Comparative Anatomy Pathology and Roentgenology of the Breast

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BY

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UNIVERSITY OF PENNSYLVANIA PRESS

© 1960 by the Trustees of the University of Pennsylvania Published in Great Britain, India, and Pakistan by the Oxford University Press London, Bombay, and Karachi

Library of Congress Catalogue Card Number: 59-8457

Printed in Great Britain by W. & J. Mackay & Co Ltd, Chatham

Introduction

SIR ASTLEY COOPER in *The Anatomy and Diseases of the Breast* says: "I have restricted myself to describing from my own preparations only; and if every author in our profession would adopt this plan and merely write on what he is capable of demonstrating, preserving and exhibiting to others, the medical world would not be overwhelmed with those crude opinions, theories, and conjectures, which, according to the present system of quoting all that has been written, are sure to compose the greater part of the works that issue from the press. My rule has been to publish that only which I could show to those who were skeptical, and were yet desirous of arriving at the truth."

No apologies are needed for imitating so eminent an example. Indeed, to do justice to all that has been written on the human mammary gland would fill several volumes. We have endeavored to confine our writing to matters of which we have personal knowledge and have for the most part worked out for ourselves. The application of two hitherto little used technics, the slicer method for cutting whole breast sections and above all the roentgenographic experience of Gershon-Cohen have enabled us to investigate the mammary gland from a new angle. We have made use of the work of others only in so far as was expedient as a background or a corollary to what we ourselves have observed. To compensate for our apparent neglect, we append a full bibliography hoping thereby that all important papers will be consulted by those who are interested.

No work stands alone. We are indebted to many who preceded us and to many who cooperated and worked with us. Of those who have gone before, the pathologist would name Professor Frederic Wood Jones and Sir Lenthal Cheatle, whose teachings were a lifelong inspiration. Of our contemporaries we can single out only one, Dr. Raoul Leborgne. We owe much to his persistence in xiv Introduction

applying roentgenographic technics to the examination of the breast, as well as to his generosity in passing on his knowledge.

Our particular thanks are due to Lolita Moore, our able and indefatigable assistant, for her help in looking up and sifting literature in all languages, indexing and tabulating cases, and for many suggestions for perfecting technic.

It is a pleasure to acknowledge the warm and sympathetic cooperation of the surgeons and physicians of our staff. Our particular thanks are due Dr. Henry Brody and Dr. Irving Young of the pathological staff for their many kindnesses during the progress of this work.

The original investigations on the pathology of the breast were begun many years ago, thanks to the facilities afforded by the laboratories of the Woman's Medical College and to the generosity of Mrs. Beatrice Fox Griffith and Dr. Corinne Trullinger Chamberlin.

In recent years through the generosity of Dr. J. C. Doane, former Medical Director of the Albert Einstein Medical Center and Chief of Medical Services, now Professor of Clinical Medicine at Temple University, a fund created by Mrs. Frank Strick was made available for a survey of breast disease in asymptomatic women. The continuity of the work has now been assured by a research grant from the National Institutes of Health.

We also wish to thank the editors and authors for permission to reproduce Professor Engel's illustrations from the *British Journal* of *Childhood Diseases*, and Dr. J. Grynfellt's diagram from the *Archives d'Anatomie Microscopique*. Dr. J. C. Valentine generously provided the photos for Figs. 1 to 3, and Dr. Jacob A. Vastine for Fig. 69.

General Remarks: Evolution of Roentgenology of the Breast

THE FIRST attempt to diagnose mammary disorders by means of the x-ray film was made by Salomon in 1913. Salomon took x-ray films of surgical specimens and compared the clinical, radiological, and pathological findings in carcinoma of the breast. The outbreak of World War I put a stop to these efforts, and the subject was not revived until 1930. In that year S. L. Warren published a roentgenologic study of the breast. Seabold in 1931 described radiologic changes during the menstrual cycle and gave criteria for the differentiation of normal from abnormal conditions in the breast. He succeeded in measuring fibroadenomas roentgenographically and demonstrated alterations in the size of the tumors. Lockwood and Stewart (1932) studied the menstrual cycleroentgenographically and distinguished between Cheatle's mazoplasia and "cystiphorous desquamative epithelial hyperplasia" on the film. Ries (1930) showed that it was unsafe to inject iodized poppyseed oil or foreign material into a duct, as abscesses would result. Mammography was later perfected by Leborgne (1953). From 1935 onward pneumography of the breast was attempted but no great advance was made along this line. Injection of thorotrast was popular until it was discovered that tumors might follow its use (fig. 189).

The more recent work of Gershon-Cohen shows that artificial aids are unnecessary in the diagnosis of breast lesions. In the period from 1937 to 1948 he made notable progress in accurate diagnosis of malignant tumors. Without minimizing the difficulties encountered in the interpretation of abnormal roentgen mammary patterns, he tirelessly advocated the use of roentgenograms as an aid to clinical diagnosis and was the first to demonstrate the feasibility of detecting occult carcinomas (1948). At the same time many workers were discouraged by the uncertainty of their

results. Two factors hampered progress—unsatisfactory technic and lack of exact pathologic knowledge.

Leborgne, working in Montevideo, was the first to propose a technic which, while contradicting many of the established rules, achieved a degree of visualization of breast structures hitherto considered impossible. His methods have gone far toward making roentgenography of the breast an exact science.

