia cannot now be questioned in view of more recent demonstrations, to which reference has already been made. In all tumors adherent to the costal wall and in those cases with retro-pectoral enlarged nodes it would necessarily be futile.

Axilla.—When, why, and by whom the axilla was first explored in operations for mammary cancer, it would be difficult to say. Moore recommended the removal of axillary glands which were palpably enlarged (1867), and, according to Professor Cheyne, "Lord Lister in the late sixties began doing a very free operation, which included in most cases the free removal of skin and ablation of the pectoral fascia and axillary glands."* But as the glands are palpably enlarged in "most cases" we may assume that Lister, at this early date, only invaded the axilla when it seemed to be necessary. That others did likewise, there is abundant testimony, for Volkmann in 1875 and Küster before him believed it a necessary step. It remained, however, for the younger Gross in 1880, in his "Tumors of the Mammary Gland," to insist that the axilla be explored in every case, and to him belongs the credit of popularizing this step. I quote his words: "Even if I should be deemed too bold in recommending that the axilla be attacked, when it is apparently free from disease, surgeons of extended experience will certainly agree with me in regarding the adipose tissue as being largely infiltrated by young cells, for it is just precisely in corpulent subjects that local reproduction is most marked along the line of the cicatrix of partial operations, or, in other words, in the fat which they have been too anxious to save in order that they might secure thick and seemly flaps." Again in 1888, in his last publication, Gross insisted strongly upon the necessity of cleaning out the axilla in every case,

*Handley's Cancer of the Breast, p. 172.

calling attention to outlying lobules of breast tissue which must not be overlooked. I know that he did so during my student days in 1878 and my internship in Jefferson Hospital in 1879. He insisted upon what every one now believes, that enlarged glands in the axilla, especially in a fat subject, may elude the most careful examination before the axillary space is opened and explored. Therefore, he explored the axilla in every case of cancer.

The fault with his work was that, far ahead of his time as it was, it did not go far enough, as he only reached the base of the axilla and depended upon a piecemeal extirpation. The axillary step of his operation would not be called thorough to-day, for I repeat, what has already been said, *that a thorough axillary dissection cannot be made with the muscles in situ.*

The defect with the axillary dissections of Gross, and I believe with those of all others up to the time of Halsted, lay in the fact that a separate incision was made into the axilla, after the breast had been removed and lymph-bearing vessels had been cut across. Further, it was a small wound, permitting only a piecemeal removal of palpably enlarged glands, good thorough work under the guidance of the eye being impossible. It was a long step in advance, but it fell far short of the mark.

It is now interesting to see how all surgeons, American, English, German, and French feared invasion of the axilla on account of the increased risk. The mortality from the simple operation was fifteen percent, and double that when the axilla was attacked. For this reason some of the very best English authorities, Butlin, Treves, and others, seriously argued against the complete operation. Gross admitted the increased danger, but advised that it be assumed on account of the fruitlessness of the operation without it.

How aseptic surgery has changed things and made really serious and able disquisitions of one time—and that not so very long ago—seem trivial to-day! Truly has the prediction of Billroth come to pass: "I should not be surprised if an experienced operator were to succeed in doing 100 consecutive extirpations with but a single death." He admitted a death rate of more than 20 percent, counting all of his cases, and got his best results from the complete operation under strict antisepsis (1877–79), his mortality then dropping to 5.8 percent. The operative mortality in 2133 operations performed since 1893 by twenty-one American surgeons reporting to me was less than one percent.

In 231 operations performed under strict antiseptic precautions by Lister, Volkmann and Billroth, the mortality was 6 percent.* True, these operations were done in the decade from 1870–1880, but all were in the hands of the best exponents of antiseptic surgery.

The best results, secured from any standpoint, have been gained since Halsted's paper in 1894, which may justly be said to mark the second epoch in surgery for mammary cancer. Twenty-seven years after Moore's publication, it re-affirmed and with greater emphasis, because it was supported by incontrovertible statistics, every position taken by Moore, going many steps in advance of him and every one else.

The axillary feature of Halsted's operation is its best; all glands, fat and fascia covering vessels and muscles are removed en masse, and nothing left from apex to base but vessels and nerves. A piecemeal extirpation is to be condemned.

Removal of Deep Fascia.—In 1904, Mr. Handley, in a paper read before the Surgical Section of the British Medical Association, advised a still more extensive operative procedure than had hitherto been practised, founded upon his theory of permeation of cancer cells along the deep fascia. I was much impressed by hearing his paper and the discussion which followed it, and since then have myself practised a freer removal of the deep

*Williams' Diseases of the Breast, p. 362.

fascia than before. I believe he is right in advocating that the fascia covering the upper part of the rectus and external oblique muscles be removed to a greater extent than heretofore. I always remove the fascia covering the serratus and subscapularis muscles.

I am hardly prepared, however, to accept the suggestion given in his recent excellent treatise on cancer, that the digitations of the serratus magnus and external oblique muscles be removed. It seems to me that the limits of the operation have about been reached and that to carry it out conscientiously in every detail the complete operation, as we now understand it, will require from one to two hours, according to the rapidity of the work. Moreover, I am not convinced of the necessity for removing these muscles as a routine procedure. Carcinomata are usually located in the upper and outer quadrant of the gland, a small part of which lies in contact with the serratus and does not touch the external oblique. It would, therefore, seem a work of supererogation to remove even a portion of these muscles unless adherence to the costal wall has taken place. In large growths of the lower and outer quadrant, especially if the gland is adherent to the costal wall, and, therefore, in contact with both muscles, the fascia covering them should certainly be removed and along with it the superficial fibers of the muscles themselves. I would not be disposed to remove the digitations in their entirety, as it would seem to me that any case so far advanced as to make this necessary is hopeless and beyond the reach of surgery.

Removal of the Breast.—Since Stiles's* valuable contribution to the surgical anatomy of the breast, it is reasonably certain that in many, perhaps most, operations prior to that time the diseased mammæ were incompletely removed. He showed by

*Edinburgh Medical Journal, 1892.

careful investigation and his nitric acid test,* that the gland is a much more extensive structure than was formerly believed, and that the periphery and detached portions were necessarily left behind after any of the usual operative procedures of the time. His work was most valuable and contributed greatly to the "complete operation" of the present day. He clearly demonstrated that the gland often extends up nearly to the clavicle, always considerably below the margin of the pectoralis major, overlapping the serratus magnus, external oblique and rectus muscles. Externally it is prolonged into the axilla, making a well-marked axillary tail.

Stiles's paper was a positive demonstration that nearly all of the elliptical incisions formerly employed were inadequate for the removal of the breast in its entirety. His investigations strongly emphasized the necessity of either a very free removal of skin as practised by Banks and Gross in their circular incisions, or an elliptical incision which is supplemented by extensive undermining of the integument and free removal of para-mammary fat.

Para-mammary Fat.—More has been said, perhaps, than is necessary about the removal of fat, para-mammary, axillary, and in the flaps. Yet it is of the greatest importance to remove the fat, because in doing so the very small lymphatic glands are at the same time removed and might be overlooked if the fat were left behind. The axillary fat, as has already been said, should go, every particle of it, along with the fascia. If the circular incision, the racquet incision of Warren, Jackson's method, and the best of the numerous elliptical incisions, to be described later on, be rightly done, little uneasiness need be felt concerning the para-mammary fat. It will have been attended to in the planning of the preliminary incision.

† Wash the breast in running water to free it from blood, immerse it in a 5 percent solution of nitric acid for ten minutes, wash again and then put it in methyl alcohol. The epithelial structures assume a dull, opaque grayish hue, which differs markedly in appearance from the stroma. (Edinburgh Medical Journal, June, 1892.)

We have traced the several important steps of the operation for cancer of the breast through their various evolutionary changes until we now have the complete operation as it is understood and practised by the best surgeons the world over. Briefly to summarize, they are: *A free removal of skin; complete extirpation of the breast with the para-mammary fat; removal of the pectoral muscles; a complete dissection of the axilla; and a sufficiently free removal of deep fascia covering the rectus, serratus magnus, and external oblique. All tissues must be removed in one piece and without undue or forcible manipulation, so as to avoid the possibility of expressing cancer cells from severed lymphatic vessels, thereby incurring the risk of inoculating the wound.*

Relative Importance of the Several Steps.—It would, of course, be profitable to know just what each step in the "completed" operation has contributed to the sum total of cures. I think that we may rightly use such a term, as operative measures have become about as extensive as they well can be if indeed they have not reached the very Ultima Thule of justifiable surgery. This can never be known definitely. Valuable information, however, is gained by taking the statistics of the best men of different decades and contrasting, so far as is practicable, the differences in their methods of operating. The first statistics of real value were those of Gross in 1880, compiled largely from the Danish, German and Austrian surgeons, who were the first to recognize the possibilities of Moore's operation; these yielded 9.05 percent of cures passing the three year limit without regional or internal recurrence. At this time the breast was incompletely removed because a small incision was made, the axilla was not opened unless palpably the site of metastasis, and then only a few enlarged glands were pulled out by blunt finger dissection.

The next papers of great importance were published in 1888 by Gross and Sir Mitchell Banks respectively, and it will be seen that these surgeons reach the same theoretical and practical results, 21.5 and 21. No two men ever operated more alike. Both made a large wound, both removed the pectoral fascia, neither sacrificed the muscles, and both did a fairly good dissection of the axilla; very good at the base, indifferent at the middle, and wanting at the apex or space of Mohrenheim.

W. T. Bull, in 1895, published his own statistics in 118 cases, and attained somewhat better results than Gross and Banks had done (26.6 percent of cures). No series of cases had ever been more carefully and conscientiously followed up, and such results in the practice of this thoroughly well-known, conservative, and able surgeon did much to give an impetus to radical operations. Moreover, he stated with greater definiteness the axillary condition in his cases than others had done, and measured more accurately its effect upon the result of operation. His method of operating was very similar to that of Gross and Banks in every respect save one—he did a much better and a more thorough axillary dissection than either of them and removed so far as it was possible, without sacrificing the muscles, everything en masse. Therefore, it would seem fair to state that his additional five percent of permanent cures was due to more thorough work in the axilla.

Having seen all three operate and knowing that each did exactly the same operation up to this step, I am convinced that Bull was entitled to the advantage shown by his statistics. Hence, we are, I think, amply warranted in saying that a *fair* axillary dissection will save double the number of cases (21.5 percent) that will follow removal of the breast alone (9.5 percent) and that a *good* axillary dissection will save an additional five percent (26.6 percent) of such patients. Of Bull's *cured* patients 40 percent had decided axillary involvement before operation. Of the entire number operated more than 61 percent had axillary involvement.

Halsted has just published a report of 232 cases operated upon by himself and assistants in the Johns Hopkins Hospital. There were 38.3 percent free from recurrence three years or longer. In 14 cases metastasis appeared later than three years; in two, more than six years after operation and in one eight years after.

This last report of Halsted is very satisfactory, inasmuch as his operation has now been on trial for 16 years. It also is instructive as pointed out under prognosis in showing clearly the advantage from early operation before there is involvement of the axilla.

It will be interesting to see, should the theory of Mr. Handley meet with general acceptance and his suggestion for still more extensive operative measures be followed out in practice, if the permanent results warrant the increased primary risk.

Technique.—As a complete operation for carcinoma of the mammary gland is one of some magnitude, due preparation should be given the patient beforehand. A general bath should be taken the evening before, it being followed by a careful shaving of the axilla, and the skin of the thorax, axilla, and arm thoroughly cleansed with antiseptic soap, bichloride solution 1–1000, ether and alcohol. Then the breast and adjacent parts involved in the operation are to be covered during the night, and up to the time of operation, with aseptic gauze.

A mild purge of calomel is taken the afternoon or evening before, and if the bowels have not acted freely by 7 A. M. the day of the operation, an enema is given. Free catharsis is to be avoided, as these patients are frequently old, and excessive purgation may add to the shock usually incident to so prolonged an operative procedure.

The operation should preferably be set for 10 A. M., when the light is good—a necessity for a thorough axillary dissection. Prolonged operations in the afternoon must at times be finished by artificial light. Moreover, they occasion a day of anxiety to the patient.

The temperature of the operating room should not be less than 72° F. and it is better to either place the patient upon a heated table or surround her with hot water bottles, being careful, of course, that burning of the skin does not occur. My invariable custom is to administer $\frac{1}{6}$ to $\frac{1}{4}$ of a grain of morphia with $\frac{1}{150}$ of atropine hypodermatically one hour before beginning ether. This, I am convinced, tranquilizes the patient, lessens the amount of the anesthetic, minimizes shock, and materially contributes to post-operative comfort. The preliminary hypodermic is particularly called for if there be, as is so often the case, accompanying bronchial, cardiac or renal complications. The ether is always given slowly and by the drop method.

The operating room should be well lighted, and if the day is cloudy a good electric light will materially aid in the axillary dissection.

Besides the anesthetist, three assistants are necessary. The first assistant stands opposite to the operator, giving necessary assistance at every stage of the operation. He should be experienced, collected, and thoroughly familiar with the various steps of the operation, for upon him largely will depend both the rapidity and thoroughness of the work. The second assistant stands on the same side as the operator, holding the arm and moving it from time to time as requested. The third assistant handles the instruments, and I find that a nurse is, as a rule, defter in picking up forceps, ligatures, threading needles, etc., etc., than the average house surgeon. Always a little, and sometimes a great deal of time, can be saved in this operation by a good third assistant. All should wear rubber gloves. A fourth assistant may be held in reserve in the event of pronounced shock, so that enteroclysis or hypodermoclysis may be promptly given without in any way delaying the operation. This rarely, though sometimes, is necessary.

Instruments.—At least two, preferably three, very sharp scalpels, two dozen hemostatic forceps, smooth and toothed dissecting forceps, large and small straight scissors, large and small curved scissors, Allis's or Mayo's blunt dissector, retractors large and small, straight and curved needles, and a fenestrated rubber drainage tube should be at hand.

As skin grafting is so often required, either a sharp razor, or, what is better, a medium size amputating knife, tenacula and two sterilized blocks of wood for making the skin of the thigh tense should be in readiness. It is unnecessary to prepare the thigh for grafting before the operation, as it is quickly done when necessary by the fourth assistant without delaying matters, and if done beforehand disturbs somewhat the mental tranquility of the patient and emphasizes in her mind the magnitude of the operation. She should be told, however, that it may be necessary.

Ligatures.—I prefer fine Pagenstecher for ligatures. Silk, of course, will answer very well, but the tensile strength of linen is greater and it is as well or better taken care of by the tissues. Catgut prepared by either the Bartlett or Claudius method may be used should a strictly absorbable material be preferred.

Sutures.—For closing the wound I prefer horse hair, using the continuous suture after the buttonhole method, unless there is too much tension, in which event supplementary interrupted sutures of Pagenstecher or silk are placed where they are most needed or used throughout.

Dressing.—An abundant dressing of sterile gauze should cover the wound, thorax, axilla, arm, and neck. The dressing should be so applied as to make firm pressure, in the axilla especially, so as to obliterate any dead space. This is of much importance and greatly enhances the chances of primary union. As the dressing must be changed at the end of 24–48 hours, so that the drainage tube may be removed and dry gauze substituted for that previously used, which will be found quite wet in the vicinity of the tube, plaster-of-Paris or other imper-

Paget's Disease of the Nipple

meable dressings should be omitted. They are quite unnecessary, their application always time-consuming, and it may be a matter of moment in the event of secondary hemorrhage to reach and open the wound as quickly as possible. Moreover, they prevent the prompt recognition of hemorrhage, save by the symptoms, which means that a great, perhaps a lethal amount of blood might be lost before the nurse would suspect what was wrong.

As soon as the dressings are applied the patient should be placed on a carriage covered with warm blankets and quickly removed to her room, the temperature of which should be at least 75° F.—preferably 80°.

The axillary or rectal temperature should at once be taken and will usually indicate a fall of several degrees. An axillary temperature of 95° is by no means rare and I have often seen it less. As a rule nothing further will be required. In the event, however, of a markedly subnormal temperature accompanied by other symptoms of shock, an enema of hot coffee and saline solution should be given, the foot of the bed elevated, and a further hypodermatic injection of atropine administered, accompanied by morphia if the patient is suffering pain. In the most severe cases hypodermoclysis with adrenalin should be given in the *thigh*, so as not to disturb the dressing over the thorax.

For strychnia as a remedy in shock I have little appreciation and believe that in many, perhaps most, cases, it is harmful. It is only in the relatively rare cases where the pulse is slow and wavering, the shabby pulse as it has been called, that it is desirable to increase the frequency and force of the systole by strychnia. Then it acts favorably and promptly. In the small and frequent pulse so usual in shock, strychnia exaggerates the condition and "lashes the tired horse."

Even though there be no shock, it is my invariable custom to order that enteroclysis be given every four hours during the first 48 hours, or until the patient is able to take plenty of fluids by the stomach. Six to eight ounces of normal salt solution with a desertspoonful of the infusion of digitallis will usually be retained without difficulty. This quenches thirst, flushes out the kidneys, and in every way subserves the patient's comfort. I consider it too helpful to be omitted in any case. If there is not great tension upon the flaps the preliminary dose of morphia may be all that is necessary. It is not unusual, however, for a second dose to be required in the evening or night following the operation if tension upon the flaps has been made in closing the wound.

Operation.—I prefer ether anesthesia given cautiously by the drop method, though not infrequently use chloroform if there is contra-indication to ether. It is of importance in the first instance that the anesthetist, before beginning the ether, adjust, if it has not already been done, a rubber cap to the patient's head, the hair being done up on top. This keeps the hair from possibly getting into the wound.

Secondly, he is instructed to lighten the anesthesia from time to time after the incisions through the skin have been made. Light anesthesia suffices during the occasionally prolonged axillary dissection.

Thirdly, he should be warned to keep his own and the patient's head turned to the opposite side so as to prevent their breathing into the wound or possibly infecting it with saliva, vomitus, etc. He, as well as all others taking part in the operation, should wear a mask and take every precaution that other assistants do to insure sterility. It would appear better to have a screen or shield, which will effectually prevent either the patient or the anesthetist from contaminating the wound. It is, however, inconvenient; prevents the operator from looking into the face of the patient and the anesthetist from observing her movements, a hint for deeper anesthesia, or from seeing the dark color of the blood incident to profound narcosis. Without a most experienced and trustworthy anesthetist, the screen is a disadvantage, as infection of the wound by either patient or anesthetist must be infrequent and the risks of anesthesia are certainly increased by the use of the screen.

I shall describe the steps of the operation I now do, and which, I think, embraces the good features of the most approved and accepted procedures for carcinoma of the breast. A straight incision is made beginning one inch below the clavicle, two finger-breadths from and parallel with the sulcus between the deltoid and the clavicular portion of the pectoralis major. It extends well below the free edge of the pectoralis major muscle, and in extent will usually be from five to six inches or more, according to the stature of the subject and the size of the breast. (Plate XLIII A.) It is rapidly carried down through skin and superficial fascia to the fascia covering the great pectoral muscle. No hemorrhage of consequence is encountered thus far. I prefer to place this incision not too close to the arm, for, in my judgment, incisions extending on to the arm result in cicatrices, which often seriously interfere with the future usefulness, and less frequently cause edema of the limb.

The index finger of the left hand is now introduced beneath the lower border of the tendon of the great pectoral muscle and made to emerge above its upper border, or in the interval between the costal and clavicular portions, if one wishes to remove only the costal origin of the muscle, and division of the tendon effected at or near its insertion into the humerus. This may be facilitated by dissecting up the external flap slightly and using retractors. I myself see no reason for removing the clavicular portion in the average case, and, therefore, leave it unless the growth is peripheral and in the upper hemisphere. Then unquestionably the entire muscle should be sacrificed. (Plate XLIV.) Only a slight dissection will be necessary to discover the lower edge of the tendon of the pectoralis minor. This should be clearly identified and separated from the fascia covering the tendon and below it. Otherwise the long thoracic artery which runs in the fascia parallel with and just below the tendon may easily be wounded.

The index finger is now introduced underneath the muscle and made to emerge at its upper border. Lifting up the muscle, the tendon is made tense and prominent, so that it can readily be seen that no other tissues are included with the tendon. The acromio-thoracic artery runs just above and parallel with this tendon, and, being a branch of considerable size, might cause some little embarrassment if it were cut at this stage of the operation. It is divided at its insertion into the coracoid process. (Plate XLV.) Therefore, we have the acromio-thoracic artery parallel with and just above the upper border of the minor pectoral tendon; the long thoracic parallel with and just below its lower border. Both can easily be avoided if care is taken. I have never as yet wounded either vessel, nor is there excuse for doing so. Both muscles retract inward as soon as their respective tendons are severed. This at once uncovers the axilla and makes its subsequent thorough dissection easy. The costo-coracoid membrane is now opened and largely sacrificed, which gives ready access to the subclavicular fat at the apex of the axilla—in the space of Mohrenheim. In removing a part of the costo-coracoid membrane, the cephalic vein at the upper and outer aspect of the wound must not be wounded. There is also in the fascia a branch of the acromio-thoracic which, with its accompanying vein should be clamped and tied. A nerve supplying the pectoral muscle may as well be sacrificed now, as it necessarily must be later on when the muscles are removed. (Plate XLVI.)

The dissection is begun at the apex of the axilla and must be most carefully conducted lest injury be done to either the axillary vein or the acromio-thoracic artery. It should be from above downward, though this is perhaps somewhat more difficult than making the dissection from below upward.

In the removal of the fat and fascia in the upper third of the axilla, the finger, covered by several thicknesses of gauze, will be all that is necessary. Instruments are rather dangerous, unless used most cautiously. Moreover, they are unnecessary.

FIG. 36.—Allis's blunt dissector.

I now carefully make an incision through the fascia to the outer side of the axillary vessels simply to start the dissection from without inward. This is made to the extent of the lower two-thirds of the axilla and not in the upper third where it is dangerous to cut. I continue the dissection largely with gauze, but Allis's or Mayo's blunt dissectors may be used

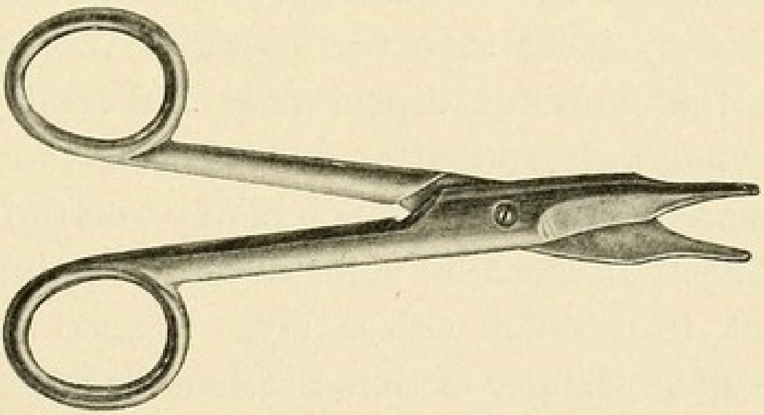


FIG. 37.—Mayo's blunt dissector.

freely and are most helpful. (Figs. 36 and 37.) Occasionally a cut with scissors or a sharp knife facilitates the dissection. The instrument of Charles H. Mayo is more than a blunt dissector for it can also be used as a scissors and is most valuable in economizing time, making a change of instruments unnecessary.

