THE INDICATIONS FOR AND CLINICAL IMPORTANCE OF MAMMOGRAPHY*

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Mammography has been practised with varying degrees of success since 1930. A number of these earlier workers believed there was some value in the procedure, but generally there was disappointment in the erratic results which have since proved to be due to the inadequacy and inferior quality of the radiograph.

Mammography was introduced as a definite clinical asset by Leborgne[1] in 1953 and vigorously sponsored by Gros,[2,3] Gershon-Cohen and Ingelby,[4,5] Van Ronnen[6] and Willemin.[7] In 1956 Robert Egan[8-10] began experimenting with various techniques, and began publishing the results of his high kilovoltage, low milliamperage technique in the years 1960 - 63. Since then, with the recognition of the necessity for meticulous attention to the technical quality of the radiograph as one of the prerequisites to accurate interpretation, mammography has made rapid strides.

The main indication for mammography is the additional

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information that can be given to the clinician and pathologist in his search for or proof of the existence or non-existence of a breast lesion and its specific character. In many cases a routine examination of the breast, even when there is no clinical evidence of neoplasia, may show the presence of malignancy.

Egan,[9] Witten and Thurber,[11] Gershon-Cohen *et al.*[12] and Frischbier[13] all state that malignant tumours can be shown at a stage in which they cannot be demonstrated clinically. Now that newer and more economical equipment utilizing 70 - 100-mm. film is being developed, mass miniature mammography may initiate mammographic checks of all women in the cancer-prone age-group, which would represent a very valuable contribution towards the earlier diagnosis of breast cancer.

In many hospitals in the USA and on the Continent mammography is considered an indispensable part of the examination of a patient presenting with breast complaints. The fact that mammography has not become as routine as it should be in any breast clinic may be due to a variety of factors.

1. Physicians, surgeons and gynaecologists have not been made sufficiently aware of the potential value of mammography.
2. The techniques utilized in the production of readable X-rays have been introduced relatively recently.
3. Radiologists themselves are only beginning to realize its value and are becoming more conversant with the means of adapting their existing equipment to produce adequate X-rays as well as teaching themselves to become more proficient in the interpretation of the radiographs.
4. Young[14] adds another reason for the lack of popularity among radiologists: The production and the study of the mammograms are time consuming.

Radiological publications are drawing attention to an ever-increasing number of indications for mammography, and Egan[15] has written extensively on this subject in his monograph.

INDICATIONS

These may be considered under several broad headings.

Where No Masses are Palpable

The patient may present with confusing symptoms referable to the breast, which may appear clinically normal and yet have underlying neoplasia, or with marked pain and tenderness making an adequate examination cursory or impossible, yet the breast may be the seat of serious underlying pathology. Changes such as skin thickening, nipple retraction, nipple discharge or eczema—all of which suggest underlying pathology, but not necessarily neoplasia—or nodes in the axillae, which could be malignant although the breast feels normal, may be definitely diagnosed.

Large, pendulous breasts may be difficult to evaluate clinically, and yet carcinoma can be readily detected on X-ray. Previous surgical procedures on the breast may have caused scarring and nodulation, making clinical evaluation very difficult. Mammography can be of great assistance in these cases. During pregnancy and lactation clinical evaluation for possible breast pathology may be very difficult. The breasts at these times are normally denser than average, but there may be enough adipose tissue present to allow a satisfactory radiological assessment.

