

*Carcinoma of the Breast—Symposium**Local mastectomy*

The value of local mastectomy is clear-cut—it removes the breast and primary tumour. It does not touch the axillary contents and if disease is present there, palpable or non-palpable, operable or inoperable, actual or potential—there the disease remains. As a clinician I am not attracted by the idea of removing part only of a cancer, be it in the breast or elsewhere, if I can, with impunity to the patient, remove all of it; and as the operative mortality of a radical mastectomy is small, and the morbidity limited, I prefer to offer the patient, if otherwise suitable, the bigger and, in my view, the better of the two operations. Simple mastectomy is suitable in the aged for the removal of a fungating mass, in bad surgical risks with localised disease, in cases where radiation is not available or suitable. Simple mastectomy has its value; it has, like the radical operation, definite limitations. As a routine surgical procedure, regardless of stage of disease or age of patient, it is a retrograde step and is quite unwarrantable.

In conclusion: the choice of the method of treatment should be guided by many factors. The best results following the best form of treatment are not unnaturally achieved in the best cases, and so far radical mastectomy achieves this more frequently than all other therapeutic measures.

Radiation is of value:

1. As the sole method of treatment in Stage III cases and here the end-results following radiation are better than those following surgery.
2. As a pre-operative measure in Stage II cases, where improved results can confidently be expected.
3. As a post-operative measure, chiefly in Stage II cases.

With the better education of doctors and patients, more women will report to hospitals at an early stage—it would be a pity if this painfully achieved progress were stultified in our methods of dealing with the disease. If women are to be mutilated by amputation of the breast, let them at least derive the maximum benefit from such mutilation.

## V. THE VALUE OF SIMPLE MASTECTOMY AND RADIOTHERAPY IN THE TREATMENT OF CANCER OF THE BREAST

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WHEN any new method of treating breast cancer is introduced it is customary to compare the results obtained with those of the radical operation. It is, therefore, important that the true value of the radical operation should be accurately determined. Failure to do so may retard the introduction of new and better methods of treatment.

Judged in terms of the results published in medical journals the radical operation appears to give excellent results. Many advocates almost convey the impression that the problem of treating breast cancer has largely been solved. Some even imply in their writings that it is unnecessary to consider alternative methods of treatment.

From such accounts it would be reasonable to expect that the returns of the Registrar-General would show a fall in the mortality from breast cancer. They do not.

This incongruous state of affairs will persist until the medical profession decides to adopt a more

realistic attitude in the assessment of the value of a method of treatment. Statements of fact must be preferred to impressions. Various ingenious methods of "improving" results must be abandoned. The effect of selection must be understood.

Briefly, it may be said that much of the present confusion arises from the common practice of publishing the results of only those cases which were fully treated. The more carefully cases are selected for treatment the better will be the results obtained. It is truly remarkable that this very obvious point is not more widely appreciated. The wide variations in the survival rates recorded by different authors would appear to be due more to the care taken in the selection of patients for the operation than to any difference in operative skill, for it must be admitted that the operation presents no great technical difficulty.

Before attempting to compare the value of any other method of treatment with that of radical

mastectomy, it is therefore essential to consider very carefully how the value of a method of treatment should be assessed. Not until this has been done will it be possible to make useful comparisons.

#### THE ASSESSMENT OF THE VALUE OF A METHOD OF TREATMENT

The influence of the following factors requires detailed consideration.

##### *Untreated cases*

It is commonly accepted that the value of radical mastectomy may be determined from the survival rate of only those cases which were treated by the operation. It is considered unnecessary to take into account the untreated cases, and, indeed, many authors make no reference whatsoever to these cases.

The value of a method of treatment must, however, depend just as much on the number of cases to which it will apply as on the results obtained when it is applied. A method which can be applied to only a very limited number of cases offers the prospect of cure to only a limited number, and cannot therefore be considered a good method, even although the results of the treated cases are good—as, indeed, they are likely to be, for by selection one can always produce good results.