As the sheath and fat are removed from the vessels we come down upon the acromial, long and alar thoracic branches, and the subscapular branch of the axillary artery, in the order named, from above downward, which, with their accompanying veins are to be carefully clamped in two places and divided between. The proximal ends are ligated. In this way the subsequent hemorrhage is materially lessened; in fact it is surprising how little blood will be lost during so prolonged and extensive a surgical procedure.

The enlarged lymphatic glands will usually be found at the base of the axilla between the latissimus dorsi, teres major, and subscapularis muscles posteriorly; the serratus magnus internally; and inferior to a line formerly indicated by the situation of the lower border of the pectoralis minor. The midaxillary and subclavian glands may, however, be infected. All such enlarged glands and surrounding fat should be carefully dissected from the several muscles, and to do this best, the fascia covering the muscles should be sacrificed. In fact, so thorough should be the axillary dissection that nothing is left on its inner aspect save the posterior thoracic or nerve of Bell; on the posterior aspect only the long subscapular nerve, and superiorly, possibly the superior thoracic artery, if it arises as an independent branch high up on the first portion of the axillary. In such circumstances it is impossible, in my judgment, to reach it with safety. It is so deeply placed that there is great danger of doing serious damage to the vein and artery, the former particularly, if an attempt is made to secure the vessel at its root. I have convinced myself by work in the dissecting room that it is at least a hazardous if not an unwarranted procedure. In this opinion my friend Dr. Charles W. Bonney, of the Anatomical Staff of the Jefferson Medical College, who has made many dissections at my request, fully concurs. It is a small branch and negligible so far as subsequent hemorrhage is concerned. Moreover, it not infrequently arises conjointly with the acromio-thoracic, and in such cases is easily secured with the other vessel.

A thorough dissection of the axilla can usually be finished in twenty minutes, and is entirely accomplished through the single straight incision. It should invariably be from above downward, without inward, and en masse. A piece-meal extirpation is not to be considered. Patience, a good light, and working with blunt dissectors, all insure a safe and reasonably speedy dissection of the axilla. As we have said, sharp instruments are not to be used at the apex of the axilla, but may materially facilitate the dissection at its base. Accidental injuries to the vein are not common, and when occurring, are, if practicable, to be treated by lateral ligature or suture. (Plate XLVII.)

The advantages accruing from attacking the axilla before removing the breast are to me manifest and self-evident. In the first place, we may find, as S. W. Gross taught during my internship in Jefferson Hospital ('79–80) that the axilla may be so extensively involved that a complete eradication of the growth is impracticable and further operative steps injudicious. True it is, however, that many cases which Gross would have considered inoperable, can be successfully dealt with at the present time, because of the more thorough axillary operation since division of the muscles became a routine procedure.

Another and a more important reason (and this I have insisted upon in several of my former papers) for working from, instead of toward, the axilla, is that by so doing we avoid expressing cancer cells into adjacent, even possibly remote tissues. Therefore, the breast should not be handled, massaged or in any way disturbed until the axillary dissection has been finished and the completion of the operation is near at hand. In my opinion, this is one, indeed the best reason for not working from sternum to axilla, and for reversing the technique of Halsted and many others.

There is still another reason for making the axillary dissection the first instead of the last step in the operation; hemorrhage is certainly very much less when the vessels are ligated at their origin, as first advised and practised by Willy Meyer. Therefore, the time of the operation is shortened and shock necessarily minimized.

It is of interest to note that injuries to the axillary vein were comparatively frequent and serious prior to the time when the muscles were resected and an aseptic technique was rigidly observed. I personally witnessed three such accidents in the early days of mammary operations, and all were fatal from sepsis. I have never wounded the vein myself, but have deliberately resected it three times, removing in one instance at least four inches on account of evident infection of its walls, as it passed directly through a large mass of cancerous glands. There was no subsequent edema in any of my cases. I confess that I was quite apprehensive the first time I was compelled to resect the vein, as I was not then advised as to its comparative safety. Subsequently I had reports of resections in 24 cases in the practice of other surgeons. All the patients recovered. In only four of them was there resulting edema and in each of these it was both slight and transient.

While accidental injuries to the vein, when practicable, should be treated by either lateral ligature or suture, we have shown that either ligation of the vein in continuity or its resection can be practised with comparative safety.

The axillary dissection having been accomplished, it now remains to complete the skin incision, which is made by beginning at the middle of the initial incision and circumscribing the entire breast with either a circular, oval, or broadly elliptical incision. The circular incision is only to be advised in a central or subareolar growth. Generally I employ an egg-shaped incision which is an oval so broad that its greater diameter is at least five inches; it will be six inches or more if the breast is a large one, or the cancer is situated peripherally, for the skin incision must under no circumstances come nearer than two inches to the edge of the growth. (Plate XLVIII.)

The knife should not be carried straight down to the muscles beneath, but slanted in such a manner as to divide the subcutaneous tissue or the para-mammary fat at least two inches further out than the skin has been cut, which will practically take it up to near the clavicle superiorly, well beyond the sternum internally, below the border of the great pectoral inferiorly, or well on to the external oblique and rectus.

While this can be done by the experienced operator by a method of subcutaneous transfixion, using for the purpose a straight, rather long and sharp pointed knife, I prefer to use an ordinary scalpel, the skin being retracted as I do so by a careful and competent assistant. In this way just the amount of subcutaneous tissue may be left adherent to the skin to insure its future vitality. Moreover, I prefer to ligate at once any vessel which has been cut. The superior thoracic, if not previously secured at its origin, will certainly be cut in undermining superiorly and the perforating branches of the internal mammary of the opposite side may be severed when the flap is being fashioned internally. I have seen severe hemorrhage, in fact an unwarranted amount of blood lost by this transfixion method, the removal of the breast being completed before any vessels were tied.

During three trips to Great Britain during the last five years, I was privileged to see many operations for mammary cancer, and was impressed with the facility and thoroughness with which undermining is practised there. The British surgeons excel all others in this step of the operation. The late Sir Mitchell Banks, of Liverpool, Mr. W. Sampson Handley, of London, and Mr. George L. Chiene, of Edinburgh were particularly deft in its execution. Such extensive undermining of the skin not only removes any outlying or rudimentary portions of the mammary gland, but facilitates the removal of the fascia covering the opposite pectoral muscle internally, that of the rectus and external oblique inferiorly, and that of the latissimus dorsi externally.

Mr. Handley, of London, considers this step of the operation one of, perhaps the most important, on account of the frequency with which invasion of the peritoneal cavity occurs as the result of permeation of cancer cells along the fascial planes of the muscles—the rectus particularly. He, therefore, extends his incision downwards in the direction of the umbilicus, so that the fascia covering the rectus may be removed to a still greater extent than has been my practice. Possibly this is wise, and, as has been said elsewhere, I am inclined to adopt his suggestion in the future and to still further extend my wound inferiorly by making the smaller end of the oval somewhat more pointed. I do not agree with him, however, in thinking that the removal of the deep fascia is far more to be desired than the free removal of skin. Quite the reverse. I insist first and foremost that we should begin with a wide removal of skin, and in deference to what seems to be sound logic and good pathology, am willing to end with a *freer* removal of the deep fascia over the rectus. My dissections have for years been *free*.

Undermining also insures approximation of a very large wound. The breast with its axillary tail still attached, the pectoral muscles, para-mammary fat, and deep fasciæ, are all lifted up on the costal wall, as shown in Plate XLIX, preliminary to cutting the costal attachments of both pectoralis minor and major. In cutting the attachments of the great pectoral muscle, the perforating branches of the internal mammary will be severed, and should be promptly seized with forceps. In undermining the flap internally, the perforating branches of the opposite side may be cut and require attention, as we have already said. They will certainly be severed in dissecting up the fascia over the sternal end of the opposite pectoral muscle and should at once be clamped and ligated.

We now have a very large wound; over the chest the intercostal muscles are exposed; inferiorly the external oblique and rectus; posteriorly the latissimus dorsi, teres major, and subscapularis, and the long subscapular nerve; at the outer aspect of the chest (the inner aspect of the axilla) the digitations of the serratus magnus and the nerve of Bell. (Plate L.)

It will be seen from Plate L that a part of the pectoralis major and minor muscles is left at their origin. This is done for two reasons: It prevents adherence of the skin to the ribs and makes a good bed to plant grafts in case grafting is necessary. It is a mistake to leave the ribs bare and delays healing of the wound.

If the growth is situated in the sternal hemisphere of the gland, the oval is reversed, so that its smaller end is at the axilla. By so doing less chance is taken of leaving behind infected skin.

In case the tumor is situated in the upper hemisphere, it is my invariable custom to make an incision above the clavicle and to carefully explore the posterior triangle of the neck. It should extend from the posterior border of the sternomastoid to the anterior border of the trapezius, and be preceded by pulling the skin downwards so as to prevent premature injury to the external jugular vein. I prefer to make a separate incision for this purpose rather than to extend the original wound into the neck, as I see only a theoretic reason for doing this. Little good is accomplished by it, the scar made is unsightly and its subsequent contraction disadvantageous. A straight incision on the clavicle retracts above it and will scarcely be noticed. Cutting through the skin, superficial fascia, platysma and deep fascia, the omohyoid is exposed, held upward by a retractor, and the triangular space which it bounds carefully freed of fat and enlarged glands if any be present. The external jugular vein is usually resected. I have rarely encountered supra-clavicular involvement, yet believe it has been demonstrated that this step of the operation cannot safely be dispensed with, for the reason previously given, viz., that in malignant growths situated in the upper and peripheral portions of the breast, a chain of lymphatic vessels passes from the breast over the clavicle to empty into glands in the posterior cervical triangle.

In tumors of the lower hemisphere, I never explore the neck. The supra-clavicular incision is also made in case I encounter infection of the glands or fat in Mohrenheim's space. If the glands just *below* the clavicle are involved, it is reasonable to infer that those just *above* it may be infected; at least it is unwise to infer that they are not. I have not found exploring the neck to add materially to the shock or danger of the operation and, moreover, I am convinced that now and then a case is saved by taking this additional precaution. I have never, however, divided the clavicle nor do I believe it necessary; neither do I feel that this step of the operation should contemplate removing a portion of the subclavius muscle or forcing a mass from the neck to the chest behind the clavicle, as such manipulations may express cancer cells in the event of cervical infection. Such dissections may undoubtedly be done with relative safety by the patient and skillful operator, but after all do not result in an amount of good to justify the risk—immediate and potential—inherent in them.

Any slight or extensive oozing can be quickly stanched by the application of hot water at a temperature of 120°. I not only consider this the best hemostatic, but feel that it is advantageous in the event that our manipulations may have expressed cancer cells on any part of the wound. Therefore, freely douching the part, whether it is bleeding or not, is desirable. Any vessel of sufficient size to require a ligature is tied with fine Pagenstecher; others are twisted. Complete hemostasis is insisted upon. It is surprising how few ligatures will be necessary if the large branches already mentioned have been ligated at their origin. I consider it important to thoroughly arrest hemorrhage before beginning the suturing, for at the best we must expect a considerable amount of serum to be poured out into such a large wound.

Closure of the wound is begun where it was started—that is, near the clavicle, and can be accomplished by either interrupted or continuous sutures. I prefer several interrupted Pagenstecher sutures, which give the necessary support and act as stays, and for accurate approximation, where the tension is not too great, supplement them with a continued suture of horsehair after the buttonhole method. In the event of much tension, interrupted sutures are used throughout.

The first incision having been sutured, closure of the oval or circular (whichever has been employed) portion of the wound is begun at the sternal end. When we have advanced one-third of the distance between the two extremes of the second and larger incision, it will be easy to tell whether or not approximation of the flaps can be accomplished with facility; if not, the suturing should be stopped at this point, begun at the other end, and carried out to the extent of one-third of the incision; the central third of the wound is left unsutured and is immediately covered by suitable grafts taken from the thigh after the method of Thiersch. It has been rarely necessary for me to graft of late, for even though a very large wound is made, the extensive undermining makes approximation easy. (Plate LI.) The length of the horizontal suture line is twelve inches or more. I have never found it less.

A vast majority of surgeons employ drainage. I have nearly always done so and still believe it to be best in the majority of instances. A tube is inserted at either angle of the wound; one posteriorly to drain the axilla, the other anteriorly extending down between the costal margin and umbilicus. I do not question that such a wound may be safely closed in many cases without drainage and occasionally have done so without cause for regret. If, however, the breast is large, or the work in the axilla has been unusually prolonged on account of extensive axillary involvement, requiring a difficult and tedious dissection, I think it safer to drain. I find that the custom of draining such wounds is practically universal among American surgeons. Only three of a large number of surgeons communicated with do not employ drainage.

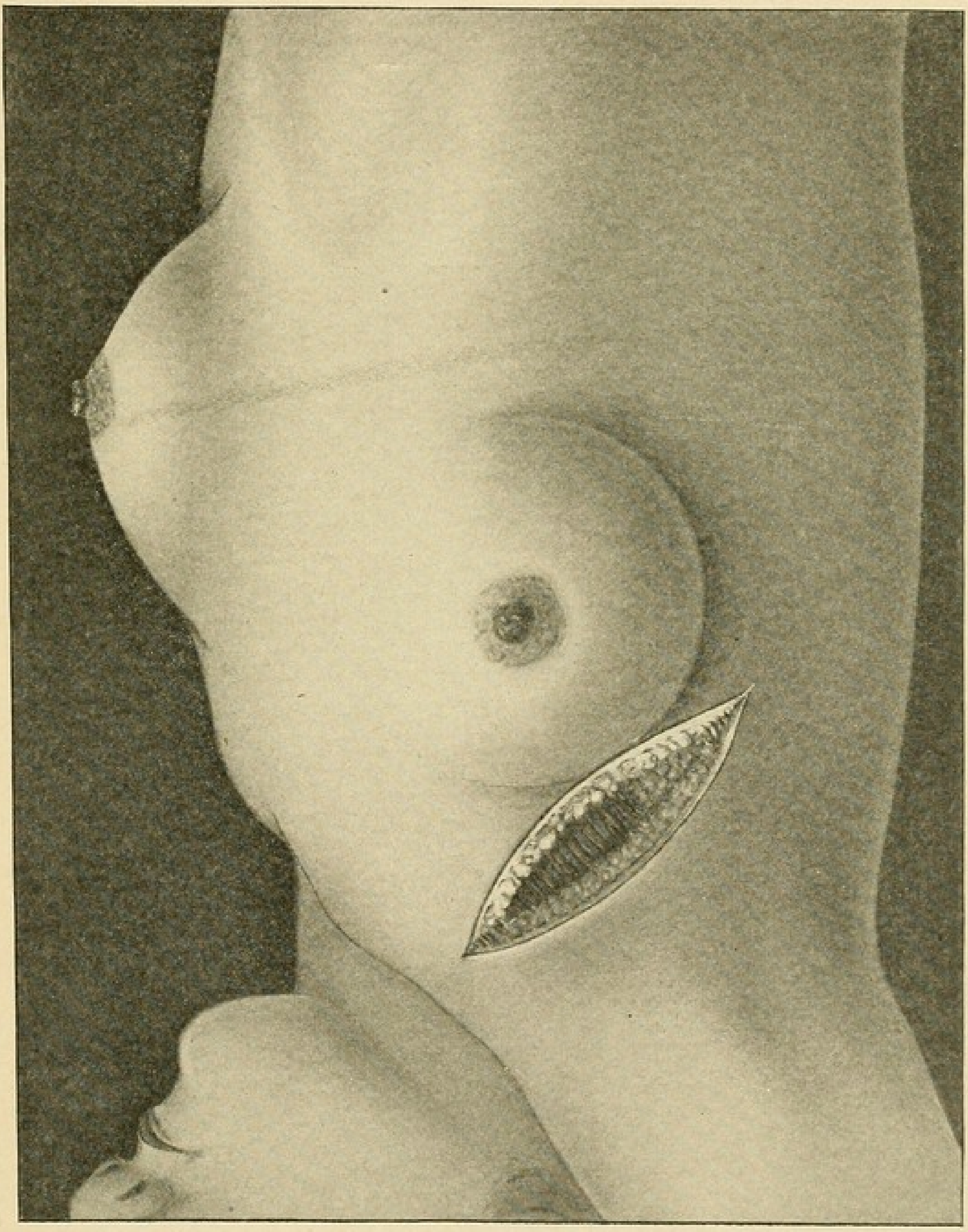
An abundant dressing of aseptic gauze is now applied in such a way as to obliterate the axillary space. A wedge-shaped pad is placed between the arm and chest and the arm bound firmly to the side by broad adhesive straps for at least 24 hours. I see no advantage in applying the dressings so that the arm will be at a right angle to the body. Tension upon the flaps is increased by such a position, hemostasis is certainly not favored by it, and the axillary space is made to gap, thereby inviting a subsequent collection of serum which may give trouble. At the end of 24 hours the arm is released, and, if painful, rubbed with alcohol. It is not included in the subsequent dressing.

If we now examine the specimen, it will be seen that the para-mammary fat has been removed to a very much greater extent than has hitherto been usual in breast operations. In fact so much has been taken away that there are two circles or ovals; one, represented by the skin itself, which is five or more inches in diameter; another, and very much larger circle or oval, by the fat and deep fascia. In other words, perhaps double the extent of the skin removed.

Plate LII shows the outline of the incisions and the line of the cicatrix.

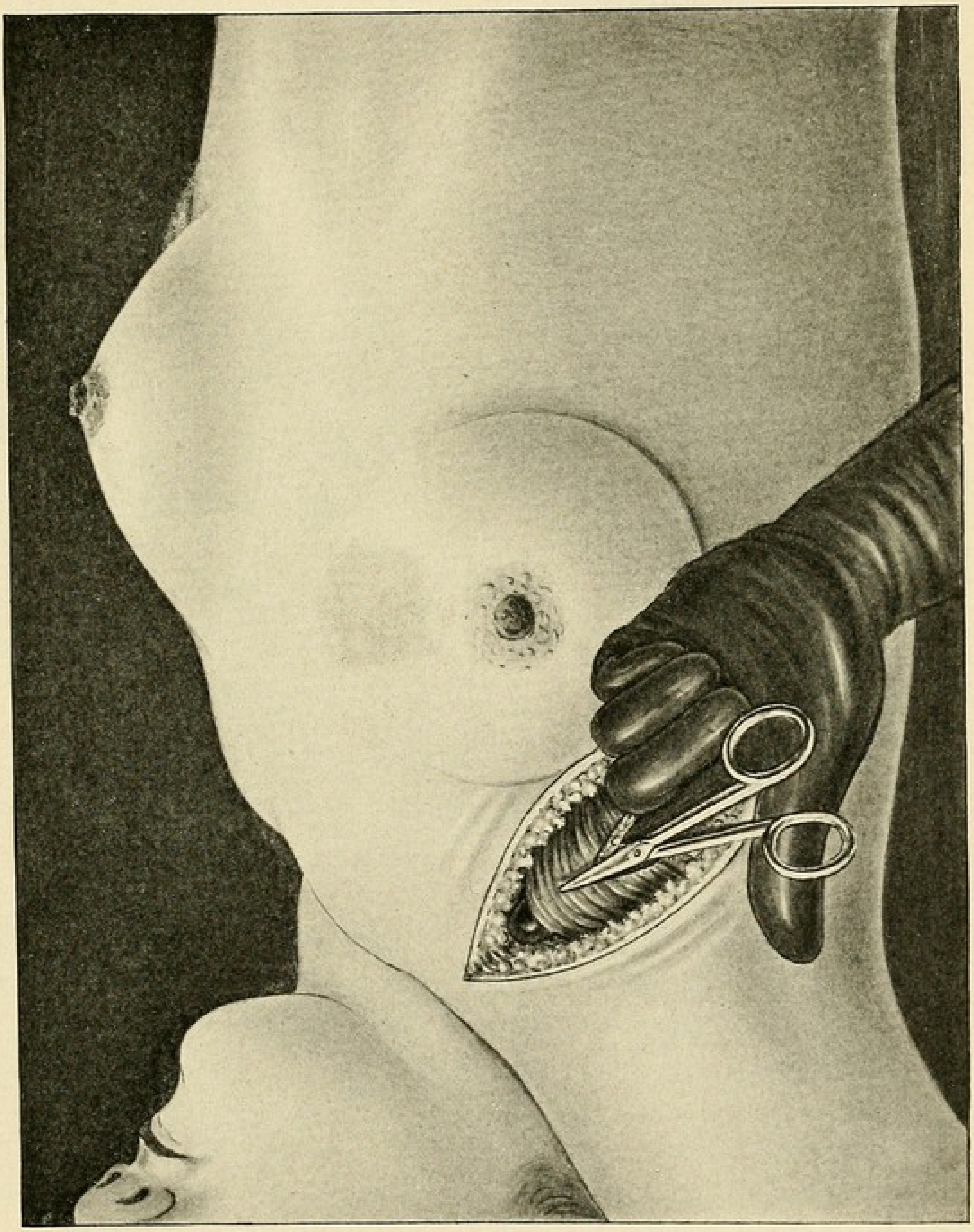
The assistant holding the arm should be careful lest hyperextension be made at any time during the operation. This can easily be done after the pectoral muscles are cut and may possibly result in monoplegia. At least this has been con-

PLATE XLIII A.