Very thorough knowledge of breast pathology is a sine qua non for interpretation of breast films. The older radiologists who followed Cheatle were able to diagnose mazoplasia fibrosa from cystiphorous desquamative hyperplasia and to distinguish both from carcinoma. But this could only be accomplished when the lesions were well developed. Since Cheatle, breast pathology has become more and more confused. Terminology is inexact and extremely variable. Classification depends chiefly on the views of the pathologist or surgeon. Many writers content themselves with such expressions as fibrocystic disease, cystic mastitis, mastopathy and even the long outdated chronic mastitis. They seldom define what they mean and do not distinguish one form of dysplasia from another. In this inchoate welter the unfortunate radiologist drifts on a sea of confusion. To make matters worse, few pathologists have studied entire breasts. Detailed examination of histologic sections is essential to complete diagnosis, but does not help the radiologist who must look at the organ as a whole, compare it with its fellow, and draw his conclusions therefrom.

The authors realized that progress in x-ray diagnosis could only be made by careful comparison of the film with the actual specimen. The method followed was to make whole serial sections of the frozen breast, stain the series, and examine the tissue under the dissecting microscope. The sections were then set up alongside the x-ray film. Each was compared with the other. The counterpart of opacities discerned on the film was studied in the section; structures seen in the section were studied on the film. After the first hundred patients were examined it was obvious that the cases fell into certain categories. Furthermore the x-ray films and

sections matched clinical groups as revealed by the records. Classification might almost be said to have made itself.

The question has been asked: "Why should we burden ourselves with the problems of x-ray examination of the female breast? A biopsy is usually necessary and will give the diagnosis anyway." In the words of Kremens (1958), one may reply that ". . . there are no short cuts in medicine. Any diagnostic information which may be obtained by additional study without detriment to the patient, should be sought without stint or reservation. There is no thought of omitting roentgen study of the chest in an individual with hemoptysis and a positive sputum! There similarly should be no hesitation to obtain whatever additional information may be made available by a roentgen breast examination despite the clarity of the clinical picture. Completely unsuspected pathology may be uncovered either in the breast under observation or, as has occurred in many instances in our experience, in the contralateral breast. One of the greatest values of the roentgen ray has been the opportunity it has afforded in detecting a disease process before it is clinically manifest."

Indications for mammary roentgenography fall into two categories:

- (a) x-ray examination is necessary for detection and localization of a malignant tumor; and
- (b) it affords a tool for the follow-up of patients or for scientific observations.

The first group comprises cases of suspected and unsuspected cancers. Definite diagnosis cannot be made clinically and in these patients x-ray examination is mandatory.

Suspected but nonpalpable cancers are usually of the type known as occult. An occult cancer in the strict sense is one in which discovery of some remote symptom or sign, such as localized pain over the spine or an enlarged axillary node, leads to the suspicion of breast cancer, but no mass is felt. A nonpalpable breast cancer can only be located by means of the x-ray film. The

fact that a tumor is suspected or even known to be present greatly facilitates the radiologist's task. A needle in a haystack may be hard to find, but in the absence of certainty as to the needle's existence, the search would seem hopeless. Whatever the explanation, occult carcinomas are among the most easily diagnosed of the nonpalpable tumors.

Unsuspected neoplasms until very recently lived up to their name. But with help of the x-ray film a number of them have been debunked. The three principal ways for a cancer to escape detection are: 1. The malignant tumor is felt but wrongly diagnosed benign. 2. It is masked by other lesions. 3. The growth is too small for palpation.

In matters of mistaken diagnosis, a tumor is felt, but it is so circumscribed and movable that suspicion of its malignant nature may not be entertained. For example, a duct carcinoma, even when it has reached extensive proportions, is frequently mistaken for a benign tumor. Biopsy is likely to be postponed. The x-ray in these cases gives an unequivocal answer. A reluctant patient is more willing to submit to operation and valuable time may be saved. Another reason for mandatory x-ray examination of all benign lesions is that while the diagnosis of the palpable lesion may be correct, a small preclinical carcinoma may be present in another part of the breast. Too often the patient is lulled into a false sense of security by the removal of a cyst or other benign lesion when the real culprit lies latent to appear perhaps years later when it is no longer curable.

X-ray examination is likewise indicated in all cases of nodularity or "lumpiness" of one or both breasts whether a dominant mass is present or not. These cases are very common. In most of them adenosis is the underlying or masking lesion. In some patients the adenosis has passed on to hyperplastic fibrosis. In a few, mazoplasia cystica has developed on the basis of adenosis. Rarely, the nodularity is due to multiple fibroadenomas. In the great majority of cases of lumpy breasts the condition is benign and remains so, but should a carcinoma develop it is not likely to be discovered for

a very long time. Often the growth is away from the region of the lump and it is not uncommon for multiple operations to be performed on these women without discovery of the cancer. Hence the necessity of roentgenography as a preliminary to biopsy.

All women presenting vague, unusual, or unaccountable symptoms referred to the breast must be examined roentgenographically. Pain is sometimes the presenting symptom of a nonpalpable carcinoma. Indefinite thickening in any part of the breast should likewise come under suspicion. Finally, x-ray examination gives reassurance to a normal patient with cancerophobia and a positive family history of breast cancer.

Carcinomas remain asymptomatic for a very long time. X-ray examination leads to the detection of a tumor long before it can be recognized clinically. Studies of rate of growth of cancers have recently enabled us to form some estimate of their duration. The preclinical diagnosis of mammary carcinoma gives a much greater hope of surgical removal before metastases have occurred than would have been previously considered possible. For this reason roentgenography of the breast should form part of any program for periodic health examination of women.

In the second category, x-ray studies, while not mandatory, have proved their worth in a number of ways. They are helpful in the postoperative follow-up of patients and even more so for evaluation of therapy when operation is not contemplated. Considerable increase in knowledge of breast pathology has resulted from studies of normal breasts and of benign lesions. Study of precancerous lesions and their recognition by means of x-rays affords reason to hope that in future many lesions will be treated in the precancerous stage and mutilating operations avoided.

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