It is generally admitted that if the operation is attempted and fails the number of cases in which it fails must be counted against the operation. Untreated cases are not treated because it is known beforehand that if the operation were attempted it would fail. The only difference between these two groups is the fact that in one the operation is carried out, while in the other it is not. Since both groups taken together indicate the extent by which the operation fails to save the life of patients suffering from cancer of the breast, untreated cases must not be omitted from the total on which the percentage survival rate is based.

Over the years the limitations of the radical operation have come to be more clearly recognised and, as time has gone on, fewer cases have been considered suitable for the operation. The work of Haagensen and Stout (1943) is noteworthy in this respect, and there is no doubt that by drawing attention to the futility of the operation under certain circumstances these authors have done good service; for, as they point out, to operate on unsuitable cases may not only shorten life but may also add to the patient's terminal discomfort. But while the better selection

of cases for operation does represent an advance and will inevitably produce higher survival rates *in treated cases*, it must at the same time be appreciated that better selection will not result in more patients being cured of cancer of the breast. The higher survival rates obtained from the radical operation in recent years are almost certainly due to better selection.

It sometimes happens that patients who are too advanced for radical mastectomy are referred for palliative X-ray therapy. The mere fact that these patients may be treated by X rays does not permit of their exclusion. They were referred because it was believed that they would be failures if treated by radical mastectomy, and whether treated by X rays or any other agent, they must still be counted as failures of the radical operation.

##### *Incompletely treated cases*

When radiotherapy is applied in association with the radical operation the position is, as a rule, still more confused. Whereas the radical operation is nearly always completed when attempted, a course of radiotherapy may be interrupted at any stage for a variety of reasons. Opinions differ as to whether these incompletely treated cases should be included in the assessment of the value of a particular technique, especially where a certain level of dosage is laid down as essential. The commonest reason for a course of radiotherapy being incomplete is because the patient was so upset by the treatment that she was unable to complete the course. These incompletely treated cases must be counted against the method and cannot be excluded under any circumstances.

But this is not all. When radiotherapy precedes or follows surgery, further selection may take place because one or other procedure is not carried out. Thus it is not uncommon to find that while it was intended to treat every case by post-operative radiotherapy, all cases not treated by radiotherapy are omitted from the total on which the five-year survival rate is based. The radiotherapy may not have been given because the case was advanced and the extensive skin removal undertaken so delayed healing that the radiotherapy could not be given, either on account of the atrophy of the skin or because extensive recurrences had appeared on the chest wall. Similarly when pre-operative radiotherapy is practised there is not uncommonly an

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interval between the radiotherapy and the surgery, and in this interval a metastatic deposit may have become clinically manifest, or a rapidly growing cancer uninfluenced by radiotherapy may have become inoperable before the operation came to be considered. The exclusion of these cases with advanced and rapidly growing cancers will certainly "improve" the survival rate and by doing so will make the addition of radiotherapy appear highly beneficial. It should be noted that even if the radiotherapy was of no value at all, by selection alone a higher survival rate would have been obtained.

In general it may be said that any combination of methods of treatment always tends to be associated with better results, not necessarily because the combination is better than either method alone, but because some selection is made before each method is applied. This is well seen when interest in breast cancer is aroused by the adoption of a plan of combined treatment. The surgeon examines the cases a little more carefully and, if he is working with a radiotherapist of experience, the radiotherapist acts as an additional check on the surgeon's assessment of the extent of disease and may recognise secondary deposits hitherto overlooked. The zenith is reached in these matters when the plan of campaign is pre-operative irradiation, operation and post-operative irradiation. Such a method of treatment extends over a period of several months and, in addition to establishing three points of selection, automatically excludes all rapidly growing tumours which become too extensive before all three treatments can be given.

*Results in a large general hospital*

When the results of treatment are based on all cases coming to a large general hospital they are of greater value than the results obtained in special hospitals, and much more reliable than the results of a personal series recorded by an individual surgeon.

