

Mammographic Examinations (4030):

Ten-Year Clinical Experience in a Community Medical Center

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THE PURPOSE of this paper is to report some of the experiences gained from a 10-year mammographic program. We feel that this study is unique because of the early date of its inception and the relatively large number of definitive examinations performed on predominantly symptomatic patients in a voluntary community medical center. Because of the increased emphasis placed on the early detection of mammary cancer and the proliferation of diagnostic centers for this purpose it is felt that our experiences may be helpful to others contemplating such a program.

Material and Method

In 1962, St. Vincent's Medical Center of Jacksonville, Florida, participated with 23 other medical institutions in a reproducibility evaluation of the Egan Method of Mammography, under the direction of the U. S. Public Health Service and the M. D. Anderson Hospital.³ Having thus started in 1962, the study presented in this report includes our experience at St. Vincent's Medical Center over a 10-year period through October 1972 during which time 4,030 mammographic examinations were performed. The data to be analyzed in this study are based upon 3,030 consecutive examinations. The first 1,000 of the 4,030 have been excluded because sufficient data were not recorded during this learning period. However, during this initial phase a measure of expertise was gained in the technical aspects of mammography and the interpretation of mammograms. Also, team cooperation was established between radiologists, surgeons, and pa-

thologists. Physician acceptance and participation developed slowly since the program was almost totally dependent upon the individual doctor discovering a clinically unsuspected mammary cancer through mammography.

The Egan technic,² with minor modifications, was employed until February 1972 at which time a Mammorex Breast Diagnostic Unit was obtained. All patients in this study were referred by physicians, the majority because of breast problems, many having palpable lesions and others with complaints such as nipple discharge, breast pain, etc. Accordingly, emphasis has been placed upon the differential diagnosis of mammary lesions with the detection of cancer as the primary goal. In addition to bilateral mammography, with few exceptions, each patient had physical examination of her breasts and axillae performed by the radiologist.

Based upon our findings and those of many others,^{11,15} we believe that mammography is most productive in women over the age of 40 years and especially in postmenopausal women. We do not encourage mammography as a screening procedure in women under 30 years of age because of the low yield in this group. Mammographies are performed in those under 30 years only upon request of the referring physician for investigation of specific problems. With the increase of physician interest in mammography the complexion of the study has begun to shift toward the examination of asymptomatic women purely as a screening procedure, emphasizing patients in the *high risk group*. We feel that this foregoing clarification relating to material is important in

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order to point out that mammography as performed in the community health center is difficult and time-consuming, requiring professional expertise in the majority of cases. Such a program is in contrast with mass screening programs in which most of the women are asymptomatic and presumably normal. In the latter type program since fewer problem cases are encountered the process is simpler so that paramedical personnel might be utilized to a degree but the yield is understandably lower.^{1,14}

Findings and Discussion

In the 3,030 consecutive examinations suitable for analysis which includes all patients who had mammography over the past 6 years (November 1966–November 1972), 191 cancers of the breast were discovered and proven by biopsy, an incidence of 6.3% (Table 1). Of these 191 cancers, 170 (89%) were diagnosed or suspected on mammography. Of these later 170 cancers, 35 (20.6%) were occult (non-palpable, clinically unsuspected cancer), having been discovered by mammography alone (Table 2). These 35 cancers, comprising 18.3% or nearly 1 in 5 of the total number of cancers discovered, would have been missed had mammography not been done. In the entire series of 3,030 examinations the incidence of occult cancers was 1.1% or 11 per 1,000. In these occult cases the diagnosis of cancer rested upon radiographic evidence of a characteristic breast mass in one-third of these examinations, suggestive calcifications in one-third, and both of these findings in the remaining third.

Of those 35 patients having occult cancers, the youngest was 23 years and the oldest 83 years of age (Table 3). Twenty-three of these patients (65%) were 50 or over while 12 (35%) were under 50 years of age. Among the 12 cases in patients under 50, nine were in the 40–49 year group, two in the 30–39 year group and one was 23 years of age. These findings show that mammography is most productive in individuals past 40. It is equally apparent that there is a rapid drop-off in the cancer yield in the younger age group.

Many investigators have drawn attention to the *high risk group* (Table 4) because of the greatly increased incidence of mammary cancer in such women.^{5,6,8,13,14} In this study we regard the *high risk group* as consisting of those women who have or have had cancer in one breast and of those having close female relatives (especially mothers and sisters) who have had cancer. Of the 191 cancers in the present study, 25 (13%) occurred in patients with bilateral mammary cancer at the same or different times.