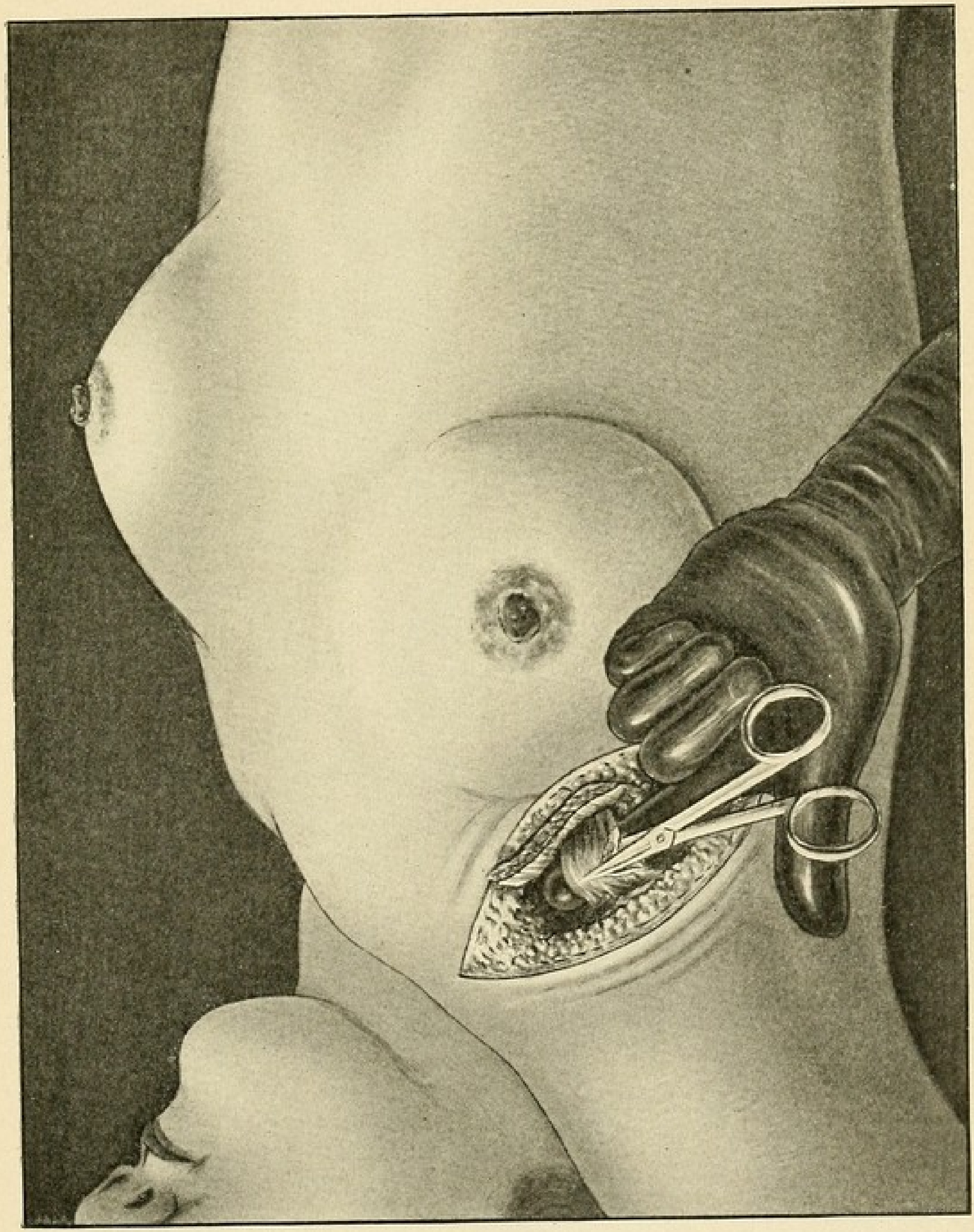
Primary skin incision.

PLATE XLIV.



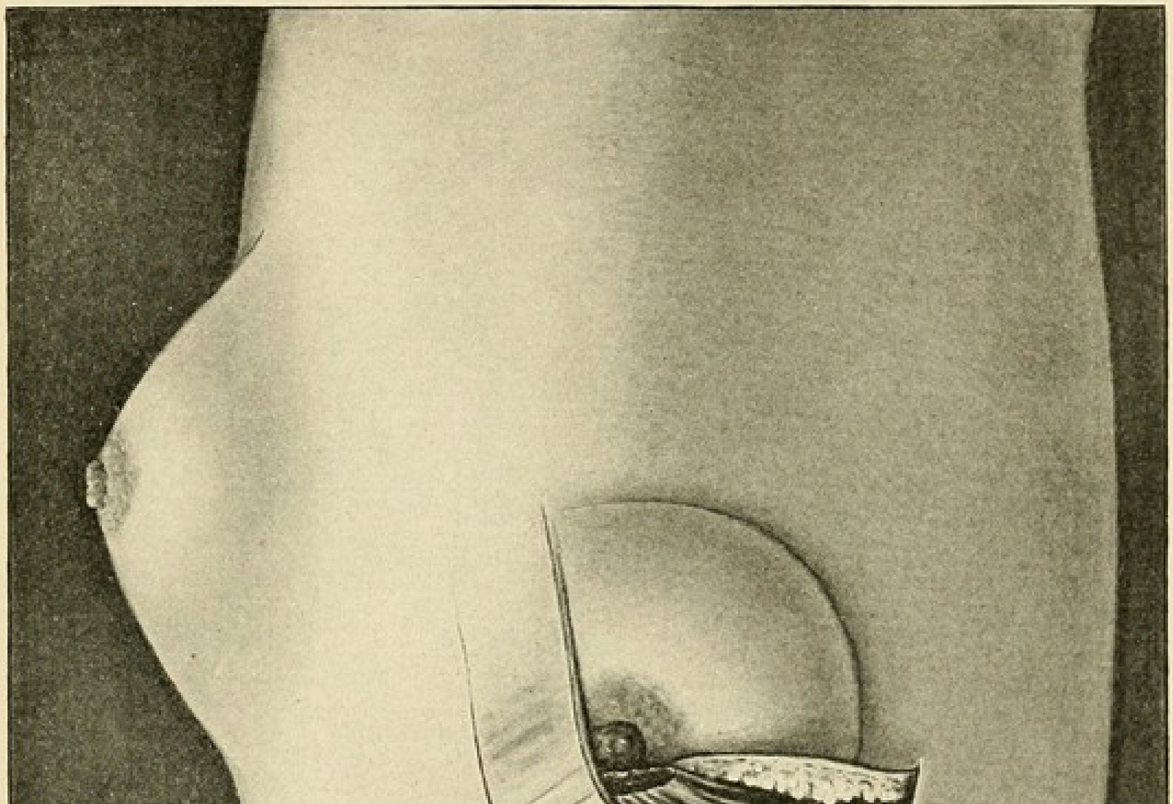
Division of pectoralis major near its insertion.

PLATE XLV.



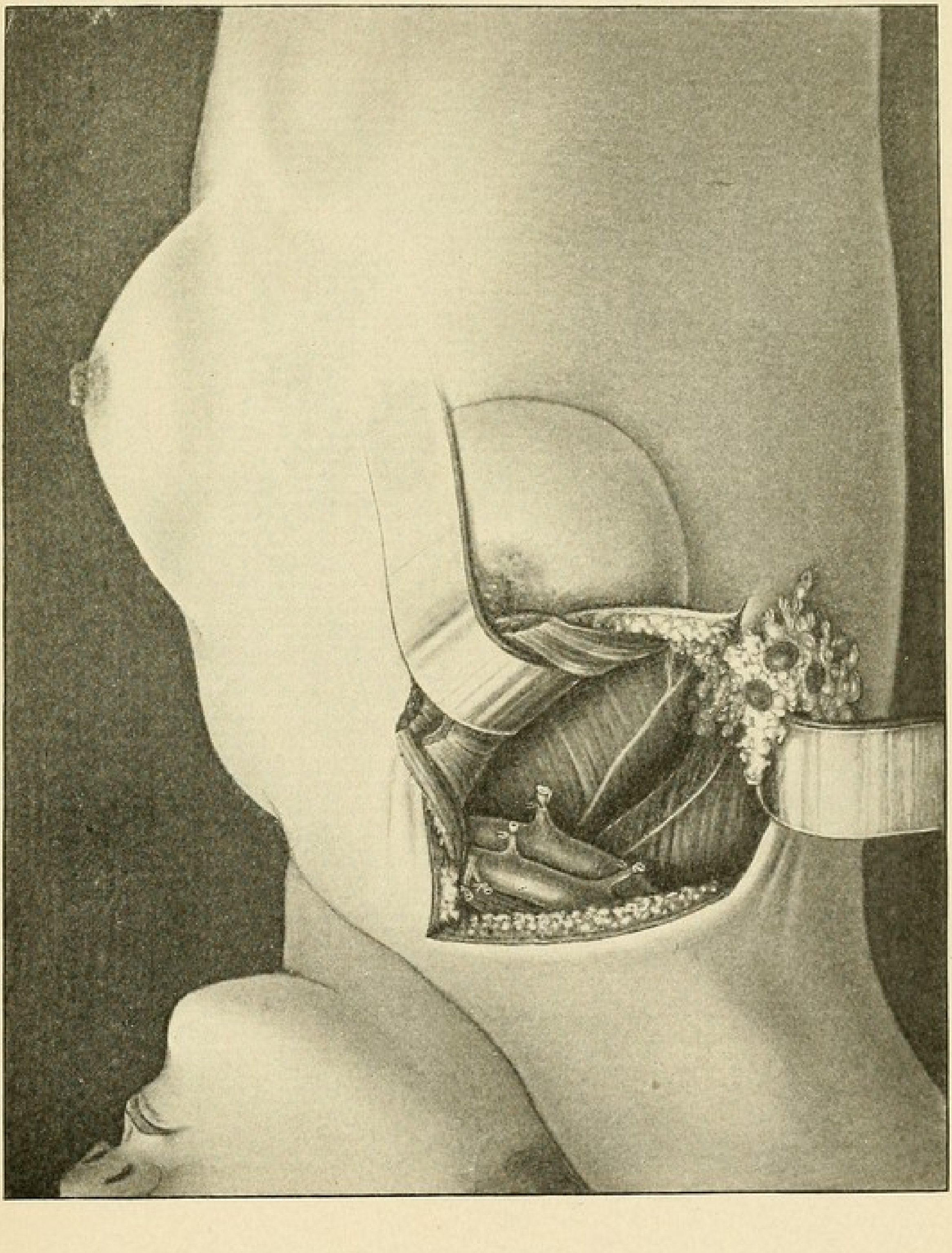
Division of pectoralis minor at its insertion.

PLATE XLVI.



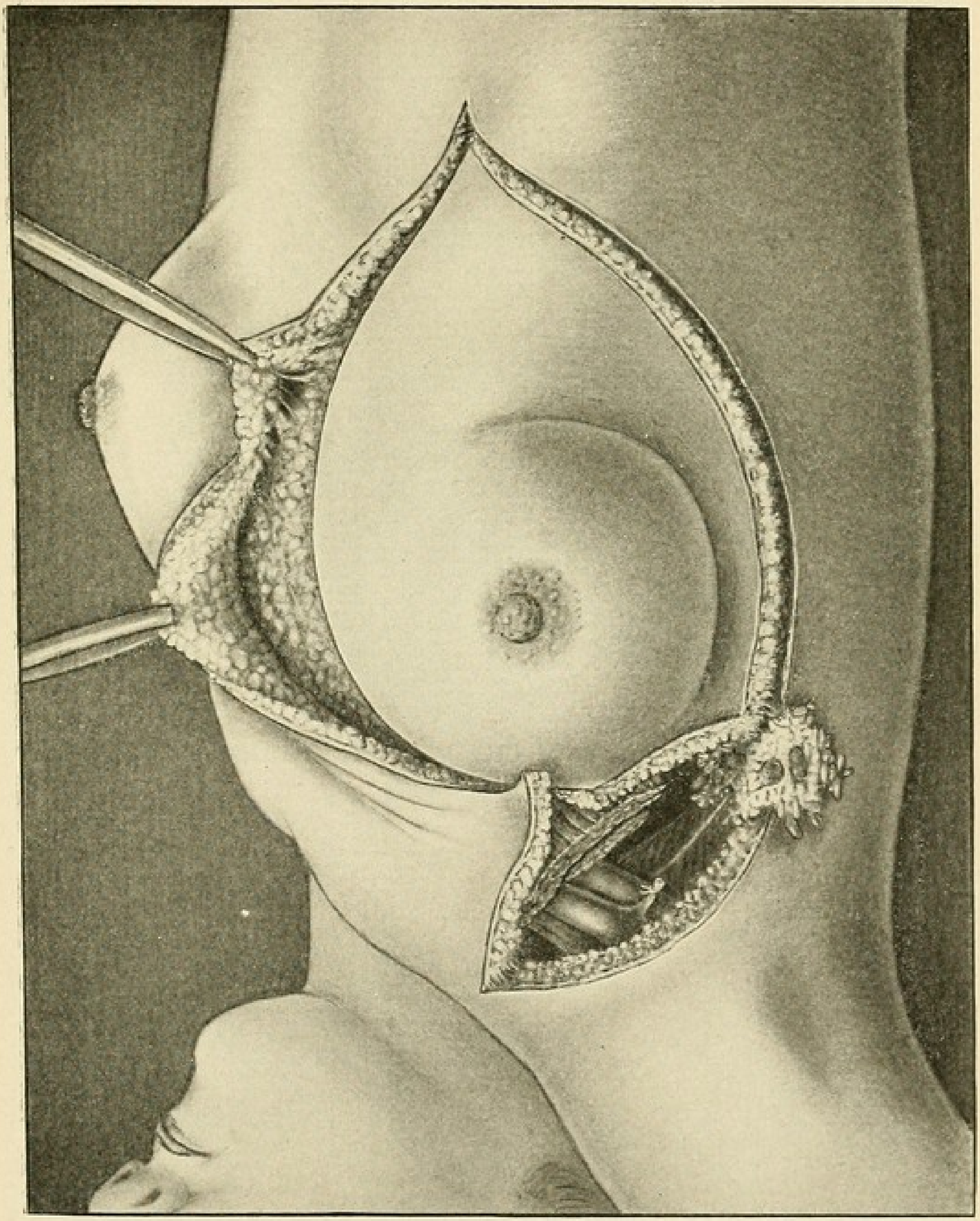
Axilla freely exposed and vessels divided at their origin.

PLATE XLVII.



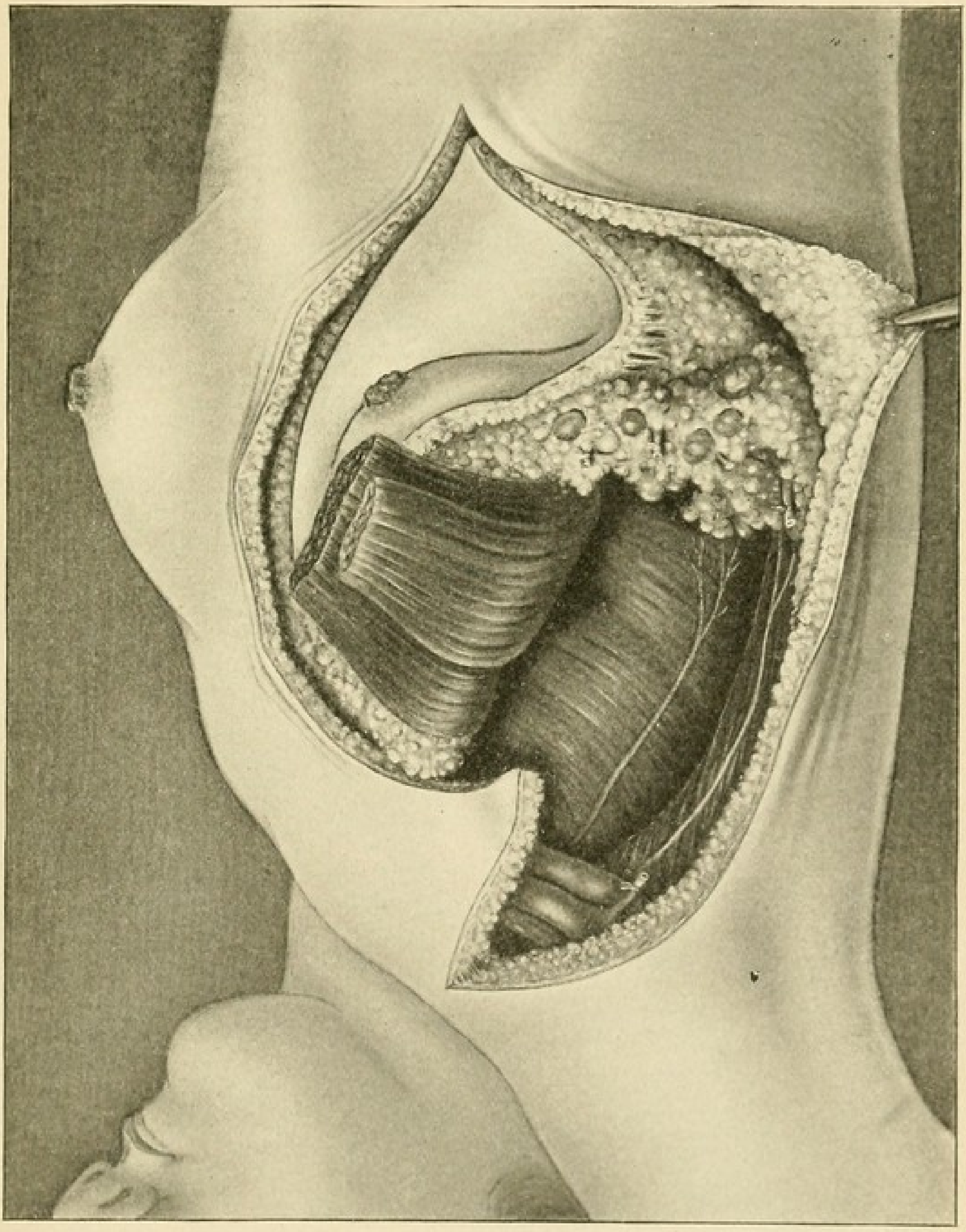
Axillary dissection completed. Fascia, fat and enlarged glands en masse shown at base of axilla.

PLATE XLVIII.



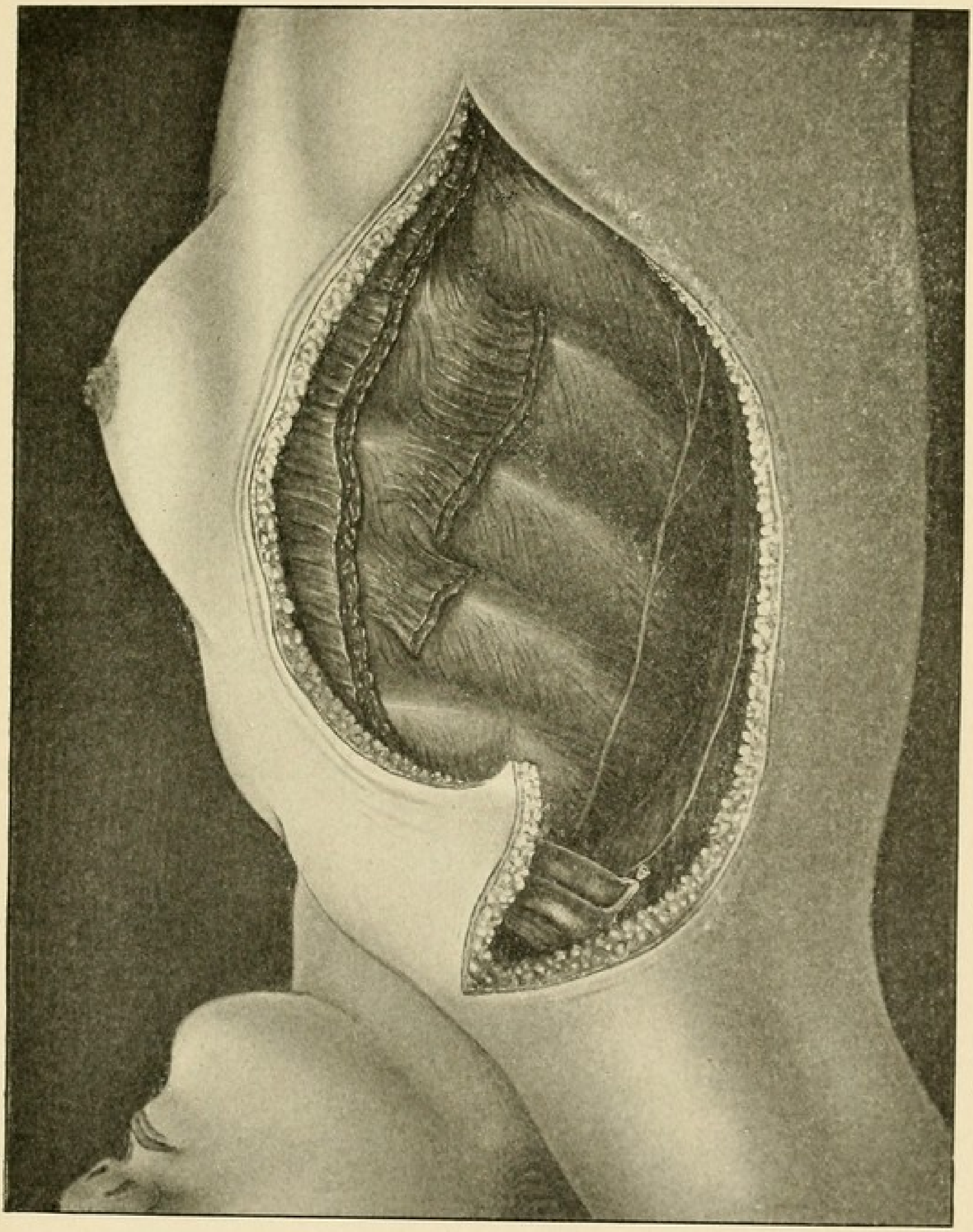
Second skin incision. Observe the extensive undermining anteriorly.

PLATE XLIX.