In a large general hospital patients with cancer of the breast are admitted to medical as well as to surgical wards, for such a hospital must cater for all stages of the disease, and patients suffering from jaundice, ascites, cerebral metastases, pleural effusions, paraplegia, etc., and all cases with severe intercurrent disease are, as a rule, admitted to the medical wards. Some advanced cases are not admitted at all. It is important in the assessment of the true value of any method of treatment that all

cases be included in the total on which the percentage survival rate is based.

Special hospitals which publish accounts of treatment are, as a rule, hospitals where active treatment of cancer is undertaken and are organised with this object in view. Cases are referred to these hospitals by other general hospitals in the vicinity, and these general hospitals act as filters and refer only those cases where treatment is possible. The staff of the special hospitals encourage this, for they are unwilling to have the beds filled with advanced cases. Moreover, so that the special hospitals for the treatment of cancer will continue to maintain their position amongst the general hospitals, they may actively discourage advanced cases. Such advanced cases as do come are not admitted, they may not even be followed up, and when the survival rates come to be calculated they are excluded. The reputation of some special hospitals may depend more on this selection than on the value of the actual treatment given.

When the results in a personal series of cases are presented by an individual surgeon, the cases are often highly selected. It will be obvious, too, that with personal prestige at stake, few will publish their results if they are markedly inferior to those already published. The accounts of individual surgeons will therefore show only what can be done under the best possible circumstances. When the true value of a method of treatment is being assessed these accounts should be ignored.

One must conclude that the only reliable figures are those of a large general hospital where records of all cases coming to it are kept and published.

*Grouping or staging of cases*

It is interesting to find when the results of any hospital are being considered how common is the belief that the hospital in question attracts more advanced cases than any other. This is all very natural, for when an analysis is carried out it will, as a rule, reveal results poorer than anticipated, and, human nature being what it is, the above excuse is offered.

It must, nevertheless, be true that some hospitals do receive a higher proportion of advanced cases than others, but it is very difficult to see how due allowance can be made for this. Attempts have been made to divide the cases into groups or stages so as to facilitate comparison with results obtained in

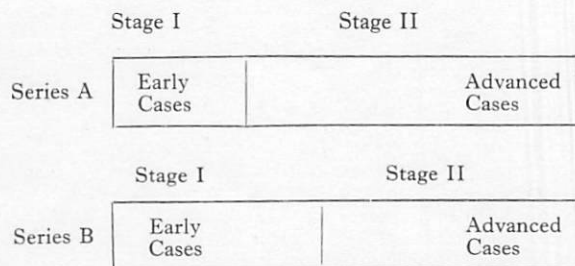


other centres. There are many methods of staging and none are free from the personal factor. Classifications may be based on clinical or histological findings, or on a combination of the two.

All cases of cancer of the breast coming to a hospital could be arranged in a continuous series varying from the very early cases at the one end to the very advanced at the other. A line could be drawn through this series so as to divide it into two stages or groups. It is not generally appreciated that the position of the line will determine the survival rates of *both* groups. Thus if we assume two identical series of cases treated by methods of equal value, and subdivide each by a line into two groups, the series with the line drawn nearest the very early cases will have higher survival rates in both groups.

FIG. 1.

TWO IDENTICAL SERIES OF CASES TREATED BY METHODS OF EQUAL VALUE



In Stage I, Series A, there are fewer moderately advanced cases than in Stage I of Series B. The results in Stage I, Series A, will therefore be higher.

In Stage II, Series A, the results will also be higher because there will be more cases in which the disease is only moderately advanced than in Stage II, Series B.

Comparison by stages might suggest that the method used in Series A was better than that used in Series B.

It should be noted that the survival rates will be the same when the total survivors are expressed as a percentage of the total cases.

The same findings will be obtained when the sub-division extends to more than two groups.

The care taken in the examination of a patient and the experience of the examiner are very important factors in determining the group or stage into which any case will be fitted. Even when the rules governing the classification are clearly defined this variation will still take place. Thus, there is great individual variation in the assessment of fixation of the primary tumour, the presence or absence of axillary glands and whether or not these glands are mobile or fixed.