Mammography in Planning of Treatment

A proved or suspected carcinoma may be found in one

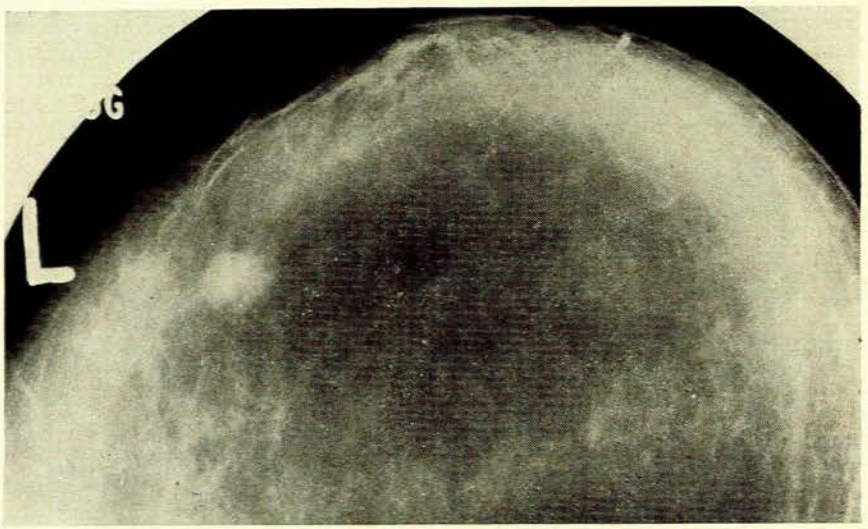

Fig. 1. Clinically no mass palpable. Large breasts somewhat lumpy. X-ray showed small tentacled tumour, approximately 1·0 cm. in size, with infiltration and fibrillary thickening. Definite carcinoma.

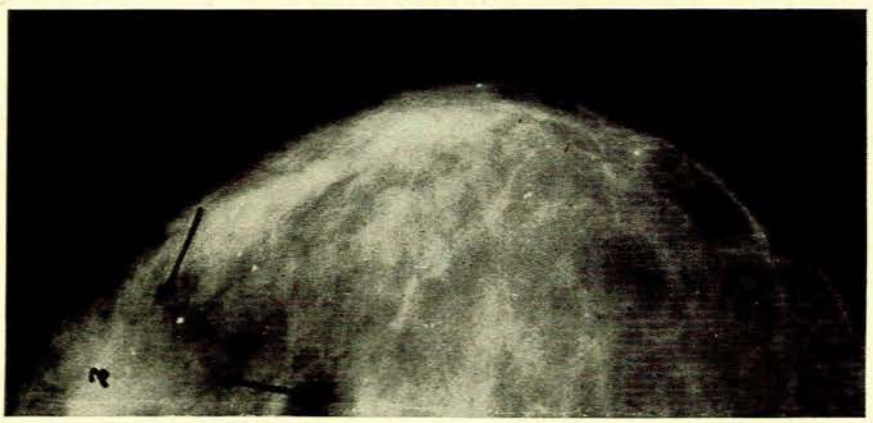

Fig. 2. Clinically, mass felt in left breast, approximately 3·0 cm. in size. Patient said lump had been present for 40 years with no increase in size. X-ray showed definite spiculated mass, 2·0 cm. in size, with sand-like calcification within tumour and well beyond its borders. Some skin flattening at 3. Carcinoma with fairly extensive infiltration as evidenced by widely scattered calcification.

breast, but there may be a second primary in the opposite apparently normal breast. No logical treatment can be planned without assurance as to the condition of the opposite breast. Frischbier[13] has noted that simultaneous bilateral primary cancers of the breast have been shown by mammography to occur 10 times more frequently than reported in the literature. This indicates the urgent need for re-evaluating some of our data on breast cancer.

Mammography may also assist the surgeon in several ways. For example, when numerous masses are present clinically, mammography helps in the surgical approach and in the selection of the most suspicious masses for biopsy. It may also help the surgeon to avoid cutting through cancerous tissue to obtain a biopsy specimen and thus prevent seeding of the carcinoma cells. A cyst clinically diagnosed as benign cannot be presumed to be benign even if after aspiration and pathological examination of its contents it suggests no malignancy. Willemin[16] and Gros[17] demonstrated many cases where this assumption was made and yet, after refilling an aspirated cyst with air, malignancy was shown on mammography to be present in part of the cyst wall only.

Carcinomas of the breast with the gravest prognosis are those showing mammographic signs such as diffuse skin thickening, increased fibrotic response, marked venous engorgement and those presenting with satellite nodules. The majority of these may be detected only on X-ray, and their presence may have a marked significance in determining operability or otherwise.