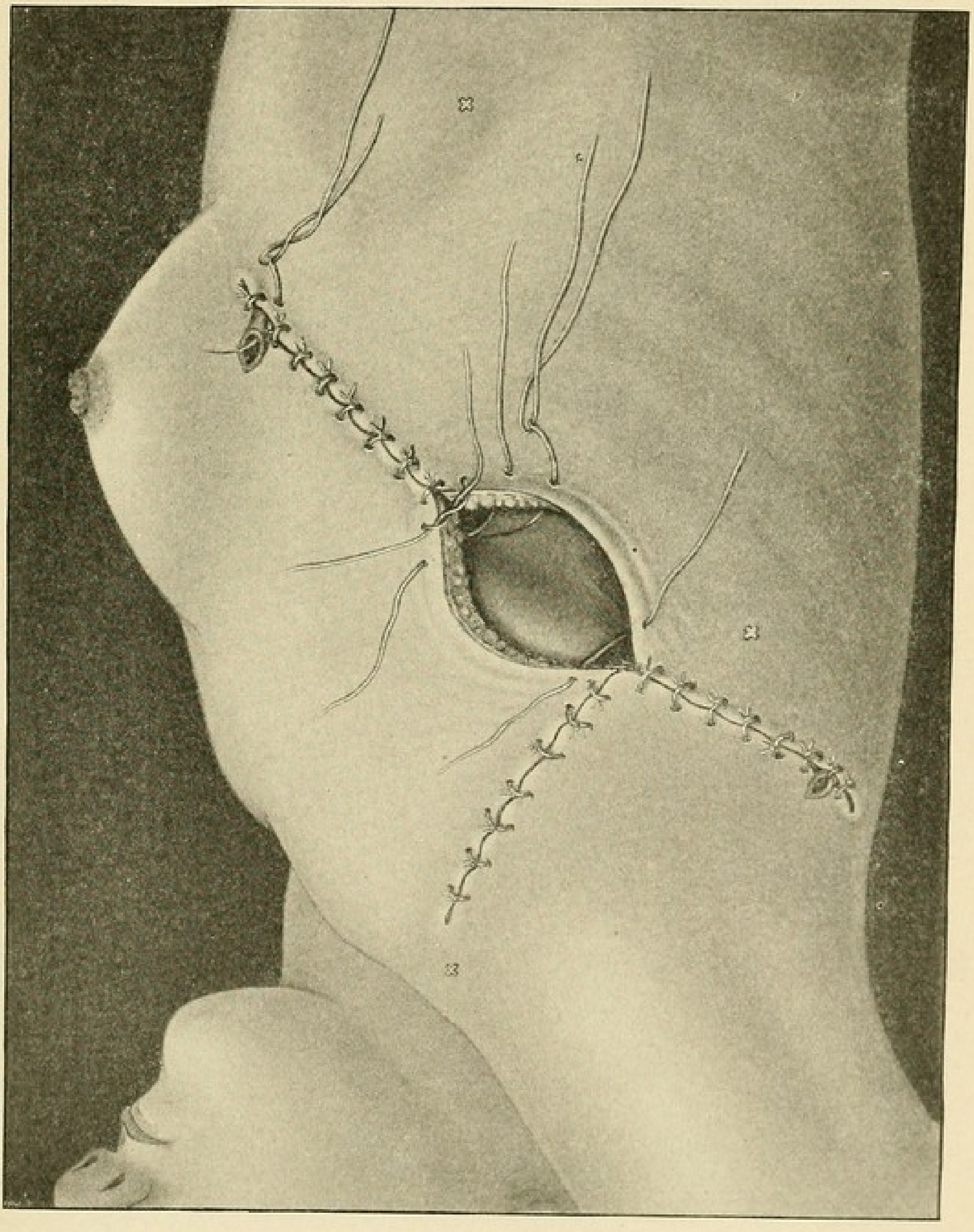
Undermining inferiorly. Muscles, breast and axillary mass being reflected prior to removal.

PLATE L.



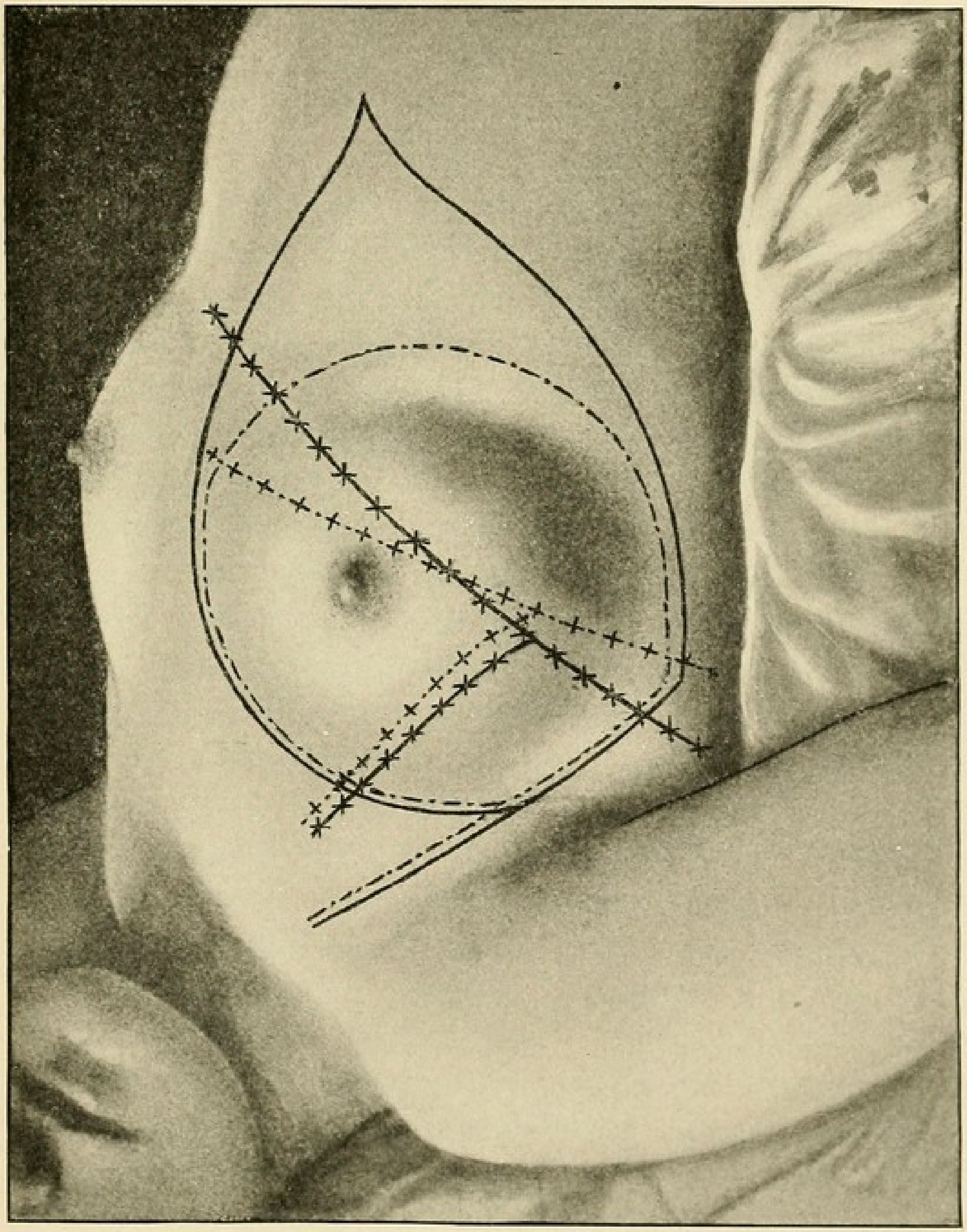
Appearance of the wound after removal of the breast, muscles and axillary mass.

PLATE LI.



Wound being sutured. Middle third of horizontal incision may be, if necessary, covered by skin grafting. It is rarely necessary.

PLATE LII.



Solid black line represents line of incision for oval operation; solid black line with crosses represents suturing after oval operation; broken line represents incision for circular operation, and crossed broken line represents suturing after circular operation.

sidered to be the cause of such paralysis after breast operations. I have never known it to occur in any of my cases. Still, this accident has been reported sufficiently often to warrant explicit instructions being given to the assistant before the operation is begun. In my judgment, monoplegia following such operations is more likely to result from pressure on the limb posteriorly, injury being caused to the musculo-spiral nerve. I have known this to happen once or twice, but never in a breast operation, and it has always been due apparently to the pressure resulting from the arm resting upon or hanging over the sharp edge of the operating table.

Post-operative Treatment.—The patients usually feel well enough to sit up on the third day. I generally allow them to do so in bed and have occasionally permitted those doing best to sit in a chair for a part of the morning and afternoon. I prefer, however, to keep them in bed until the fifth day. One of my patients left the hospital on the sixth day, going to her home in an adjoining state. She felt perfectly well and able for the journey. I do not think that I would have countenanced her leaving the hospital so soon had the weather not been very hot and her home far more comfortable than the hospital.

My patients often leave the hospital in ten days or as soon as the sutures are removed. Some remain a fortnight; exceptionally two and a half or three weeks may be required if either skin grafting has been necessary or a part of the wound has been allowed to granulate.

The drainage tubes are removed at the change of dressings at the end of twenty-four hours. They are inserted, as formerly stated, at either angle of my wound; one posteriorly to drain the axillary space; the other anteriorly which extends well down to midway between the costal margin and the umbilicus as serum is likely to accumulate here. I formerly made a posterior stab and inserted a drainage tube into the axilla only.

I ignore all suggestions which have been made to keep the arm in this or that position so as to increase its future usefulness. Some believe moderate abduction is necessary; others think that the arm should be at a right angle to the body; others still that a triangular splint should be used. All such suggestions and devices have been thought necessary on account of a definite restriction in the movements of the arm after certain operative procedures, where the cicatrix extends from the chest wall to the arm, and necessarily fetters it subsequently more or less. A very great majority of such incisions do cause subsequent trouble with the arm and, therefore, the numerous suggestions and expedients for preventing it and for mobilizing the scar.

The cicatrix following the operation I employ is entirely on the chest wall, does not extend to the arm, or in any way encroach upon the axilla; therefore, its "mobilization" is entirely a negligible quantity. I release the arm on the second day or when the drainage tubes are removed and the dressings changed. Subsequently the patient is allowed to move it at will.

Another serious objection which I have found to the incisions which pass from chest to arm, or the reverse, is that the cicatrix has occasionally been responsible for a subsequent edema of the arm.

I no longer have my patients complain of not being able to dress their back hair, or indeed anything that they were able to do before the operation. I do not see the slightest difference in the relative usefulness of the two arms. I have had quite a number of my patients complain of limitations in the movements of the arm when I employed Warren's operation. In two cases, the bridge of skin from arm to thorax was so pronounced that I subsequently, months after the operation, divided it, releasing the arm, and also lessening the pain caused by the contraction of the scar. In a third and more marked example of the kind, I wanted very much to do it, but the patient would not permit me.

I wish to say definitely that any limitation in the movement of the arm is not due to the loss of the pectoral muscles, strange as it may seem, but in every case that I have seen is entirely due to a cicatrix following an incision unfortunately placed.

I have two patients in whom both breasts have been operated on; one of them had the right breast removed five years ago for a scirrhus carcinoma with more than an average amount of axillary involvement. A very large wound was made after the method then employed by Prof. Warren, differing a little, but not essentially from the method which he now uses. Both muscles were sacrificed. Two years later a cyst appeared in the left breast. She being nearly fifty, having had cancer in the opposite breast two years previously and her mother having died of mammary carcinoma, I deemed it wise, and she requested me to remove the entire mamma. This was done and the fascia covering the great pectoral muscle removed also. I did not, however, sacrifice the muscles themselves. At the same time that the operation was performed on the left breast a bridge of skin which had fettered the right arm and had prevented her from "doing her back hair," also causing a moderate edema of the limb, was cut and considerable of the cicatrix excised. The resulting defect was covered by a Thiersch graft so as to prevent subsequent contraction. To-day she has a supple cicatrix, the edema has entirely passed away, and she uses her arm as well as she ever did; just as well as she does the left arm, notwithstanding that the muscles were sacrificed on the right side and spared on the left.

I may state that this patient has been in my office within a week. Therefore, I speak advisedly both as to the local and general condition. She was never in better health in her life. The supra-clavicular operation was done in this case, but was found to have been unnecessary, as there was no infection above the clavicle.

It has been my experience to see four cases of pneumonia following breast operations. Fortunately all have recovered. Three of them came early, within 72 hours after the anesthetic, and were presumably due to the ether, as they were catarrhal pneumonias.

The last case I encountered two years ago when a patient doing splendidly up to the eleventh day, being about ready to go home, slept in a draft, and had an acute, frank lobar pneumonia, which delayed her convalescence several weeks. It was followed by phlegmasia in both limbs. This is the only time I have ever seen phlebitis following a breast operation. The patient made a complete recovery.

The right breast was removed; the pneumonia was clearly confined to the left lung. The phlebitis began in the left leg about the time the pneumonia was subsiding; the right leg became involved a few days later, and both limbs had to be bandaged for some weeks afterwards. In time, however, the return to their normal condition was complete.

There has been no recurrence of the malignant disease, and the patient is to-day in the very best possible health—much better, she states, than she has ever been before.

Plastic Operations.—Various plastic procedures have been devised to fill in the defect caused by the extensive removal of the superficial structures in the complete operation for the removal of a carcinomatous breast. Chief among the earlier of these procedures may be mentioned the methods practised by Legueu and Graeve in France and Sweden respectively, by Mixter in this country, and by Franke in Germany.

In order to cover in a defect caused by the ablation of an extensive recurrent carcinoma extending from the axillary line to the sternum, Legueu made a large flap containing the other breast and sutured it over the raw surface made by his extensive dissection, thus transplanting the healthy breast. Graeve and Mixter performed similar operations for the same purpose. Franke's procedure differed from these in that he dissected out the healthy breast from the flap which he cut, using only the skin and subcutaneous tissues, thereby doing away with the unsightliness of a single breast in the middle of the anterior thoracic wall.

Of the plastic procedures popular in America, I consider that of J. Collins Warren the best, for this method is without the inherent danger of all other plastic procedures, inasmuch as the skin is widely removed, the defect resulting therefrom is covered by a cutaneous flap brought from below, a region which, in a majority of instances, will be farthest removed from the tumor, and, therefore, presumably healthy. In other words, the flap is cut *last*, and only to facilitate the closure of a wound sufficiently ample. I have employed this method frequently and with satisfactory results in the main. The one objection that I have sometimes found with it has been a resulting band of skin which subsequently fetters the arm somewhat in its movements and less frequently causes edema on account of the incision extending from the chest to the humeral attachment of the pectoralis major.

Warren's operation is described by its originator practically as follows:

"An incision is made from the anterior and outer margin of the axilla running a little above its upper border and the line of insertion of the pectoralis major muscle around the lower border of the breast to a point on the boundary line of the inner and lower quadrant. A second incision is made, beginning at the middle of the anterior axillary fold, gradually diverging from the first incision as it approaches the breast and, sweeping around the upper and inner margin of the organ, meets the first incision at its terminal point.

"A flap is next marked out on the outer side of the pectoral region by dividing the skin on the outer edge of the wound, on a line drawn first at right angles to the primary incision and then gradually sweeping around until it becomes parallel to it and terminates at a point a little below the level of the lower margin of the wound. (Plate LIII.)

"In case there is infection of the cervical region, an additional incision should be made from the middle of the upper half of incision number two along the posterior border of the sterno-mastoid muscle to expose the clavicle and the posterior cervical triangle. This incision, if necessary, should not be made until a later stage of the operation.

"The second step of the operation is the dissection of the integuments freely on all sides, the axilla included, from the subjacent adipose tissue. The axillary skin and the flap are thus dissected off on the outer and lower side of the wound, and the dissection on the median line is carried well over the margin of the sternum. This superficial dissection should also be carried upwards so as to expose the clavicle. (Plate LIV.)

"The third stage of the operation is now begun. Beginning with the humeral insertion of the pectoralis major muscle, the forefinger of the left hand of the operator is slipped under the edge of the muscle from above downward and the muscle is divided a short distance from its insertion. (Plate LV.) The proximal end of the muscle is seized with hooks and pulled in the direction of its origin, while its fibers are separated from those in immediate contact with the clavicle. An assistant while holding the hooks gently draws the breast with the other hand in the direction of the epigastrium. A few touches with the point of the knife expose the insertion of the pectoralis minor muscle. The finger is now hooked under this insertion and the muscle divided (Plate LVI).

"When the assistant retracts the breast in the direction already indicated, the axillary region is freely exposed, and the thin fascia overlying the vessels being divided, the larger vessels are readily identified. In this way the dissection of the axilla can be carried out with great precision, and the origin of all the large branches can be secured with a ligature (Plate LVII).

"As the dissection of the axilla approaches the clavicle, care must be taken not to cut through the superjacent fat that has been exposed by the earlier dissection, but to reflect it back in every direction toward the center of the mass so that the upper edge of the origin of the pectoralis major at the sternal margin is clearly identified. As the dissection proceeds downward and outward in the axilla, the adipose tissue must not be divided until the knife can come down upon the latissimus dorsi muscle. The greatest care must be taken not to separate any of the tissues from the included lymphatic glands or to cut into them.

"A few sweeps of the knife separate the mass from the latissimus dorsi muscle. The breast is now seized by the operator and rapidly dissected off the thoracic wall from without inward. The origin of the pectoralis minor is first divided, and the final act of the operation consists in severing the origin of the pectoralis major while the breast and attached tissue are firmly held away from the sternal margin. (Plate LVIII.)

"If deemed advisable to invade the neck, the incision already mentioned is made along the posterior border of the sternomastoid muscle. After cutting through the deep layer of the superficial fascia of the neck, the posterior border of the sternomastoid is pulled inward and the omohyoid is lifted upward. A thin fascia then presents itself, under which lies a pad of adipose tissue, in which one or more lymphatic glands are found. When the region has been properly cleaned out, it is possible to make the forefingers of each hand come in contact with one another beneath the clavicle.

"The closure of the wound in this operation has always been a difficult problem, since it has been decided that the whole integument of the breast should be included between the incisions. Any method which permits of an easy approximation of the edges of the wound is out of date. The lower portion of the wound is the part where the edges are the most difficult to approximate. The free loosening up of the skin enables the upper portions to come easily together.

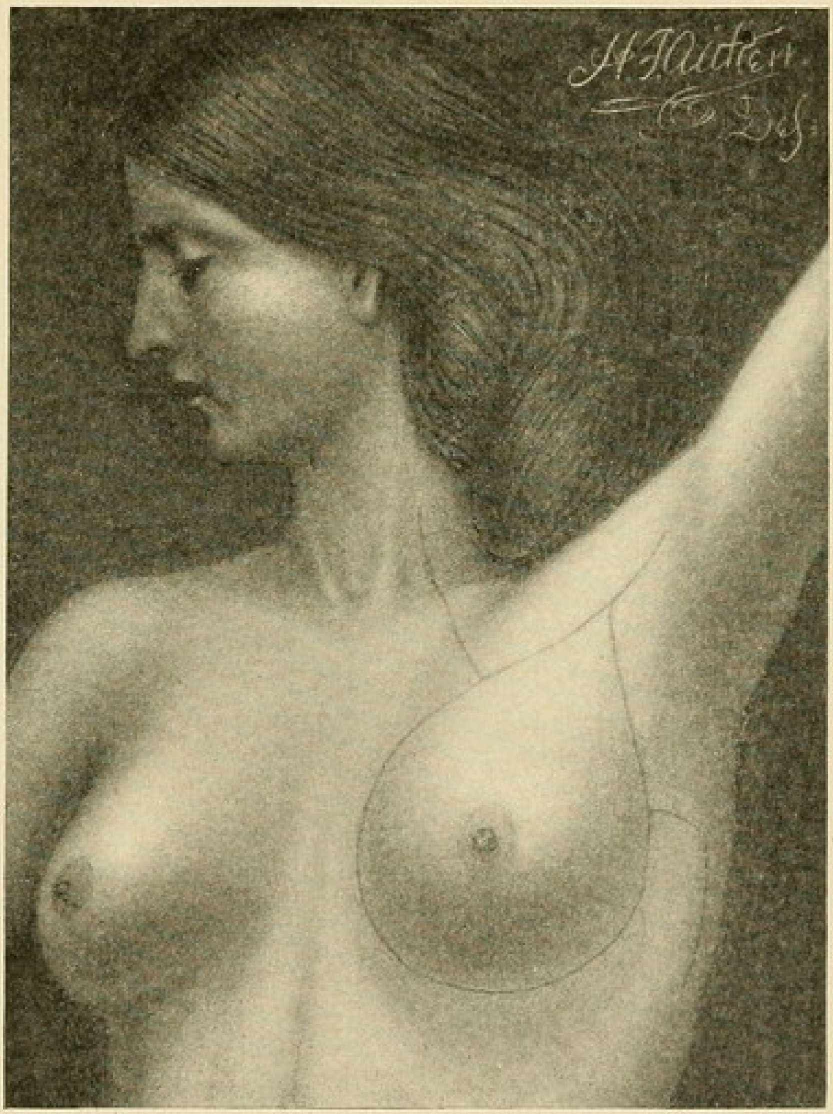
"The flap made at the outer side of the wound is about the size of the human hand, and when first turned in seems to be totally inadequate for the purpose. To draw upon this flap is to endanger its vitality. Therefore, the suturing is begun on the outskirts of the wound at four different points, viz., at each end and on each side. A few stitches are taken at the axillary and at the sternal ends of the wound first. The flap is then turned in and held in place by a temporary stitch, while it is gradually pushed up into place from below by sutures firmly girding together the edges of the skin to which the flap was originally attached. Sutures should all be superficial, as deep sutures cut and do not give the skin included by them a chance to stretch. Plate LIX shows the wound as finally closed."*

The margins of such an extensive wound cannot be approximated, and for the purpose of covering it in, a flap is taken from the side of the thorax and turned up from the lower margin of the wound. An incision is made at the middle of the lower lip and at right angles to it. The knife is carried in a gentle curve downward or upward as preferred, or in both directions, and the flap or flaps can be so spread out as to cover in the greater portion, if not all, of the exposed surface.