Surprisingly, it would also appear that even when the clinical findings are not in dispute, a variation in

grouping may still occur. Heyman, at an international congress, represented the extent of the disease in carcinoma of the cervix by diagrams and invited the audience of experienced gynaecologists to stage the cases according to the widely used League of Nation's classification. The variation was remarkable.

Because clinical classifications are widely admitted to be unreliable, it has been stated that the only useful classification is one depending on the histological examination of the axillary glands. But it will be agreed that a patient with very early involvement of a single gland will have a much better prognosis than a patient with massive involvement of all the axillary glands, and any attempt to subdivide cases according to the extent of involvement will introduce a personal factor just as great as in any clinical classification. Again, a classification, dependent solely on the presence or absence of metastatic involvement of the axillary glands, would be of limited value, for a patient with early involvement of the glands will have a better prognosis than a patient with, say, skeletal metastases, and no involvement of the glands. Moreover, any classification dependent on the histological examination of the axillary glands cannot be used if the axillary glands are not removed by operation. Classifications based partially on the clinical findings and partially on the presence or absence of axillary involvement are of greater value, but are still subject to an error of sufficient magnitude to make direct comparisons between two methods difficult.

When all cases are examined and *staged at the time of the examination* by a single individual, the variation will naturally be less. In surveying the value of the radical operation many authors have not personally seen the cases and the staging has only been made at the time of the survey. It is difficult under these circumstances to avoid modifying the stage in the light of the result obtained. Classification of cases into "operable" and "inoperable" groups, depending on whether the cases were treated by operation or not, is also unreliable, for there is great variation in the standard of operability amongst surgeons. It is unfortunate that many of the surveys which have been made have had to be carried out on such unreliable information. Their usefulness in the assessment of the value of the operation must be considered very doubtful.

While admitting that some form of staging is

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desirable, it will be obvious from what has been said that no really satisfactory method of staging has yet been found. The methods of staging hitherto used may only add to the difficulty of comparing results. It would appear that the survival rates of the total cases seen are the only reliable means of comparison.

*Untraced cases*

If the effort made to trace cases is not very energetically undertaken the number lost sight of may be high. It is obvious from some reviews that the patients did not report regularly after treatment, and that it was only when the review came to be written that a communication was sent. When no reply was received the case was deducted from the total. But in many cases where no reply is received, the patient is dead, so that the deduction of these untraced cases from the total will raise the survival rate.

When the proportion of untraced cases is high it would be better to express the survival rate as lying between two percentages—these two percentages being obtained by assuming on the one hand, that all untraced cases are alive, and on the other by assuming that they are all dead.

*Deaths from intercurrent disease*

Deduction of cases dying of intercurrent disease is permissible, for at the age at which cancer of the breast develops, a number of patients may be expected to die of other diseases in the interval usually elapsing before an assessment is made. This point is still more clearly brought out when the assessment is made after an interval greater than five years. It is important, however, that no case be considered to have died of intercurrent disease unless there is reliable evidence that no malignant disease was present at the time of death. If the evidence is not clear, it is best to assume that death was due to malignant disease. In any case the proportion of deaths from intercurrent disease should not be greater than that for the population as a whole.

*“Clinical cures” and “symptom free rate”*

There is always a proportion, and sometimes a very high proportion, of cases where the assessment of the state of the patient is made either by the general practitioner or by the patient herself. In these cases it is fairly safe to conclude that only gross recurrences will be detected. Even when

patients report to hospital it not infrequently happens that there is considerable doubt as to whether the patient is free from disease or not. The number of “clinical cures” must always remain a statement of opinion and is, therefore, less reliable than the number of survivors, which is a statement of fact.

As the result of considerable experience in attempting this particular type of assessment, I have no doubt that comparisons based on survival rates are to be preferred.

*The five year survival rate*

The five year survival rate has been used for many years and, apart from certain very slowly growing cancers, it provides a useful basis of assessment of the value of a method of treatment.