Mammography may assist in establishing the site of primary malignancy when secondary neoplasia is present with no obvious primary.

Mammography and the Pathologist

It is axiomatic that the pathologist should be supplied with the proper tissue for histological examination. Re-examination of a patient by means of mammography may show that a carcinoma has remained after a biopsy, indicating the need for further surgical exploration.

MAMMOGRAPHY AS A ROUTINE SURVEY

Mammography should be borne in mind when a patient presents with a family history of breast cancer or for

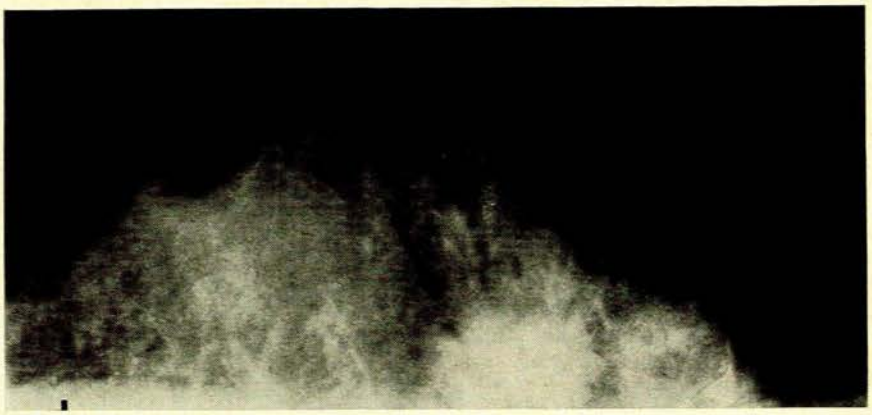

Fig. 3. Patient aged 34 years. Mass felt in left upper outer quadrant, 5·0 cm. in size. Possible dominant area of fibro-adenosis. X-ray showed tentacled mass, 2·0 cm. in size, with skin retraction and fibrillary thickening—carcinoma.

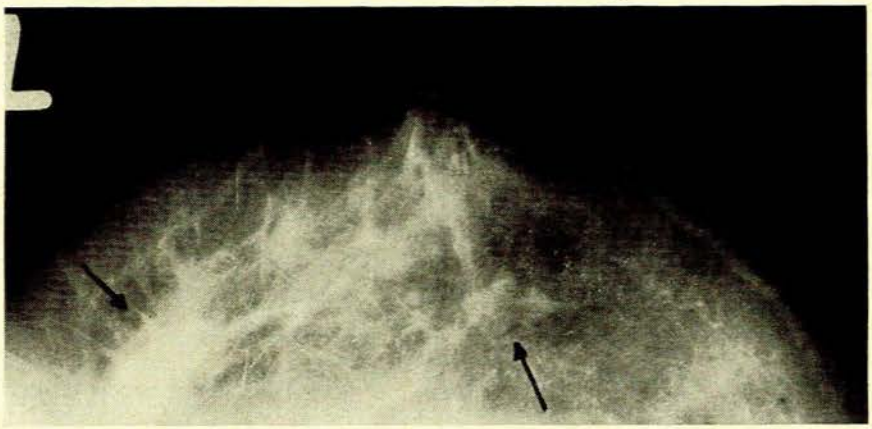

Fig. 4. Patient had right mastectomy in June 1968. Left breast gives one an impression of vague parenchymal thickening. X-ray showed two dominant masses: one, in the upper outer quadrant, measured 3·0 × 1·5 cm.; the second, 0·5 cm. in size, was in nipple line 1·0 cm. medially. Both masses were neoplastic.