Because of this high incidence of bilaterality, mammography is strongly recommended in patients with clinically obvious cancer in one breast to avoid overlooking a possible occult cancer in the opposite breast

TABLE 1. Total Number of Definitive Cases Analyzed, Number of Cancers Detected, and Cancer Incidence.

Total Mammographies Performed 1962–1972	4030
Definitive Cases 1966–1972	3030
Cancers Detected	191
Cancer Incidence	6.3%

TABLE 2. Incidence of Occult Cancers as Related to Total Cancers Found and to Total Mammographies Performed.

Total Cancers Discovered	191
Occult Cancers Discovered	35
Per Cent of Total Cancers	18.3%
Per Cent of Total Mammographies	1.1%

(Table 5). In the first 96 cancers in the earlier years of this study, data relating to the family history are not available. However, in the remaining 95 consecutive cancers found in more recent years, such data are available, showing a family history of mammary cancer in 13 (13.7%). In this group of 95 cancers either bilateral disease, a positive family history or both occurred in 24 instances (25%).

In mammary cancer lymph node involvement is intimately related to prognosis.^{2,5,15} In this study statistics are available in this regard in 160 of the 191 cancers. In these 160 patients axillary lymph nodes were positive in 76 (48%). Figures are available in 30 of the 35 occult cancers, the nodes being negative in 19 (63.3%) and positive in 11 patients (36.7%). Thus, there is a gain of 12% in regard to nodal involvement in this occult group of cancers which will no doubt be reflected in an improved prognosis. As our program becomes increasingly weighted with the screening of asymptomatic women, more earlier lesions will be found and there should be further decrease in the rate of nodal involvement. No pattern was

TABLE 3. Age Incidence

	Under 40	Over 40
All Cancers	10	181
Occult Cancers	3	32
Cancers Missed on Mammography	2	19

This table shows the age incidence in all cancers found, as well as in those undetected by mammography. In the three above groups there is an obvious preponderance in each group of women over 40 years of age.

TABLE 4. High Risk Group

Positive Family History	13.7%
Ca. Opposite Breast	11.5%
Both of Above	25%

This table illustrates the main categories included in the high risk group and their incidence as found in this study.

TABLE 5. *The Importance of the Contralateral Breast in Patients Having or Having Had Mammary Cancer.*

<i>Occult Breast Cancers</i>	35
With Cancer of Opposite Breast	13 or 37%
Previously	8
Concomitantly	5

discernible to show that model metastases relate to age.

The age of the woman is a key factor in mammography, having a profound influence on the yield of cancer diagnoses.^{10,11,15,17} Of the 191 cancers in this series, 181 (95%) were found in patients in the 40 years or over age group. Among this series of 191 cancers, the age spread was from 23 to 87 years, only 10 (5%) occurring in patients under 40 years of age. These figures support our above stated policy regarding the selection of patients for mammography.

It is obvious that women in the *high risk group* should have mammography initiated and repeated as often as the clinical situation dictates.⁶ There is a growing feeling that women over 40 years of age should be studied by mammography periodically.^{6,7,14} Several studies are underway and others shortly will be launched to test the validity of the policy of mass screening in the over 40 age group.¹⁵ The woman with a solid lump in the breast poses a special problem, this being an indication for mammography in those over 30 years of age and in younger women if indicated by clinical circumstances.

Of the 191 cancers in this series, 21 (11%) were missed by mammography (false negatives) (Tables 6 and 7). In 11 of these the breasts were excessively dense so that the lesion could not be visualized. In five instances the lesions could not be visualized even though the films were technically adequate and carefully examined; this margin of error was inherent in the method. Two were missed because the position of the tumor in the breast made it impossible to include it on the film. Two were missed because of an error in interpretation, seen in retrospect on re-examination of the films. The remaining cancer was missed because of faulty technic (blurring on the film secondary to motion).

TABLE 6. *False Negatives*

<i>Cancers Missed on Mammography</i>	21
Dense Breasts	11
Small Lesions	6
Faulty Technic	3
Recent Aspiration	3
Error in Interpretation	2
Inaccessible Lesion	2

The factors influencing the failure of detection of cancers by mammography are shown in 21 cases. In some cases, more than one factor contributed to the failure. The false negative rate was 11% which is similar to that reported by others.

TABLE 7. *Detection of Mammary Cancer*

<i>Total Cancers Found</i>	191
Physical Examination	
Found	156 or 82%
Missed	35 or 18.3%
Mammographies	
Found	170 or 89%
Missed	21 or 11%
Both Exams Essential for Best Results	

The detection of the maximum number of breast cancers requires the combined modalities of physical examination and mammography in each case. Each modality will reveal some cancers which could not be detected by the other.