A longer period than five years is, of course, preferable, and few will disagree that a ten year survival rate is not better, but whatever period is selected the same objections can still be raised. By the same process of reasoning a twenty year survival rate would be still more valuable. Unfortunately, few of us live sufficiently long to use ten or twenty year survival rates.

The five year survival rate must not be confused with the cure rate which some have suggested should be the basis of assessment, but the advocates of this surely do not appreciate precisely what is meant by the cure rate. It is impossible to determine the cure rate till all the treated patients are dead, and since a clinical examination is unreliable, an autopsy would be required in every case. Not only so, but if a patient died, say, two years after treatment in a street accident, it does not follow, even if an autopsy showed no evidence of recurrence, that the patient was, in fact, cured of cancer. An autopsy can only detect relatively large masses of tumour cells and if the patient had survived for a few years longer, small groups of cells, not demonstrated at the autopsy, might have caused the death of the patient.

Some confusion has also arisen from the accounts given of the natural duration of the disease. It has been assumed that, because the natural duration of the disease is occasionally longer than five years, the five year survival rate is of no value. Patients, however, rarely seek advice as soon as the disease commences and, not infrequently, they only seek advice after a very considerable interval. It cannot therefore be expected that by the time advice is



sought many would survive for five more years without treatment.

The five year survival rate is but a basis of comparison between two methods of treatment, and any objections to its use are common to both assessments. It represents a reasonable period of time after treatment in breast cancer and must be accepted as a practical basis of comparison.

#### The ideal basis of assessment

When the medical services of Great Britain are regionalised, each hospital organisation will become responsible for the health of the community it serves. It will then be possible to estimate the number of new cases of breast cancer occurring per annum in each region. If the number of survivors is then expressed as a percentage of the total estimated cases, the true value of the treatment carried out will be obtained, for all selection will be eliminated.

For some time every effort has been made to encourage the reference of all cases of breast cancer occurring in south-east Scotland to the Royal Infirmary in Edinburgh. From the information so obtained it has been possible to estimate the number of new cases of breast cancer per annum per million of population. This estimated figure is 240, and in recent years the number of patients referred has almost reached this rate. The accuracy of the estimate is further supported by the following evidence.

In Fig. 2 the number of deaths recorded in the Royal Infirmary of patients from south-east Scotland (all other cases from outside this area are excluded in this investigation), has been expressed as a percentage of the number of deaths recorded from the same area by the Registrar-General. The two curves are rapidly approaching one another and it would therefore appear that nearly all cases are now being referred.

#### Summary of method of assessment

Because the variation in the selection of patients will often modify survival rates to an extent greater than the method of treatment, it is of paramount importance that a common basis of assessment be used. The following basis is suggested for consideration:—

(1) When the value of any method or combination of methods is being assessed, no case must be deducted from the total. Cases failing to complete treatment, and cases where the method cannot be

applied, are just as much failures as cases fully treated and failing to be cured.

(2) The only reliable results are those of a large general hospital where records are made of all cases coming to the hospital, irrespective of whether they are admitted or not.

(3) The limitations of any method of staging—clinical, histological, or a combination of the two—must be recognised, and while results may be presented by stages, the figure of greatest value is the survival rate of all the stages taken together. This figure should always be stated.