In the procedure recently devised by Jabez N. Jackson, of Kansas City, Missouri, the skin incision is begun at a point about one and one-half inches below the clavicle in the sulcus between the deltoid and pectoralis major muscles. From this point the incision is carried in a straight line along the sulcus, parallel to the inner border of the deltoid muscle, until it reaches the lower border of the pectoral fold as it terminates in

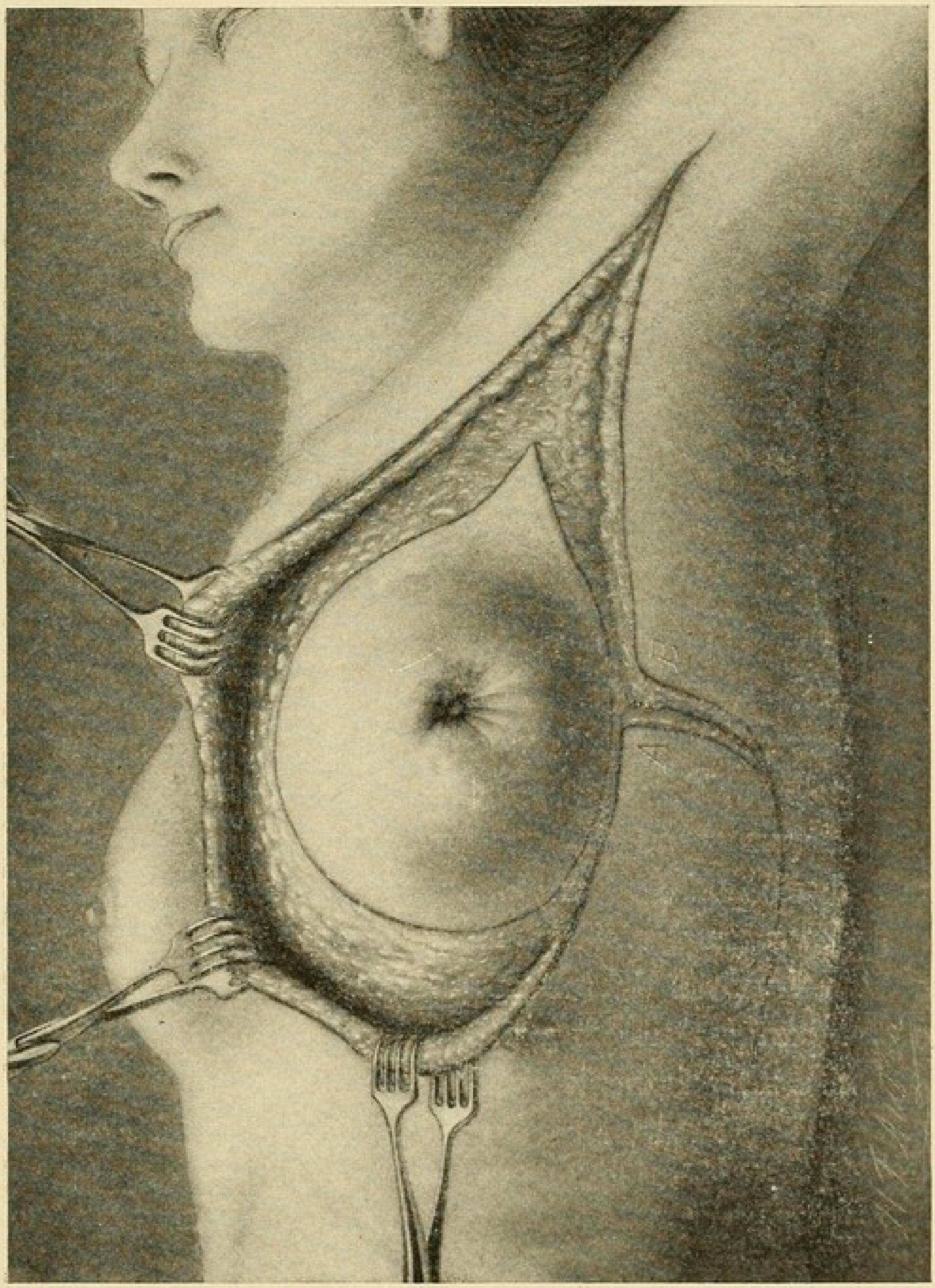
*Annals of Surgery, December, 1904.

PLATE LIII.



Showing skin incisions in Warren's operation. (*Annals of Surgery.*)

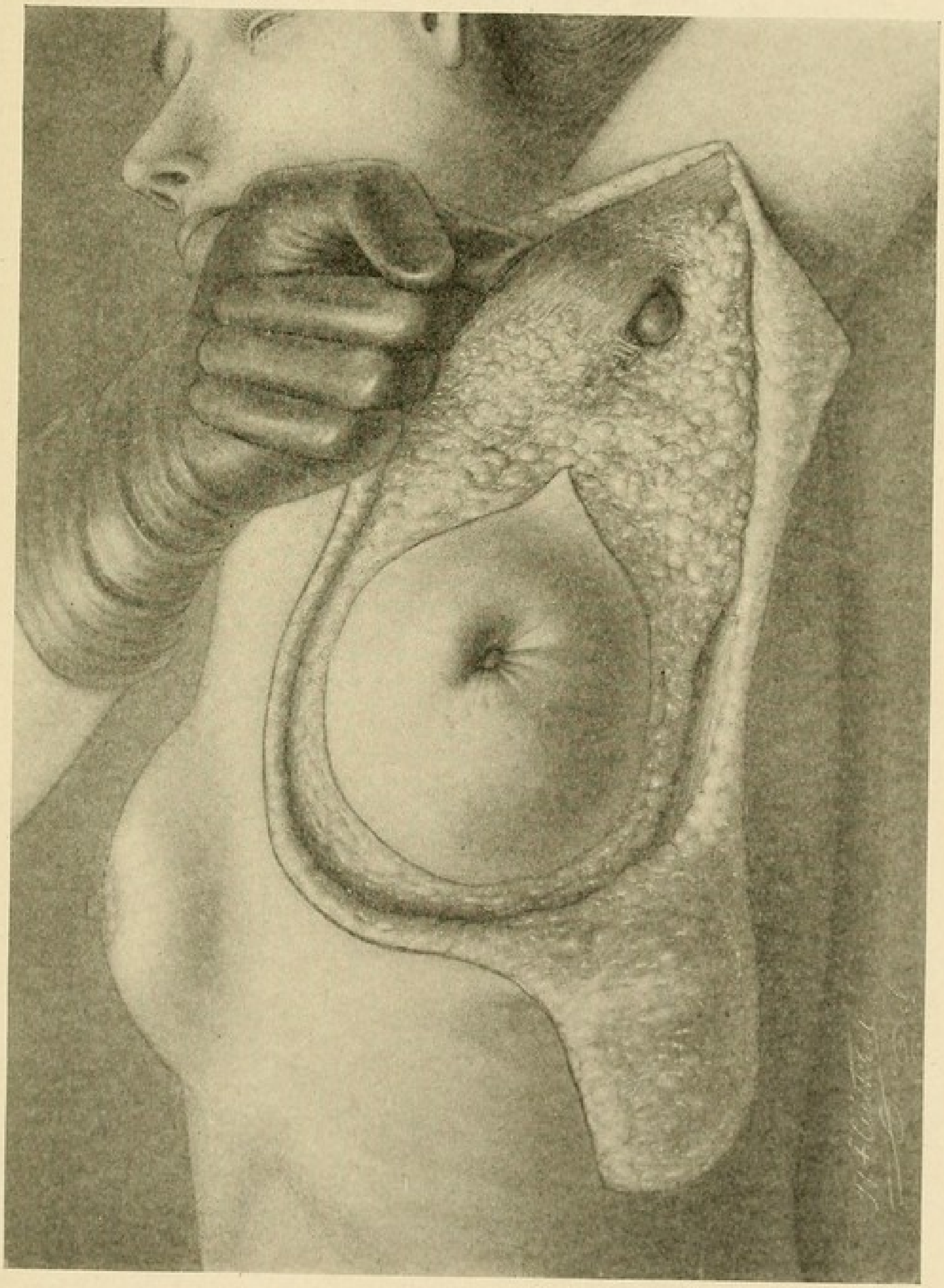
PLATE LIV.



Illustrating Warren's Operation for Mammary Carcinoma.

Preliminary dissection of the integuments in all directions, leaving a pyramidal mass of tissue to be removed, of which the primary nodule is the apex. (*Annals of Surgery.*)

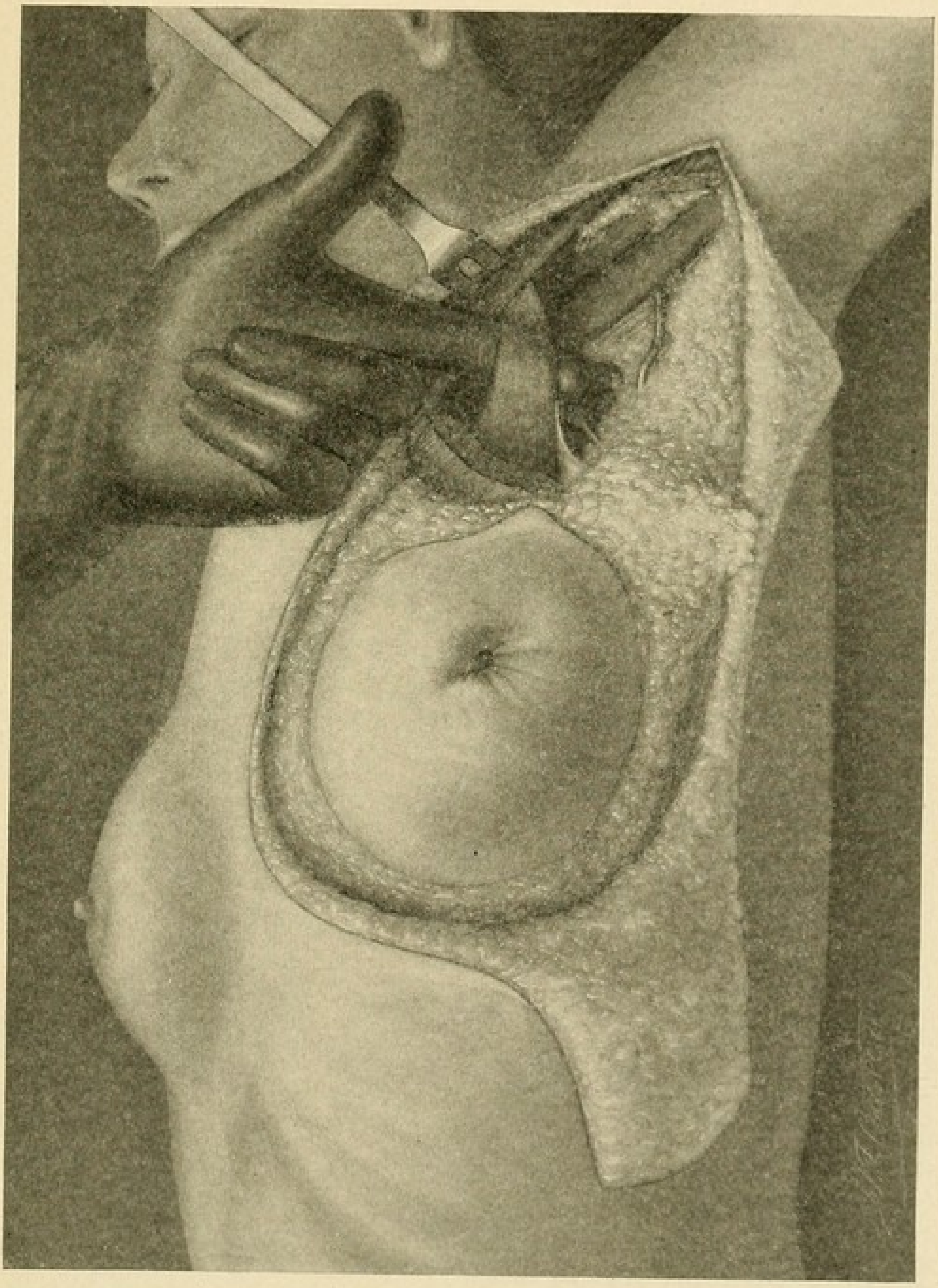
PLATE LV.



Illustrating Warren's Operation for Mammary Carcinoma.

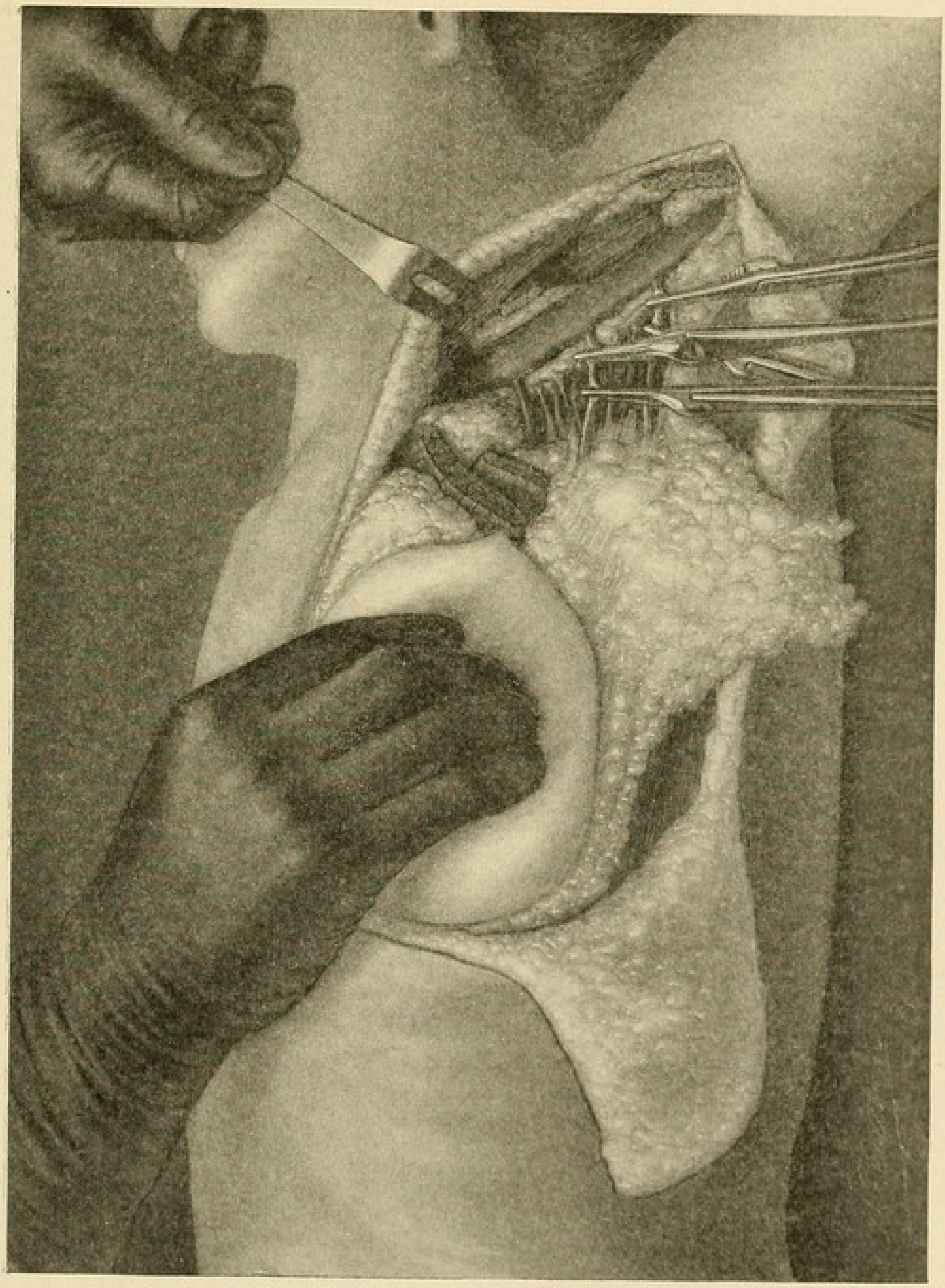
Exposure of the insertion of the pectoralis major. The knife is about to divide the muscle at this point. The latissimus dorsi is also exposed, showing the limit of the dissection outward. (*Annals of Surgery.*)

PLATE LVI.



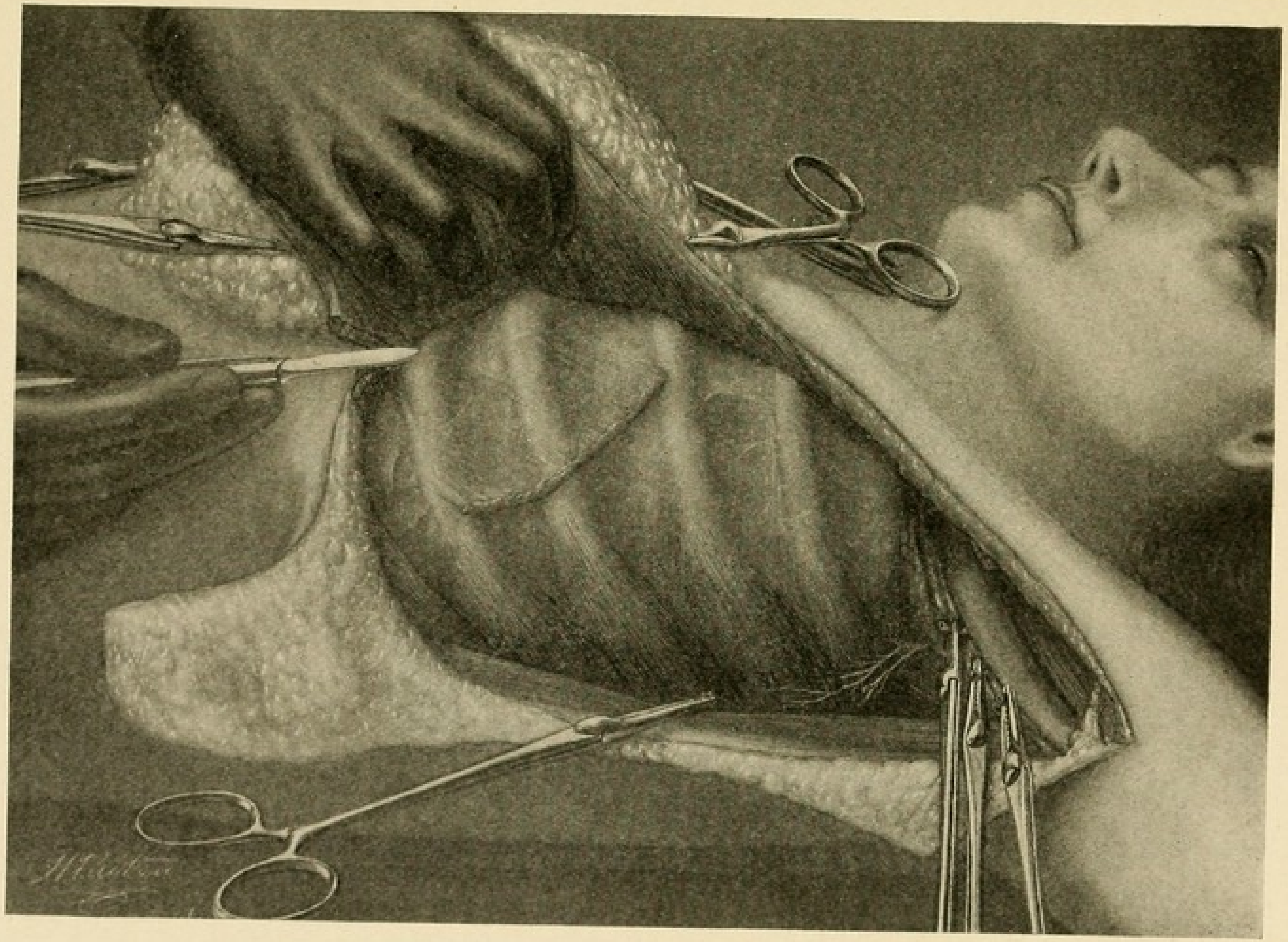
Illustrating Warren's Operation for Mammary Carcinoma.
Division of the insertion of the pectoralis minor. (*Annals of Surgery.*)

PLATE LVII.



Illustrating Warren's Operation for Mammary Carcinoma.
The divided muscles permit the retraction downward and inward of the breast and axillary contents and enable the operator to expose freely the axilla and to tie the main branches at their origin.
(*Annals of Surgery.*)

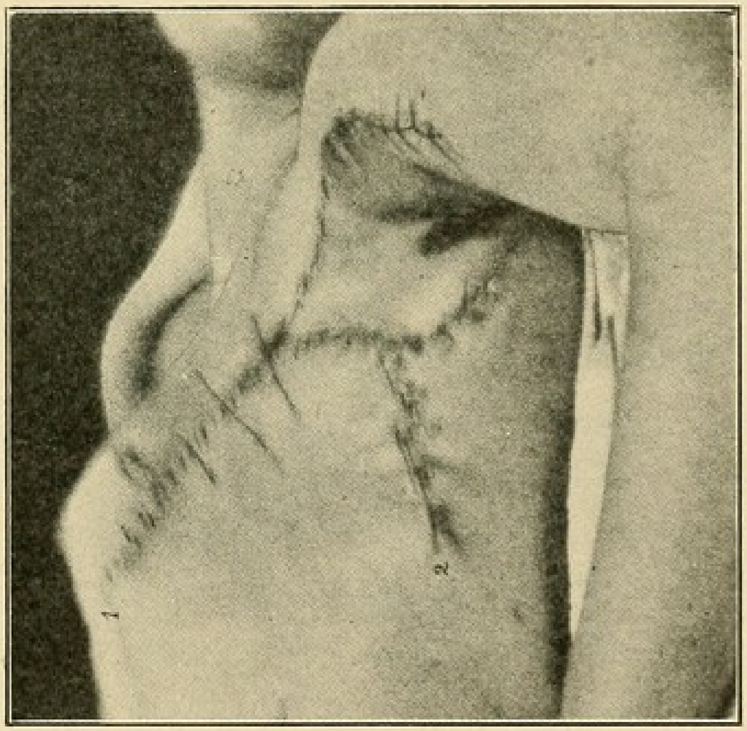
PLATE LVIII.



Illustrating Warren's Operation for Mammary Carcinoma.

The mass to be removed has been reflected towards the median line; the origin of the pectoralis minor has been divided and the origin of the pectoralis major is being divided as the final step in the operation. The large wound is thus uncovered only at the last moment. (*Annals of Surgery.*)

PLATE LIX.



Showing appearance of wound after closure in Warren's operation.
(Slightly modified owing to an unusually large wound.)

the arm. As this incision is carried down through the skin and superficial fascia, it exposes the fibers of the pectoralis major converging well to its tendinous insertion on the humerus. At the lower point of this incision, where it curves along the under border of the pectoralis major, the index finger is now shoved up underneath the pectoralis major muscle and brought out again at its upper border, so that the entire muscle is thus hooked up on the index finger and by blunt dissection separated out to its tendinous insertion. The tendon of the muscle is then divided close to its insertion into the humerus. The muscle immediately retracts toward the chest and exposes, underneath, the pectoralis minor muscle imbedded in its fascia, which above runs to the clavicle, and below spreads out over the chest wall. It is also divided close to its insertion, and, like the pectoralis major, retracts at once, thus giving a good exposure of the axillary space. If necessary the horizontal incision may be begun before the axilla is cleared out.

After the dissection of the axilla has been finished, the original skin incision is completed by carrying the horizontal incision over to the chest and outlining the outer half of the ellipse, which should parallel the original incision so as to permit the flap to be raised and turned upward toward the clavicle, thus giving a deeper exposure of the attachments of the pectoral muscle above and in front. It is important that a small tenaculum forceps should be placed at each angle of this flap when it is completed; it is then wrapped in gauze until it is used later to cover in the defect. The dissection is now completed usually with gauze, the tissues are loosened up underneath the pectoral muscles under the breast and toward the chest, and the remaining attachments of the muscles separated. After the pectoralis major muscle has been entirely separated from beneath, the breast is allowed to drop back into its normal position, the skin incision is completed and the breast and pectoral muscles are finally removed.