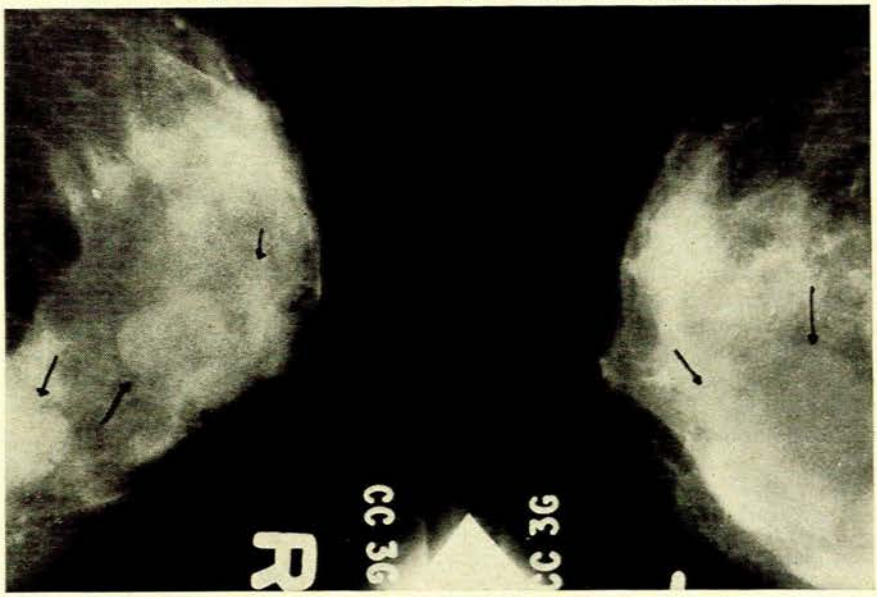

Fig. 5. Clinically the patient had a possible mass in the left breast, difficult to define. X-ray showed multiple smooth round and oval masses in both breasts. No primary or secondary evidence of malignancy. Benign multiple cystic mastopathy.

women who have cancerophobia, because a simple X-ray can put their minds at ease. Women who have had a mastectomy and come to the breast clinic for routine follow-up should be subjected to mammography. In our own clinic many unsuspected carcinomas have been found in the remaining breast, sometimes months and sometimes years after mastectomy.

Egan[15] points out that as so little is known of the natural history of cancer of the breast, any aid should be welcomed. Mammography provides a permanent record of a lesion in relation to its immediate surrounding tissue, the whole organ, and the axillary node region. It can be repeated as often as is desired without disturbing the lesion.

Fig. 6. Clinically, cystic changes were felt in the left breast. (Right mastectomy had been performed 1 year previously.) Some generalized nodularity. X-ray showed no evidence of malignancy. Note trabeculae coursing around translucent masses—most probably lipomata.

Carcinoma in the breast may remain latent for long periods and then suddenly show rapid growth, or several primary cancers in the same individual may grow at the same rate, suggesting that each may have been retarded initially or, alternatively, that any rapid growth may be influenced by some systemic body factors.

Ingelby *et al.*[19,20] have studied the growth rate of breast tumours by tracing their outlines onto squared paper. They found, *inter alia*, that circumscribed tumours grew more slowly than spiculated tumours and the growth rate in the same tumour varied from time to time.

These fields are still wide open for much research.

CONCLUSION

Gershon-Cohen *et al.*,[21] in their survey carried out on 1,120 women, found that by using mammography tumours could be detected earlier, small tumours became more readily evident, axillary metastases were less than were found in carcinoma of the breast associated with the general population, and the 5-year survival rate was almost double that of breast cancers found without the aid of mammography.

Despite the undoubted value of mammography it should be remembered at all times that it is not infallible, and that, as with every medical diagnostic procedure, difficulties in interpretation and borderline cases will be met, and errors will be made. This is as true for the radiologist as it is for the pathologist and the clinician.

Mammography and physical examination are complementary and neither is a substitute for an accurate, careful and successful biopsy. Young[14] of the Royal Infirmary, Edinburgh, points out, 'that if the principle is accepted that every palpable tumour should be biopsied, in case it is malignant, it is to be hoped that in time it may be accepted that every radiologically suspicious area should be treated in the same way'.

SUMMARY

The reasons why mammography has not become a routine procedure are emphasized. Mammography is an aid when no masses are palpable, and it can be of assistance when for one reason or another the clinical examination is not satisfactory. Mammography can be used in the planning of treatment and can assist the surgeon by establishing the primary site of a neoplasm. It is useful to the pathologist, as a routine survey and in research.

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