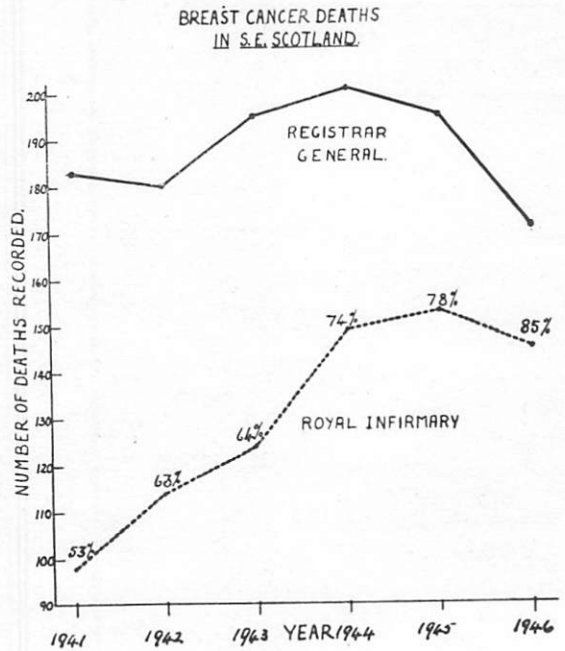


FIG. 2.

The number of breast-cancer deaths occurring in patients referred to the Royal Infirmary from the south-east of Scotland has been expressed as a percentage of the deaths recorded by the Registrar-General from the same area.

(4) If the number of untraced cases is high the maximum and minimum values of the survival rate should be stated.

(5) While deaths from intercurrent disease may be deducted, the death rate from these causes should not exceed that of the corresponding age group of the population as a whole.

(6) The "clinical cure rate", or the "symptom-free rate", is too unreliable to be of value.

(7) While admitting that the ten year survival rate is preferable, it is submitted that the five year

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survival rate is a useful practical basis of comparison in breast cancer.

(8) In the course of time it may be possible to assess the value of the method on the total estimated cases occurring in the region served by the treatment centre.

If the information is provided as suggested it will soon become possible to determine the true value of any method or combination of methods of treatment. The adoption of the above basis of assessment would terminate the present competition to produce higher results by means of better selection. It would end the remarkable state of affairs whereby we find high survival rates being recorded in medical journals and, at the same time, a higher mortality from breast cancer being recorded by the Registrar-General. If advance is to be made we must not be afraid to face the facts, however disappointing they may be.

Having now stated the basis of assessment, it is instructive to examine the true value of the radical operation.

#### ASSESSMENT OF THE TRUE VALUE OF THE RADICAL MASTECTOMY

Unfortunately, in most publications on the value of radical mastectomy, the results are presented of only those cases where the radical operation was performed. The five year survival rate of the cases actually treated varies from 35 to 45 per cent. These figures are, however, meaningless unless we know the total from which the selection was made. The greater the care in the selection of patients for the operation, the higher is the survival rate.

It will be shown later (Table I) that with the more modern standards of operability, only approximately 56 per cent. of the total cases referred to a large general hospital are regarded as being suitable for radical mastectomy. With such a degree of selection, approximately 40 per cent. of the operable cases will show no evidence of involvement of the axillary glands on histological examination. In the large series of cases published by Harrington, the glands were histologically free from disease in 39.5 per cent. of cases.

If only 56 per cent. of the cases are selected for radical mastectomy the five year survival rate of the treated cases will be of the order of 45 per cent. The five year survival rate of the total cases coming to a large general hospital is, therefore, unlikely to exceed 25 per cent. (45 per cent. of 56 per cent.).

This assessment may be put in another way. If radical mastectomy is the only method of treatment available, 44 per cent. of all the cases coming to a large general hospital are too advanced for the operation, and, of the remaining cases, where the operation is actually performed, 55 per cent. of the patients are dead within five years. Taking all cases together, approximately 75 per cent. are failures as judged by the five year survival rate.

It was because the radical operation was recognised to fail in so many cases that it was decided in 1941 in Edinburgh to try other methods of treatment, and an account will now be given of the methods adopted.

#### ASSESSMENT OF THE TRUE VALUE OF RADICAL MASTECTOMY AND POST-OPERATIVE RADIOTHERAPY

The value of combining post-operative radiotherapy with radical mastectomy was first investigated. The investigation began in 1935 and was continued until 1940. During this period 790 cases of breast cancer were referred to the Royal Infirmary, and the five year survival rate of the total cases was 32.4 per cent.