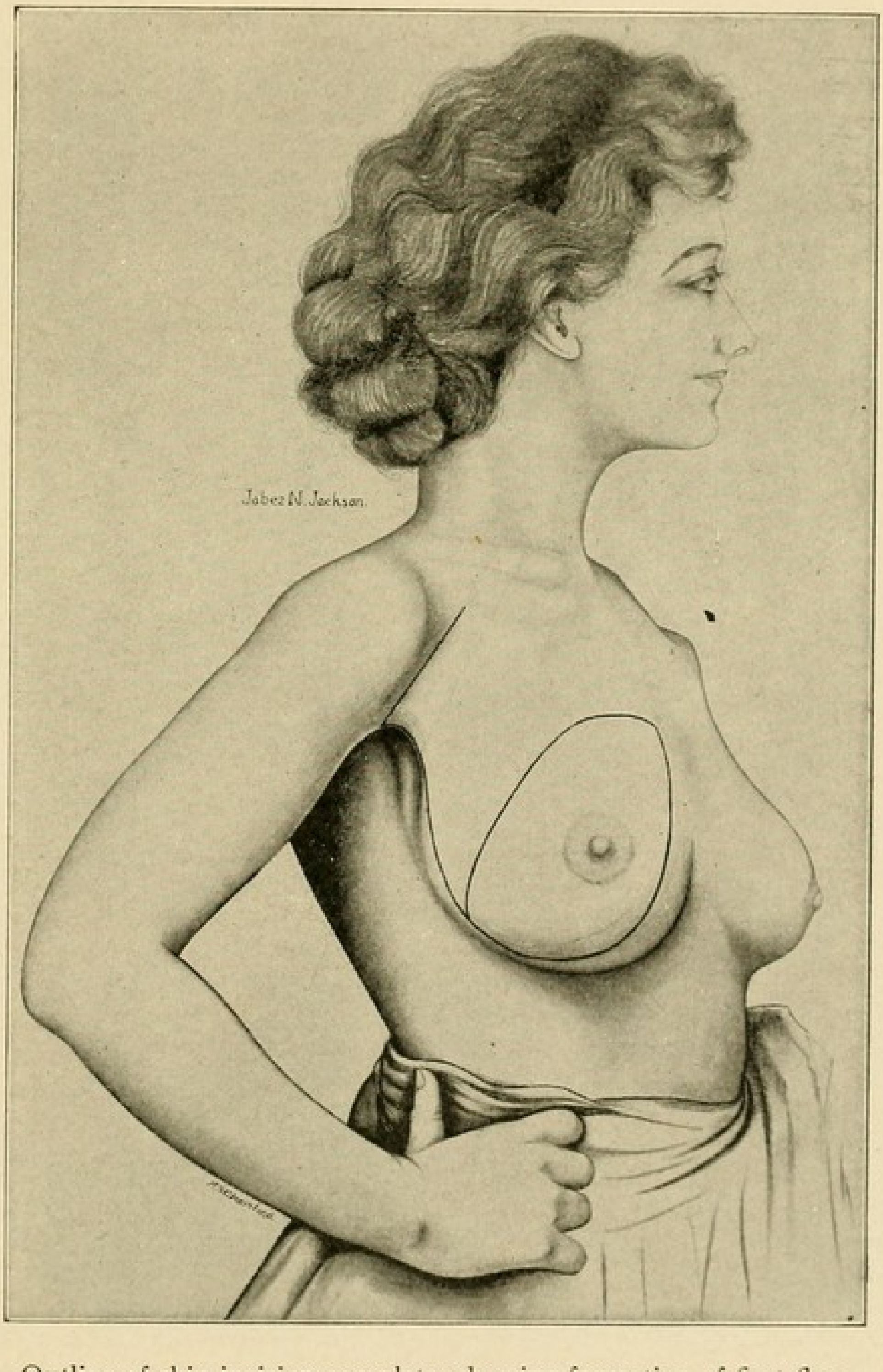
The quadrilateral flap of skin and superficial fascia which originally formed the anterior covering of the axilla is now stretched out by tenaculum forceps and transferred inward to cover the defect of the chest wall created by the removal of the skin of the breast about the nipple. This flap, which is one of the distinctive features of the operation, will always contract after it has been loosened and will look as though it could be of but little service. It is spread out by means of the tenaculum forceps already mentioned, with probably another pair on either side. As the flap is drawn over on the chest it is fixed by attachment to the corresponding skin margin, as shown in Plates LXVI and LXVII. Another distinctive point consists in catching up, with the tenaculum, the margin of the lower portion of the pectoral fold, which represents the integument which formed the original floor of the axilla and which in thin subjects is often very marked. The tenaculum on this margin is placed at such a distance from the lowest point of the first vertical line that when drawn upward it will bring this skin point up to the beginning of the first incision beneath the clavicle. This maneuver brings the loose skin from the floor of the axilla close around the axillary vessels and does away entirely with the axilla as a cavity. These tenacula are usually clamped and mark the fixed points of coaptation.

An approximation suture of silk-worm gut is now placed at these points to steady the subsequent suturing. The remaining portion of the incision may be closed either with interrupted or continuous sutures. A puncture in the lowest recesses of the wound space behind furnishes opportunity for a drainage tube.

The steps of this operation are shown in Plates LX to LXVIII inclusive.

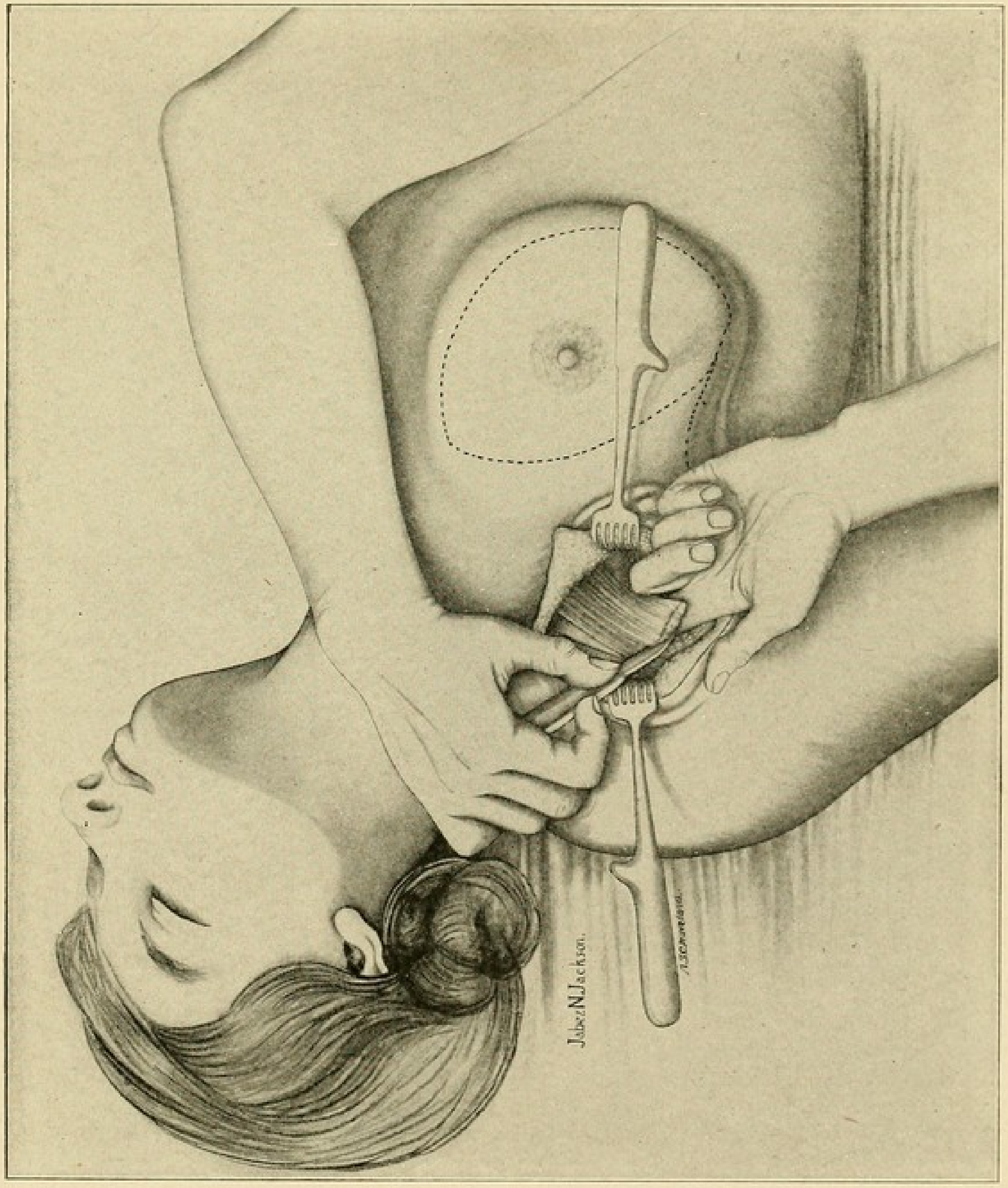
I have employed this procedure in a reasonable number of cases and consider that it meets most of the requirements admirably. The chief defect with it, a most serious one as I

PLATE LX.

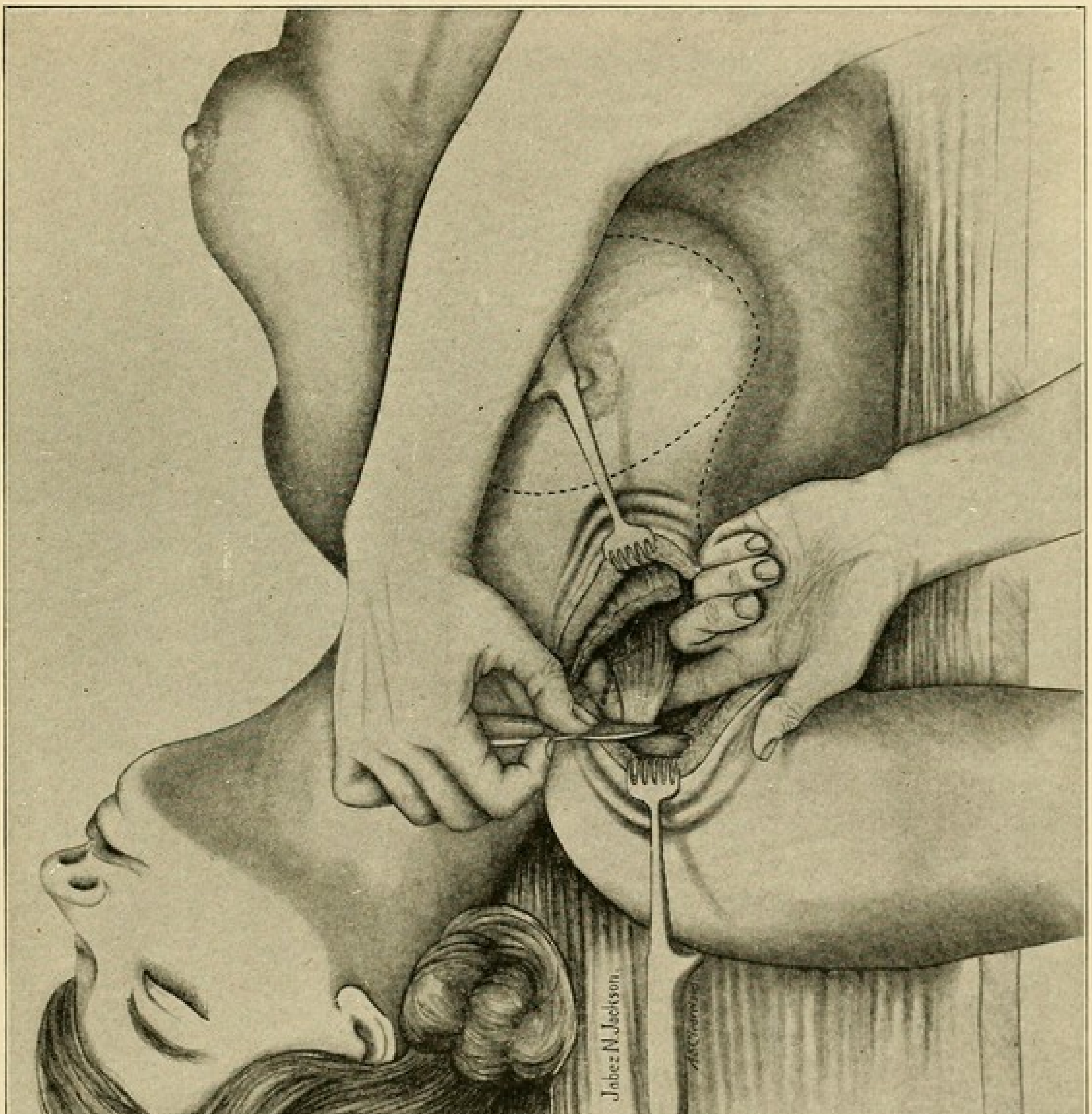


Outline of skin incision complete, showing formation of first flap.
(*Jabez N. Jackson.*)

PLATE LXI.

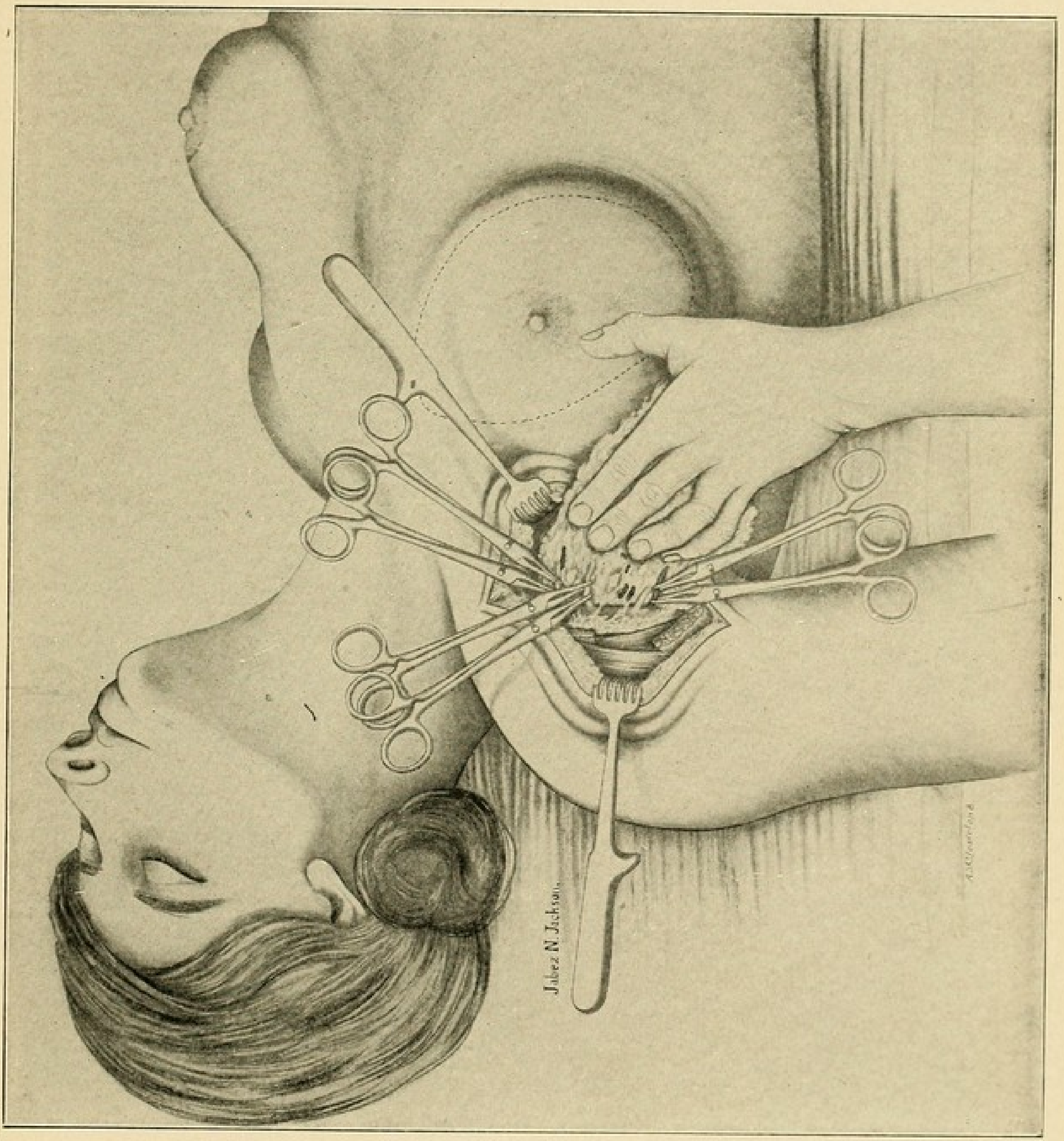


Division of pectoralis major muscle at insertion through primary vertical incision. (*Jabez N. Jackson.*)



Division of tendon of pectoralis minor at insertion. (*Jabez N. Jackson.*)

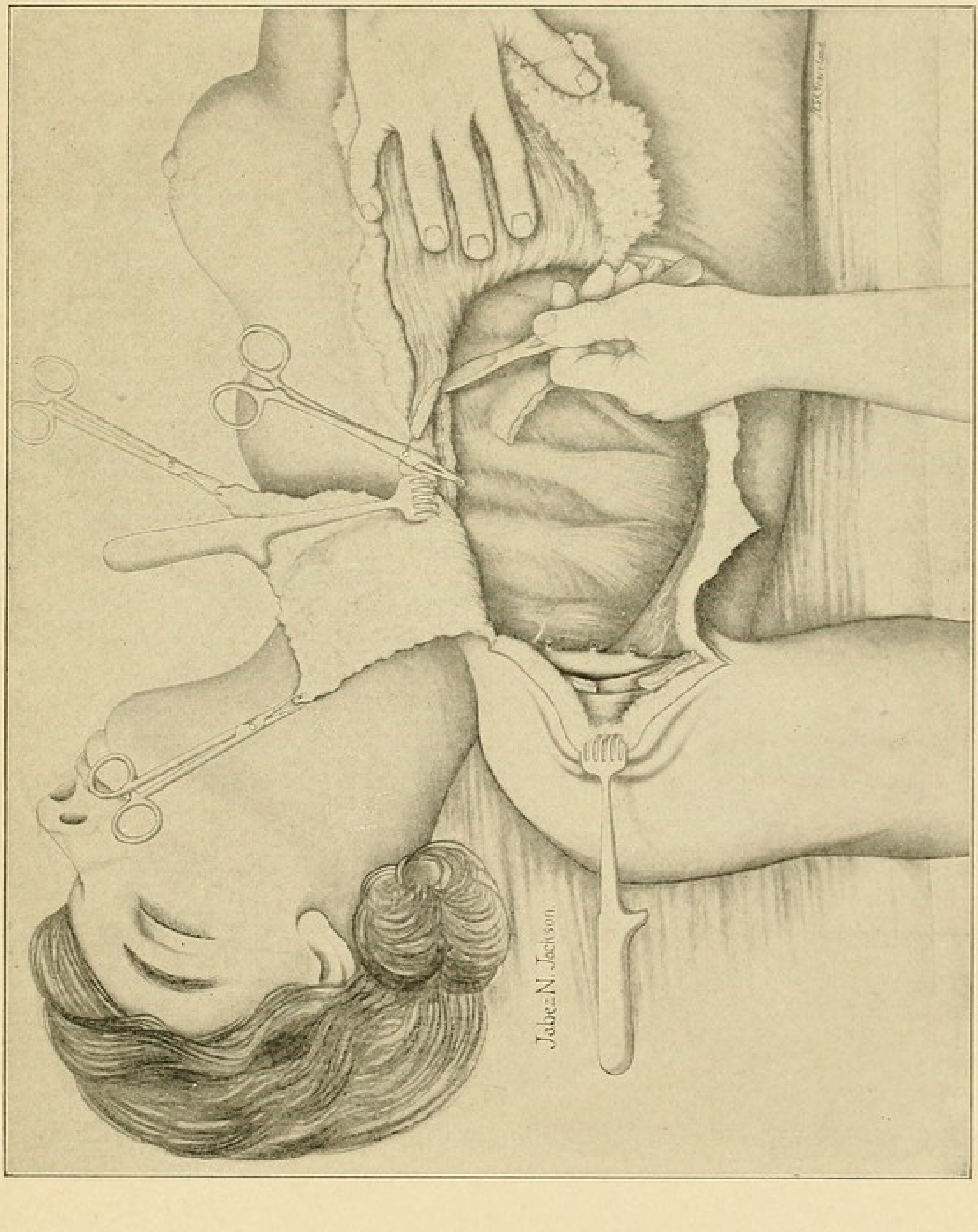
PLATE LXIII.



Clearing fascia and glands from around axillary artery and veins, isolation of branches to fossa for primary ligature. (*Jabez N. Jackson.*)

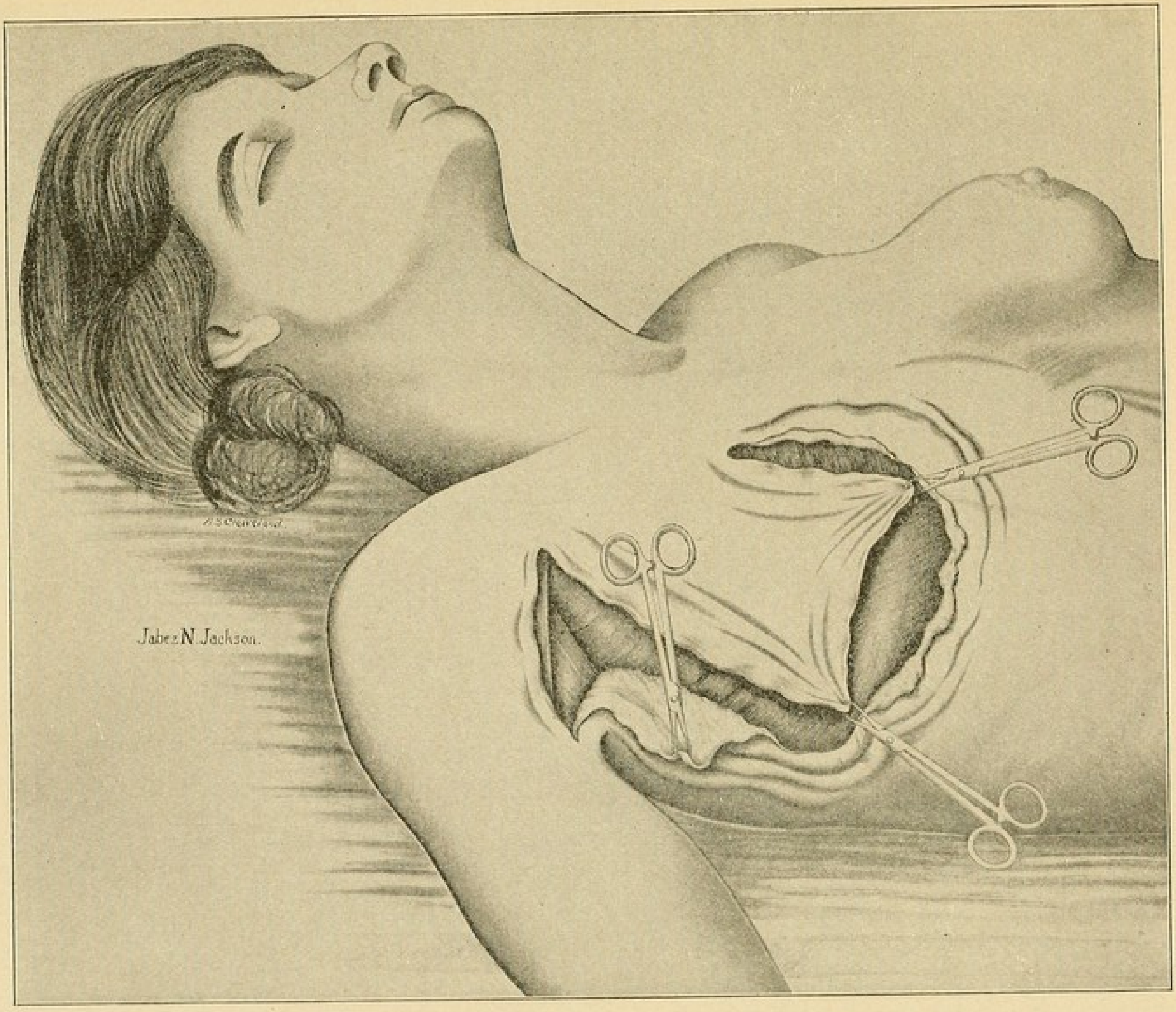
PLATE LXIV.