In three instances in which lesions were missed, aspiration had preceded mammography. The edema and hemorrhage incident to aspiration may well interfere with the radiologist's interpretation. We suggest that aspiration be delayed until after mammography.

It is well known that dense or glandular breasts most commonly found in younger women but which occasionally occur in older women mitigate the accuracy of film interpretation.^{2,10,16} Conversely, fatty breasts, most common in older women but which occur in some younger women, greatly facilitate the accuracy of the mammographic reading.^{10,16} These are basic observations and are supported by our experience.

Of the 21 cases not suspected or diagnosed by mammography, 20 had palpable breast masses which led to biopsy. This points up the importance of the physical examination since 10% of the 191 cancers would have been missed had we relied on mammography alone (Table 7). The remaining patient of these 21 had biopsy because of a bloody nipple discharge.

Figures relative to false positive readings are not available because of insufficient data. However, in series reported by others the false positive rate varied between 5 and 10% which is probably a representative range.^{11,13} False positives pose no threat since biopsy should always precede definitive treatment.

Of the 191 cancers in this study, 35 (18.3%) were occult as noted, leaving 156 (82%) in which there were symptoms and/or physical findings which led to biopsy. Biopsy was recommended on the basis of mammographic findings in 89% of these cases. Eleven per cent of the cancers would have been missed by mammography alone and 18% (the occult cancers) would have been missed by clinical examination alone (Table 7). It is thus obvious that for maximum diagnostic accuracy, both modalities are necessary in every case.

Let us state emphatically that mammography is not a substitute for biopsy.¹⁰ Every breast lesion suspicious of cancer should be subjected to biopsy.^{5,8,14}

The overall yield of 6.3% cancers or 63 per 1,000 examinations in this series appears high when compared

with the figure of 2.72 per 1,000 examinations recently reported by Strax *et al.*^{14,15} in a group of 20,000 women. This discrepancy is explainable since the group reported by Strax was made up of predominantly asymptomatic women examined in a mass screening program. In contrast, most of the 3,030 women in the present study had clinical complaints or findings relating to their breasts. We believe that the higher yield experienced in the study at St. Vincent's Medical Center would more closely approach that to be expected in other similar community institutions.

For a mammographic program to succeed in a community hospital the team approach is essential as emphasized by Egan⁵ and by Hayden.⁸ This team must include the referring physician, the radiologist, the surgeon and the pathologist.^{5,8} The key person in this team is the radiologist as the value of mammography is directly proportional to his expertise and interest.⁸ The accuracy of mammography is dependent upon constant attention to technical details and striving to improve results on the part of the radiologist.⁸ The surgeons benefit from mammography in terms of earlier diagnosis which should result in higher cure rates and longer survival of his patients. This view is supported by the studies of Strax¹⁵ and Egan⁵ who estimate the lead time gained in these cancers found by mammography alone to be 1 to 2 years.

The total quadrant type of biopsy by the surgeon, the specimen mammography employing the Faxitron or similar device by the radiologist to be sure the suspicious lesion is included in the specimen,^{9,12} and the bread loaf method of localizing the specific area to be sectioned by the pathologist exemplifies the team cooperation to which we refer.¹²

An active mammographic program will result in an overall increase in staff awareness and interest in the problem of mammary cancer.⁵ This has been shown to cause a substantial increase in the number of breast biopsies performed with a concomitant increase in the number of early lesions discovered and of the number of patients being free of nodal involvement.⁵

It would appear on the basis of results now available that mammography offers a definite promise of improvement in an area in which cure rates have been disappointingly stable for many years.^{5,12,14,15}

Conclusions

1. This study spans a 10-year period during which 4,030 mammographic studies were performed, of which the last 3,030 were utilized for analysis.

2. All patients in this study had both mammographic and clinical examination of the breasts, a combination which we feel is essential for maximum accuracy in cancer detection.

3. In 3,030 mammographic examinations 191 mammary cancers were found, a yield of 6.3% or 63 per 1,000 examinations.

4. A detection rate of 85–90% of mammary cancer can be expected through mammography. The rate in this series was 89%.

5. Thirty-five unsuspected (occult) cancers (18.3% of 191) were detected by mammography alone and would have been missed without this modality.

6. Twenty-one cancers (11%) were detected by clinical examination alone and were not shown on mammography.

7. A diagnostic program utilizing mammography can be practical and productive in a voluntary community hospital.

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