Flap completed and turned upward. Branches from axillary artery and vein ligated; dissection being continued from apex of axillary fossa downward and outward beneath retracted pectoral muscles. (*Jabez N. Jackson.*)



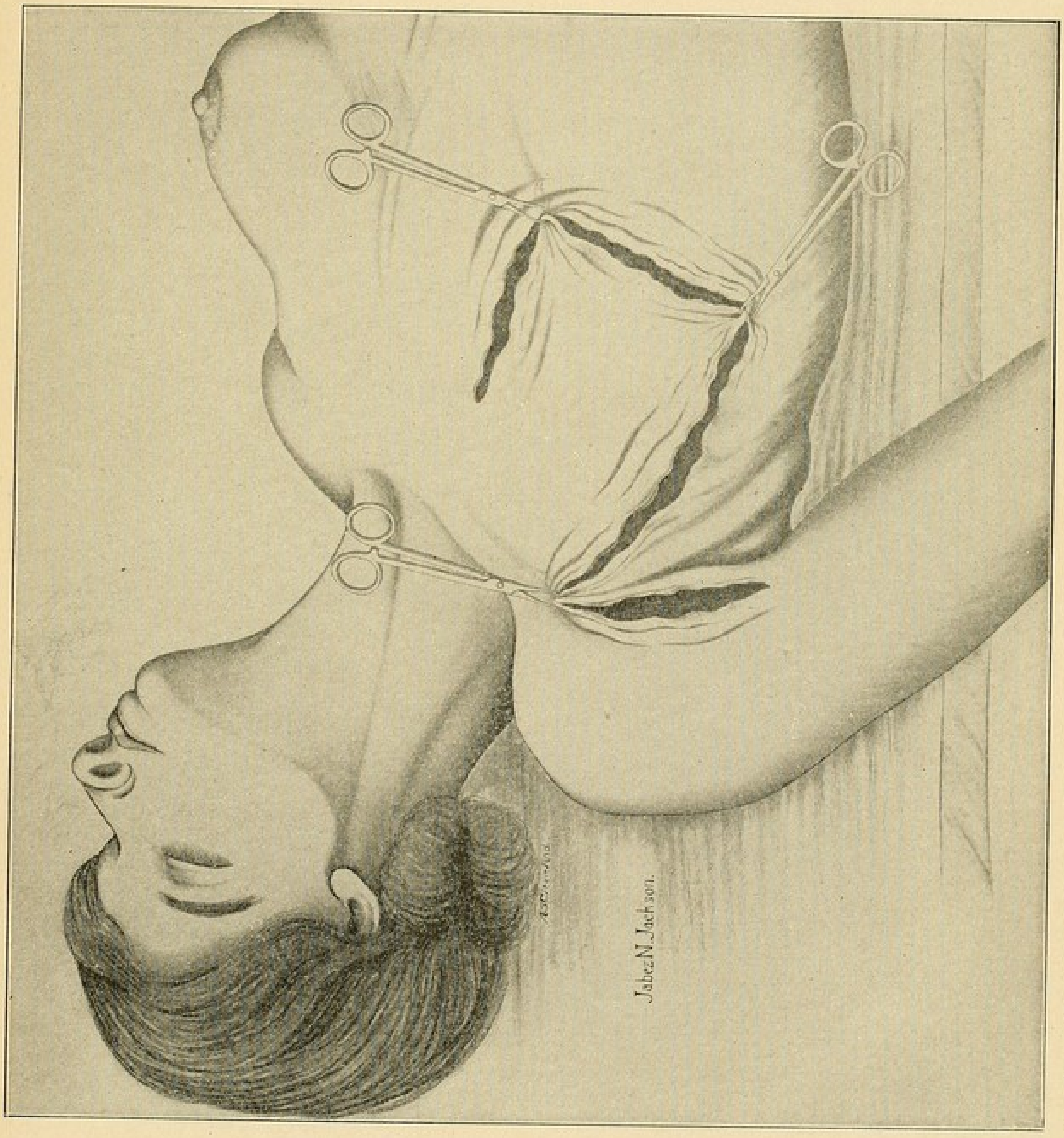
Axillary dissection completed. Division of pectoral muscles at origin from beneath. Mammary branches caught and ligated on division. Amputation completed. (*Jabez N. Jackson.*)

PLATE LXVI.



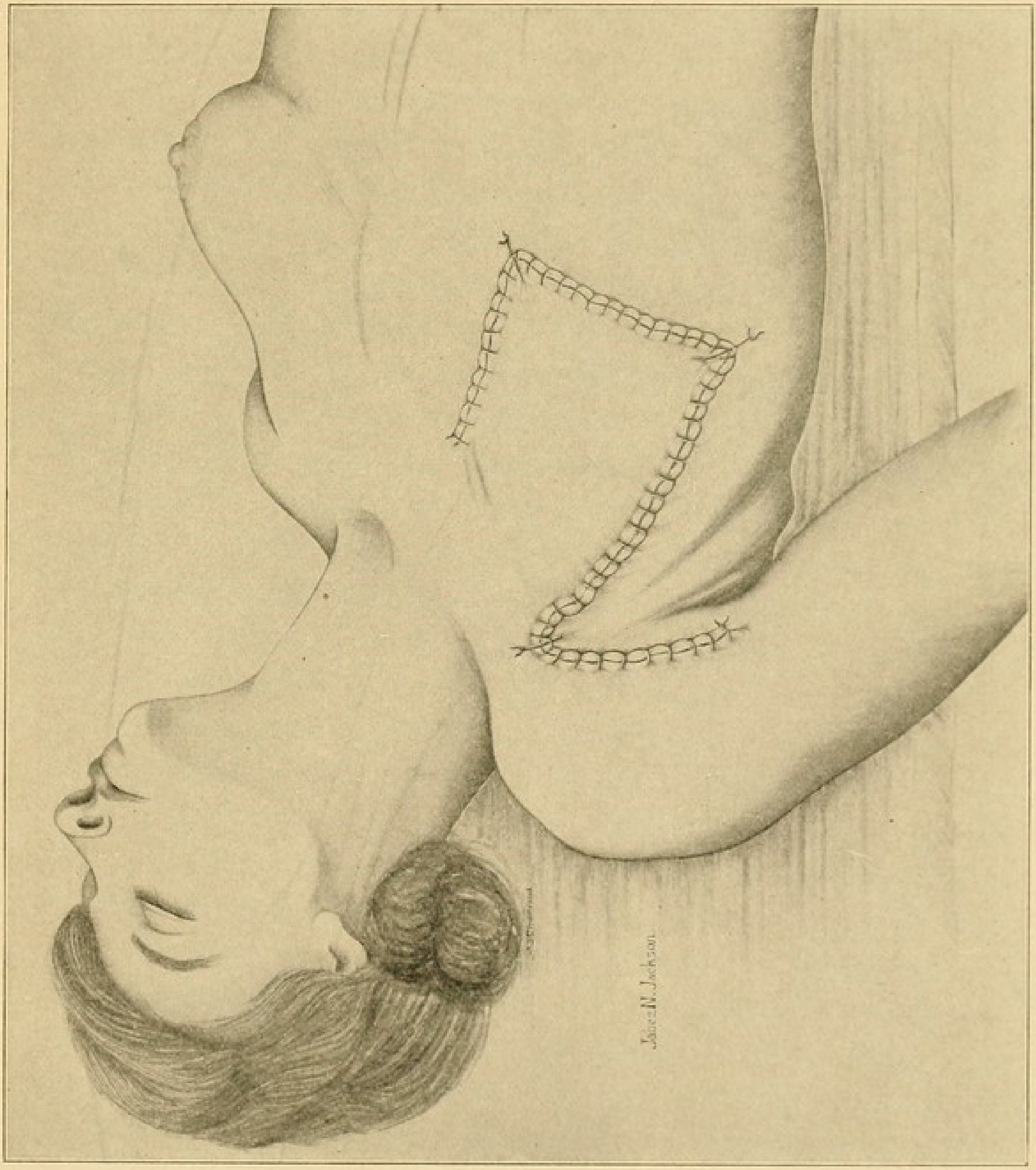
Amputation completed. Flap A, the corners of which are held by tenacula, is drawn over to cover the chest defect and the wound is closed by plastic adjustment. (The apparent laxity of the tissues is erroneous). (*Jabez N. Jackson.*)

PLATE LXVII.



Flap in place and fixed by tenacula. Loose skin of original axillary floor drawn upward to complete covering and hugging about axillary vessels, thus obliterating axillary fossa. (*Jabez N. Jackson.*)

PLATE LXVIII.



Suturing complete. Tension sutures at angles. (*Jabez N. Jackson.*)

see it, is that the skin flap is taken from a region near to, if not actually where the growth is situated—in the greater number of cases—the axillary hemisphere. It insures easy closure of the wound, but at the expense of retaining suspicious if not certainly infected skin. Within the past year I employed this incision to my great regret in two cases certainly, as both were reoperated for recurrences in the skin within six months after operation. In one of them the tumor was situated at the sternal end of the breast, which made the recurrence all the more unlooked for and disappointing. In other cases where the growths were situated inferiorly and *far away* from the flap, I have not, as yet, encountered recurrences.

Another defect is that the skin overlying the entire breast is not sacrificed. This can, however, be overcome by broadening the ellipse and extending its inner half well to or beyond the middle line of the sternum. This must be done to be safe for tumors in the *sternal* half of the gland. Moreover, such a modification would permit of a freer removal of the deep fascia, which has recently been insisted upon as a pathological necessity. This operation is ingenious, original, and can be quickly done, but if more skin were removed, it would still permit of primary union and be followed by better ultimate results.

In a communication[1] recently received from Dr. Jackson, he states that the illustrations of his operation do not exactly represent the technique which he now employs. He states that he "sacrifices practically the entire skin of the breast, or at least all lying within a radius of three or four inches beyond the furthest extension of the tumor mass." With this modification I should think more favorably of his procedure.

Dawbarn, of New York, has suggested an ingenious operation to supply the defect caused by the removal of the pectoralis major muscle. He transplants a part of the deltoid, having its origin at the outer half of the clavicle, attaching it to the severed pectoralis major which is attached to the inner half of the bone. In a personal communication to me he describes his operation as follows (it has not yet been published): "After both pectoral muscles have been removed our patients have no other means than the action of the anterior fibers of the deltoid for the advancement of the arm nor for its adduction. When one considers the point of origin of this portion of the deltoid, it is at once obvious that if this part of the muscle sprang from the inner rather than the outer half of the clavicle its power to produce such motions would be greatly increased. Bearing this in mind, I have for several years past quite regularly adopted a plan of muscle anastomosis, viz., the detachment from its origin of an inch (more if thought necessary) of the anterior fibers of the deltoid, the muscle being split in a direction parallel to its long axis for a distance quite short but sufficient to permit the detached portion to be sutured to a stump, of corresponding size, of the adjacent pectoralis major. This resource is of course contraindicated if the cancer extends to the vicinity of the muscles involved in such contemplated anastomosis; but this relatively seldom occurs. The stump of the great pectoral may be left an inch long (sometimes longer) in order to permit the more ready accomplishment of union of muscle to muscle. On the other hand the deltoid, as just stated, is dissected as far as it is to be so used from a level as close to the collar bone as possible. I have found three medium twenty-day tanned chromic catgut sutures to be quite sufficient; and the entire little procedure adds only some five minutes to the length of work. As a rule it is easy to avoid injury to the cephalic vein—the preservation of which is at times so important—the deltoid slip being fashioned so as to cross obliquely in front of the vein. So far as I have been able to determine, the portion of the deltoid entering into the anastomosis is not deprived of its innervation, nor does it undergo atrophy; though obviously, to avoid this, it should be split down for as brief a distance as good work will permit. On the other hand it does secure what is intended, namely, facilitation of flexion and adduction of the humerus."

While this device of Dr. Dawbarn is entirely original and another evidence of his surgical fertility, it is, I believe, wholly unnecessary and intended to correct a condition which I do not

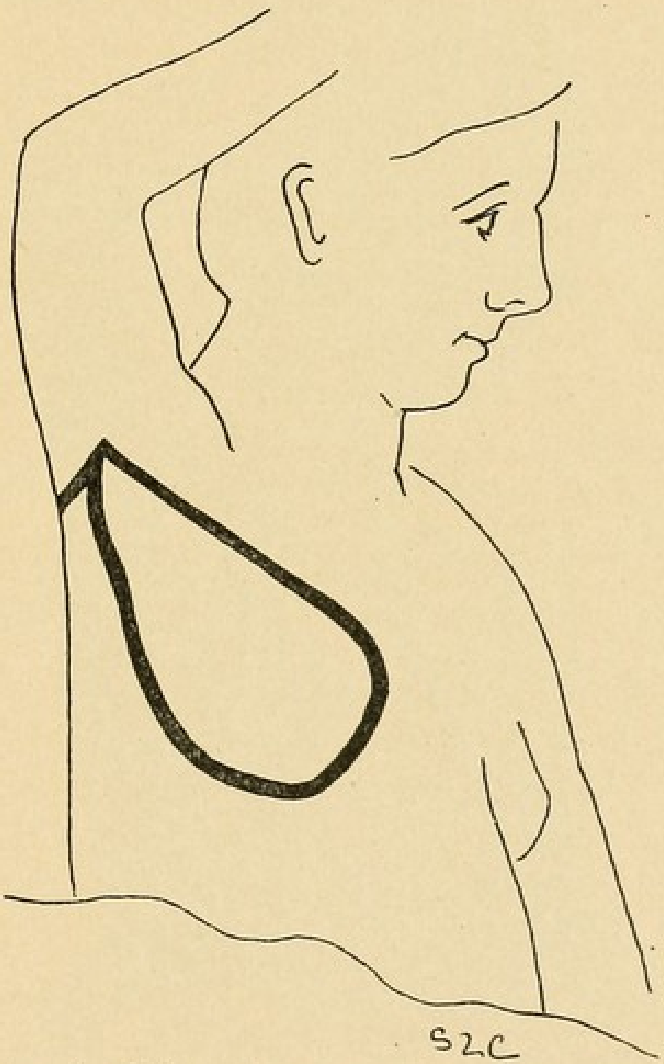


Fig. 38.—Primary incision in Tansini's operation.

think exists. There is no trouble about patients who have had their pectoral muscles removed adducting the arm, or, indeed, doing anything else that they were able to do before such removal. I have already expressed my opinion fully enough on this subject.

Of the plastic procedures practised by foreign surgeons, I shall describe that of Tansini, which is one of the best. This incision has been imitated by other surgeons, but the principal feature of the operation, and its best, viz., bringing the flap from the back where the skin is presumably healthy, undoubtedly originated with Tansini. I have never employed it, because of the difficulty of its execution, the possibility of sloughing, even though rightly done, and the great probability of its occurrence if a false step is made.

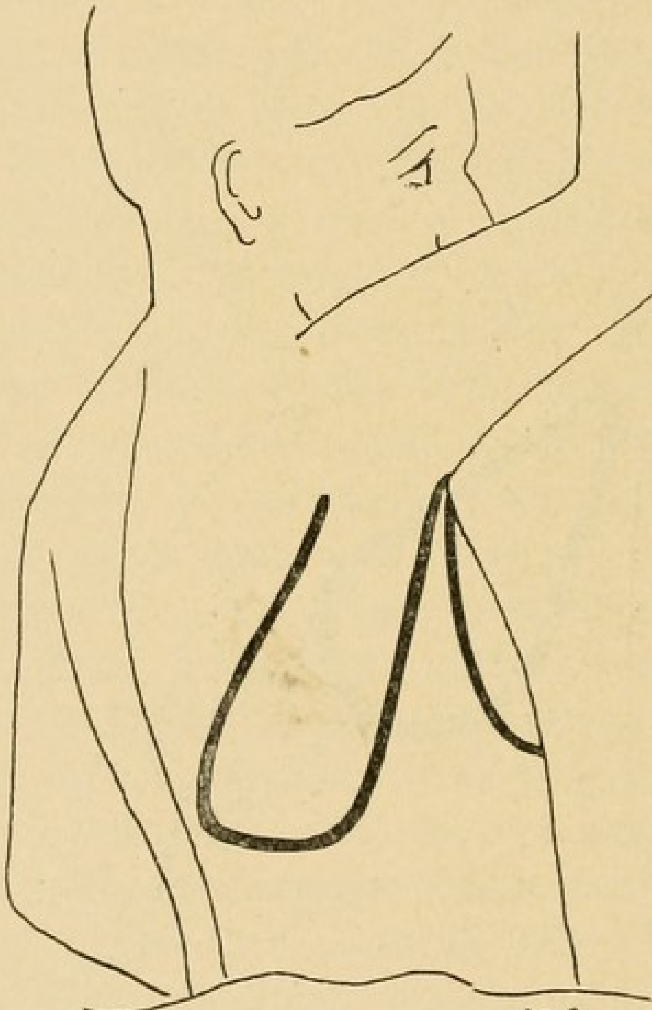


FIG. 39.—Second incision in Tansini's operation.

In Tansini's operation, the broad oval incision must extend to the outermost point of the axilla (Fig. 38) so that the narrowest portion of the entire wound, that is, the point of union of the two incisions, shall be there. Thus the autoplastic flap formed by the second incision (Fig. 39) will cover in the axillary space in such a manner that the upper extremity of the cicatrices will correspond to the anterior and posterior axillary borders respectively, the center of the space being protected by healthy skin. The flap formed by the second incision must be 6 or 7 cm. (about $2\frac{1}{2}$ inches) in breadth, and have its center corresponding to a point 3 cm. ($1\frac{1}{5}$ inches) from the

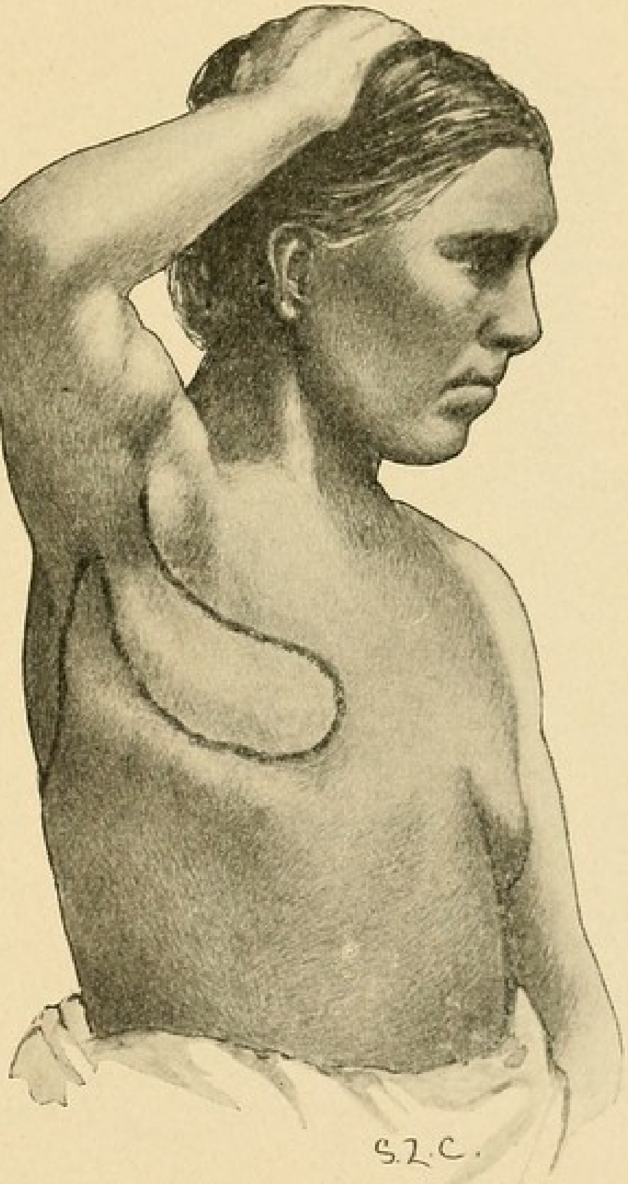


FIG. 40.—Showing cicatrix in Tansini's operation. Front view.

posterior axillary border, 5 cm. (2 inches) from the spine of the scapula, and 10 cm. (4 inches) from the angle of the scapula. Its anterior border is outlined by cutting from the termination of the first incision at the outermost point of the axilla downward and inward towards the midline of the back. This cut is then carried horizontally and with a slight curve across the back and upwards to a point opposite and 6 cm. ($2\frac{3}{8}$ inches) internal to the point of starting, thus forming the posterior border. This flap is easily drawn forwards and made to cover the defect in skin caused by the removal of the breast,

FIG. 41.—Showing cicatrix in Tansini's operation. Side view.

and, moreover, as already stated, supplies the axillary space with a covering of healthy skin. The dorsal wound is closed by a series of linear sutures. A small area at the lower extremity often remains open. (Figs. 40 and 41.)

As first practised by its originator this operation did not give invariably good results owing to frequent sloughing of the flap, sometimes to the extent of one-third of its surface. A careful study of anatomical preparations, however, enabled him to overcome this disadvantage. It was found that certain important branches given off by the dorsalis scapulæ (arteria scapularis circumflexa), itself a branch of the subscapular, are contained in the stem of the flap. This vessel passes between the teres major and teres minor muscles and one of its terminal branches supplies both latissimus dorsi and the skin over it. In addition to this branch, however, the latissimus dorsi receives branches directly from the subscapular.

From the above considerations it will be seen that in order to preserve the vitality of the flap, it is necessary to include the latissimus dorsi and to insure a still better blood supply, a piece of the teres major may also be included.

In dismissing plastic procedures in general, I wish to state positively that the prominence given them is out of deference to the opinion of many surgeons whose judgment I value, and also to meet a demand—with some a paramount one—of securing easy primary coaptation of the wound. That they do so frequently at the expense of an abiding result, I am now fully persuaded after a fair, and I think I may say conscientious, employment of them for a period of ten years. They are inadequate, disappointing, and do not meet the pathological requirements necessary in dealing with an infiltrating and disseminated malignant process. The prime defect with all of them is that they subordinate a radical cure to the carrying out of a preconceived plan which will do very well in *some cases* where the lesion is favorably situated, but must fail in many, perhaps most instances where they are practised. I cannot doubt that he who employs them in many cases will find himself sooner or later, as I have been, the victim of chastened hopes, and definitely put them to the one side as alluring and convenient for the surgeon, but an enormous handicap to the patient.

If cancerous growths were always to be found in precisely the same situation in every case (instead of as they are indifferently, some central, more peripheral, and about an equal number in each of the four quadrants of the mammary gland), then I could easily understand how a skin flap could be so fashioned as to meet every requirement, surgical and pathological. But with growths so widely variant as we find them to be in carcinomatous breasts, there is but one safe rule to follow, and that is to sacrifice every particle of skin superlying the entire mamma. Anything short of this is simply courting failure.

Palliative Operations.—The more I see of palliative operations, the more I am impressed with their uselessness. I have about come to the conclusion, that any case so advanced as to forbid a reasonable hope of complete extirpation of the disease should be treated by non-operative measures. I have no hesitation in saying that the few patients upon whom I have performed palliative operations, hoping to relieve pain and prolong life, have been sadly disappointing to me. Pain is only relieved for a time, and it is my belief that the end is hastened rather than delayed by partial operations. I will not say that a foul ulcerating mass may not be removed for the purpose of giving temporary comfort, but am distinctly of opinion that little encouragement should be given a patient thus affected either as to decided relief from pain or prolongation of life. I would much rather in such cases do a still more radical operation than ordinarily practised, even going so far, as I have done in one case, to remove a portion of the sternum and several ribs with a part of the parietal pleura, if there seems the least hope of getting beyond the apparent limits of the disease. In the case referred to, life was undoubtedly prolonged by the heroic measures employed, and I was greatly surprised to see the woman come into my office one day when I had supposed her dead for more than a year. She lived nearly three years after my last operation.

The recent statistics of the Johns Hopkins Hospital just published by Bloodgood, confirm me in the opinion that life is undoubtedly shortened by partial operation, as such patients live only 2.2 years if operated upon, whereas they live 3.2 years without operation. Moreover, such operations undoubtedly do the cause of surgery harm on account of the deterrent effect they have upon operable cases. Patients are sure to learn of them and do not understand that such operations were done as a *dernier ressort* and with little, if any, hope of permanent benefit accruing therefrom.

Occasionally, but very seldom, in my judgment, will a case be encountered where Berger's operation must be considered. Within the past six months such a case presented itself to me, and the accompanying photographs show the condition of the patient prior to operation. Her plight was truly a pitiable one. She had been operated on by another surgeon, and there was prompt recurrence in spite of a very thorough operation so far as I could judge from the history. Her arm was enormously swollen, it being more than double, in fact nearly thrice the size of the opposite limb. It was so heavy that the patient had to stay in bed on account of the great pain occasioned by the weight of the limb when she was up. Her suffering was so intense that I finally consented, after her urgent and repeated insistence, to remove the arm. The entire scapula and outer two-thirds of the clavicle were also removed, as well as all visibly affected soft parts. The patient made a good operative recovery, and was entirely relieved of pain for a time, moreover, she was able to walk about the hospital and to enjoy a degree of comfort which she had not known for months. The relief, however, was of brief duration, as she died of internal metastasis five months after the operation. (Plates XL and XLI.)

I am most pessimistic as to the value of operations in cancer en cuirasse. Never have I seen good result from them, and seldom, in my judgment, should operative measures be employed. I can easily understand how the lesions might be so discrete as to admit of removal by wide and free operation. But I repeat, such cases must be rare, as I have not seen one.

Treatment of Inoperable Cases by Röntgen-rays, Etc.—It is not my purpose to go exhaustively into the subject of the value of the Röntgen-rays in malignant disease. This belongs to special monographs on the subject. Briefly, I should say that all inoperable cases may be treated by the X-rays and that some will find more or less relief from pain and apparent benefit so far as reduction in size of the tumor is concerned. A few cases are undoubtedly made worse by the treatment, the growth seemingly being stimulated to an unwonted degree rather than repressed. No one can tell what is to be the result in any given case and the use of the rays must, in the present state of our knowledge, be empirical.

I formerly subjected most of my patients after operation to a certain number of treatments by the X-rays and then believed such a course warranted. But the fact that I have seen the disease stimulated and made to pursue a more rapid course has made me sceptical, and I now limit the use of the rays to inoperable cases, or to those where there is a doubt as to the complete eradication of the disease by operation.

I have seen the best results follow the rays in superficial squamous epitheliomata and lupus. I have also witnessed remarkable results occasionally in the treatment of inoperable sarcomata, but I fail to recall a single case where the X-rays exerted more than a temporary benefit in a case of cancer of the breast. We may find in time that the variety of the growth will influence the result perceptibly. They apparently do little good in scirrhus.

As already indicated, the X-rays are entitled to a greater degree of confidence in the treatment of inoperable sarcomata than we have a right to expect when dealing with carcinomata. I have not used this treatment in sarcoma of the breast, but have so often seen gratifying results, occasionally astounding ones, from the use of the rays in sarcomata located elsewhere that I should be inclined to advise this treatment in any case where operative measures were clearly out of place. W. B. Coley has cured one such case by the use of his toxins. I have had a reasonably large experience in the treatment of sarcomata elsewhere by Coley's method, having used it in more than one hundred cases. In many there was prompt and distinct betterment, causing me to believe for a time that a cure might be effected. In only one case, however, have I seen such a result. An extensive sarcoma of the pharynx was entirely cured by the use of toxins and has remained well for more than ten years. When the treatment was begun, at my suggestion, by a former colleague, Dr. M. F. Coomes, of Louisville, Ky., it was my belief that the patient would not live six months.

I am also convinced that a patient with sarcoma of the parotid who had been twice operated upon by a New York surgeon, and who declined a third operation, fearing paralysis of the facial nerve, which she was told would almost certainly ensue, was so much benefited by the toxin treatment that she might have been cured had she not been compelled to leave here and discontinue the treatment.

I consider the treatment by toxins of sufficient value to be insisted upon in all clearly inoperable cases of sarcoma and am, moreover, inclined to give a few injections as a prophylactic against recurrence after operation, even in favorable cases.

I have seen no good whatsoever come from the toxin treatment in cancer, though I formerly used it in many cases.

PAGET'S DISEASE OF THE NIPPLE.

This disease, which was first described by Sir James Paget, in 1874, and which appears in the nipple and areola as an eczematous inflammation, has been the subject of much discussion by surgeons, dermatologists and pathologists. Moreover it is one which has always been fraught with interest because of its relation to cancer, and at the present time particularly it has attracted renewed attention by reason of the important pathological studies which have been made of it by several investigators.

It may not be amiss briefly to review the history of this disease and mention the more important theories which have been advanced relative to its nature.

Paget himself, basing his opinion on the study of fifteen cases, described the affection as a disease of the mammary areola preceding cancer of the mammary gland. He considered the changes in the skin to be the expression of chronic irritation, a kind of eczema, and believed that this supplied a soil favorable for the development of carcinoma. In all of his cases cancer of the breast developed subsequently, and it was this circumstance which led him to call attention to the disease. He states that "for an explanation of these cases it may be suggested that a superficial disease induces in the structures beneath it, in the course of many months, such a degeneracy as makes them apt to become the seats of cancer; and that this is chiefly likely to be observed in the cases of those structures which appear to be, naturally, most liable to cancer, as the mammary gland, the tongue and the lower lip."

Paget's opinion was accepted for a considerable period of time.

In 1881, however, Thin published his paper on "Malignant Papillary Dermatitis of the Breast," which he stated to be the same disease previously described by Paget. He differed from the latter, however, in believing it to be carcinomatous from the very beginning, and that the original location of the morbid process is within the galactophorous ducts. He declared that the involvement of the epidermis was secondary. Thin's theory was also accepted by Duhring, Raymond Johnson, and many others and it is the one which I myself accepted without hesitation as announced in several previous communications on the subject.

In 1889 Darier enunciated his parasitic theory, in which he maintained that the disease was due to infection by psorosperms. A year later Wickham published a paper in which he strongly supported Darier's theory. Darier himself, however, later changed his views, but notwithstanding this fact his original theory has continued to be cited from time to time.

Kaposi expressed himself as being of the opinion that the disease is not a morbid entity, but that it is rather an obstinate form of eczema, which though it may develop into cancer, is yet susceptible of cure. Unna, per contra, considers it to be a disease *sui generis* differing from both carcinoma and eczema, although he admits that it may supply a basis for the development of carcinoma. Recent careful histological studies have served to increase our knowledge of the true nature of the disease. They will be discussed when we come to consider its pathology.

In regard to the **etiology** of this disease little is known. The vast majority of cases have occurred in women, although some have occurred in men. Thus, for example, Crocker observed a case in which the penis and scrotum were affected, and Stelwagon has also reported one in which the disease was confined to the scrotum.

In this connection it is interesting to note that instances in which parts other than the breast were attacked have been observed in the female. Holzknecht mentions one in which the primary location was probably the axilla, and Shield saw one which affected the abdominal wall.

As concerns **age,** the majority of cases occur between the fortieth and sixtieth years, although some have been observed in women as young as twenty-eight and several have been reported in those over seventy.

The influence of **heredity** is unknown.

The influence of **pregnancy and child-bearing** is very indefinite, if indeed they have any effect. Cases have been reported in women who have never been pregnant, as well as in those who have borne and suckled children. It is natural to suppose that the irritation of the nipple caused by nursing might predispose to the development of the disease, but, as already stated, nothing definite is known in regard to the matter.

Pathological Anatomy.—If a section of the diseased tissue from a case of Paget's disease be examined under the microscope, a collection of large transparent cells will be observed in the deep layers of the epidermis. These cells differ from those of the rete Malpighii in that their protoplasm is much clearer, and they are also larger. They have several nuclei which stain readily and are rich in chromatin. The protoplasm is often vacuolated. In some instances the cells are not compactly arranged, spaces of considerable size intervening. Schambacher, however, found them arranged in strands which were surrounded by an envelope of connective tissue. The epidermis is thickened, the cells small and atrophied. Recent careful observations tend to show that there are no transitional cells between the large, clear so-called Paget cells and natural epithelial cells (Jacobaeus, Schambacher). Some investigators have thought that the former are degenerated epithelial cells, but more careful observations have shown that such is not the case. In one of the preparations examined by Jacobaeus the Paget cells were found to be continuous with the cells of the glandular carcinoma, and the same condition was observed by Schambacher. Furthermore, they were found to extend to the superficial layer of the skin in areas where the disease was most advanced. Thus it is seen that there is a direct communication between the morbid process in the skin and that affecting the gland, and it is surely logical to infer that the disease is carcinomatous from the very beginning. No convincing evidence has been adduced to show that a secondary carcinomatous degeneration takes place, and it was mere presumption which led to the enunciation of such a view. As already stated, I have always maintained that true Paget's disease was nothing more or less than carcinoma, and I am still inclined to believe with Thin, Duhring and others that the disease begins in the galactophorous ducts and later invades the nipple and areola by direct extension to the surface.

A contribution to the study of Paget's disease made by Schambacher in the Deutscher Zeitscrift für Chirurgie, November, 1905, is of such importance that attention must be given to the conclusions drawn from the study of this case. Allusion has already been made to the arrangement of the Paget cells in this specimen. Taking into consideration the clinical course of the disease in conjunction with the pathological findings, the author comes to the conclusion that the disease was originally an **intraepidermoid carcinoma** which invaded both milk-ducts and skin. He considers it analogous to the form of cutaneous carcinoma recently described by Borman. The cutaneous lesions in addition to those produced by the malignant process itself he found to be due to inflammatory infiltration, which, indeed, predominates in the skin, and it is this condition which gives the disease its eczematous character. Schambacher based his views, so far as the clinical aspect of the malady is concerned, upon the following circumstances, which I deem it appropriate to mention in this place. The disease began with the formation of a crust upon the nipple which finally fell off and left a reddened inflamed surface, the redness extended to the areola very slowly and did not invade the skin of the breast for five years, no evidence of disease in the mammary gland itself was detected until four and one-half years after the lesion on the nipple was first noticed. Moreover, both gross and microscopic examination showed the nipple to be the part most severely affected. Indeed, the structure was almost completely destroyed.

These considerations are certainly worthy of careful attention and should afford a basis for still further observations.

Symptoms.—Paget's disease apparently begins as an eczematous inflammation of the nipple which extends concentrically to the areola. Very often the first thing which attracts attention is the formation of one or more small grayish scales on the nipple, together with slight redness of the contiguous parts of this structure. This condition may or may not be accompanied by slight itching or burning. This stage of the disease may continue unchanged for many months. A notable thing about it, and one which is important from the standpoint of diagnosis, is that the lesions are entirely uninfluenced by the ordinary remedies to which mild forms of eczema not uncommonly yield. As the morbid process advances the areola becomes involved. Fissures develop and raw, eroded spots make their appearance. At this period the lesions may assume a moist character, or they may continue to be dry, much like psoriasis. (See Plate XLIII and Fig. 42.)

In some cases, the diseased parts are moist almost from the very beginning of the disease.

Both of these forms were recognized by Paget. His description of well-developed cases cannot be improved, so I will quote it verbatim. He states that in the majority of cases "it had the appearance of a florid, intensely red, raw surface, very finely granular, as if nearly the whole surface of the epidermis were removed; like the surface of a very diffuse acute eczema, or like that of an acute balanitis. From such a surface on the whole or greater part of the nipple and areola, there was always

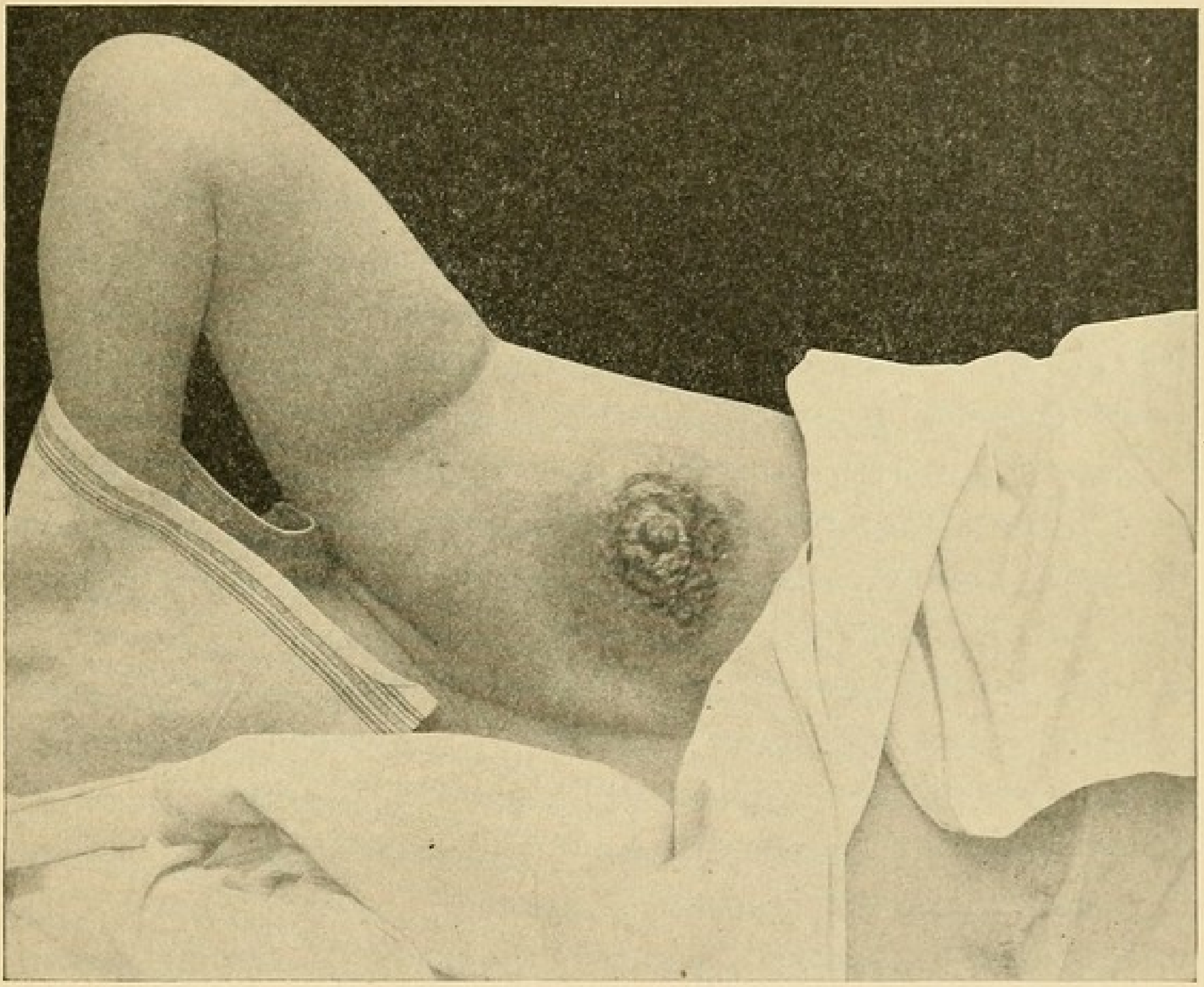


Fig. 42.—Paget's disease of the nipple.

copious, clear, yellowish, viscid exudation. The sensations were commonly tingling, itching and burning, but the malady was never attended by disturbances of the general health. In some of the cases the eruption has presented the characters of an ordinary chronic eczema, with minute vesications, succeeded by soft, moist, yellowish scabs or scales, and constant viscid exudation. In some it has been like psoriasis, dry, with a few white scales, slowly desquamating, and in both these forms I have seen the eruption spreading far beyond the areola in widening circles, or, with scattered blotches of redness, covering nearly the whole breast."

This extensive involvement of the skin has been occasionally seen from time to time by later observers. In a remarkable case reported by Neisser the morbid process invaded the whole side of the body, passing from the breast to the sternum, over the shoulder onto the back, and then extending anteriorly to the abdominal wall.

There is usually a distinct line of demarcation between the healthy and diseased parts. Healing may take place in certain portions of the diseased area, although this occurrence is by no means constant. In the dry cases there is a peculiar parchment-like appearance and feeling of the diseased area.

Retraction of the nipple occurs as the disease progresses, and in far advanced cases the nipple may be nearly or entirely destroyed, an excavated ulcer, or perhaps merely slight depression, taking its place.

In such cases more or less involvement of the axillary glands will not uncommonly be detected. The integument of the axilla may also be somewhat reddened and edematous. Sometimes instead of showing ulceration this flattened or deepened surface may be covered with scales.

In course of time the cancerous nature of the disease invariably manifests itself in the tissues of the mammary gland. Paget states that the disease of the nipple was followed by cancer of the breast in from one to two years. Further observation, however, has proved that several years may elapse before gross changes in the mamma itself can be detected.

The most important thing in Paget's original paper, as he himself stated, was the emphasis placed upon the invariable sequence of mammary cancer in this disease. His observations are entirely in accord with our present belief that the malady is cancerous from the very beginning. It is pertinent to this subject to state that a vast number of cases reported as Paget's disease were in reality not such, but were of such slow evolution as to lead one into the belief that they did not partake of the nature of cancer. Thus, no doubt, may be explained the small percentage of cases studied by Williams in which cancer developed. This slow evolution which characterizes some cases is the circumstance above all others which gives some plausibility to the theory of intraepidermoid origin of the cancerous process, to which reference has already been made.

An important circumstance in the natural history of the disease is that only one nipple is affected at first, simultaneous eruption of the morbid process in both never having been observed. Cases have been recorded, however, in which the second nipple became involved at a later period, or after the other had been removed.

In contrast to what has already been stated concerning the protracted course of some cases, it may be said that there are others of very rapid evolution in which well-developed signs of glandular carcinoma manifest themselves within a few months after the primary lesions of the nipple and areola appear. Then there are other cases which remain stationary for a long period only to advance rapidly to glandular involvement. In some of these cases traumatism has been blamed for the sudden progress of the disease, whereas in others no determinable causes for the newly assumed and unwonted activity were present.

In comparison with other forms of cutaneous carcinoma Paget's disease may be considered comparatively benign. Naturally when the carcinomatous process has extended to the glandular structures of the breast the prognosis is less favorable.

Diagnosis should present no difficulties, particularly in well-marked cases which have existed for some time. Beginning cases might be mistaken for simple excoriation or eczema of the nipple, but the failure of the lesions to yield to the ordinary remedies—boric acid, salicylic acid, zinc oxide, etc.—should at once arouse suspicion as to the true nature of the disease. Indeed the occurrence of lesions such as have been described under symptomatology should immediately lead the physician to suspect Paget's disease.

Treatment.—The treatment of Paget's disease is entirely surgical and consists, in my opinion at least, in early amputation of the breast and exploration of the axilla in every case. If infected it should be thoroughly cleaned out. I cannot approve of partial resection, or, indeed, anything less radical than that which is believed to be necessary at the present time to successfully contend with a malignant process in glandular structures richly endowed with lymphatic vessels. Every theory worthy of the least acceptance admits the malignant nature of the affection and its ultimate tendency to involve the breast.

The only difference between pathologists is *where* it begins. Clinically this is negligible, as the skin is very early involved in cancer of the breast, and it is reasonable to assume that when the overlying nipple and areola are involved in a carcinomatous process, the time soon comes when the condition of the breast must be questioned on account of the free communication between said structures. It is then carcinoma of either the galactophorous ducts or skin primarily with certain involvement of both, and the breast as well, secondarily. Therefore, the future safety of the patient will be menaced by temporizing agents in the shape of lotions, unguents, caustics and electricity, and scarcely less so by incomplete operations.

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