The method was very successful in reducing the number of local recurrences, but many patients continued to die of distant metastases. This led to the belief that dissection of the axilla might cause dissemination of malignant cells to sites beyond the area which could be irradiated. At the time of the operation, tissues invaded by the tumour must commonly be divided, and the trauma inflicted on involved tissues must increase the natural tendency of malignant cells to disseminate to distant sites. Should cells be disseminated to distant sites before radiotherapy is applied, the radiotherapy will not be effective in saving the life of the patient. In an attempt to overcome this difficulty it was decided to continue to remove the breast by surgery, but that the treatment of the axilla should be by radiotherapy alone.

#### FACTORS WHICH SUGGESTED THE USE OF SIMPLE MASTECTOMY AND RADIOTHERAPY

The decision that treatment of breast cancer should be attempted by means of simple mastectomy and radiotherapy was taken in 1941. The decision was not lightly undertaken, for of all the operations for cancer, radical mastectomy is the most nearly perfect. The following observations, however



suggested that other methods of treatment were at least worth exploring.

*Disease confined to the breast*

When the disease is confined to the breast, surgery gives good results. Surgery is thus an effective method of treating the disease in the breast, and it was decided that surgical removal should be continued.

*Axilla involved*

While at first sight surgery might appear to be the most satisfactory method of treating the axilla, a more careful examination will show that its value is, in fact, very limited. It is true that the results are excellent when the axillary glands are not involved, but if there are no malignant cells in the axilla it would appear unnecessary to dissect it, for the removal of normal lymph glands cannot influence the result. On the other hand, when the axilla is secondarily involved, there is universal agreement that radical mastectomy often fails to save the life of the patient. Since, therefore, surgical removal of the glands is unnecessary when the axilla is not involved, and often fails when the axilla is involved, it was decided to treat the axilla by radiotherapy to see if better results could be obtained.

*Destruction of cancer cells by radiotherapy*

In many forms of cancer, radiotherapy has now become the treatment of choice, and, in breast carcinoma, it has been shown that post-operative recurrences can be effectively treated by this means. Immediate post-operative radiotherapy will greatly reduce the number of local recurrences. From these observations it must be concluded that radiotherapy can destroy breast cancer cells and that radiotherapy is at least an alternative method of treating the axilla.

FURTHER FACTORS SUPPORTING THE USE OF SIMPLE MASTECTOMY AND RADIOTHERAPY

Since 1941, over 2000 new cases of breast cancer have been referred to the Royal Infirmary, so that the experience gained in the use of simple mastectomy and radiotherapy is considerable.

*Proportion of cases suitable for treatment*

Soon after this method of treatment was introduced it was appreciated that a much higher proportion of patients could be given full treatment than had been possible before. Thus patients with

fixed axillary glands and glands present in the supraclavicular region may still be fully treated and, as will be shown later, a considerable measure of success has been achieved in these cases.

*Interval before radiotherapy is applied*

The wound heals more quickly after simple mastectomy and there is less risk of necrosis of the margins of the skin flaps. In consequence there is less delay in the application of radiotherapy and the interval during which cells may escape to distant sites is reduced.

*Tissue tolerance*

The tissues tolerate radiotherapy much better when only a simple mastectomy is performed, and subsequent atrophy is therefore less marked.

*Œdema of the arm*

When post-operative irradiation is given after radical mastectomy, œdema of the arm is common. With simple mastectomy and radiotherapy, œdema of the arm is almost unknown.

DATA FOR THE YEARS 1941-45

*Number of cases*

In the period 1941-45 the number of cases of breast cancer referred to the Royal Infirmary was 1451, and of this number there were 1334 primary cases. The remaining 117 had all been treated elsewhere and were referred only after the development of recurrences.

Each primary case was classified when it was first seen, and the classification adopted was that suggested by Paterson, of Manchester (1938). It should be noted that this classification is based entirely on the pre-operative clinical findings.

TABLE I

ALL PRIMARY CASES REFERRED IN THE PERIOD 1941-45

	Stage I	Stage II	Stage III	Stage IV	Total
No.	405	344	182	403	1334
%	30	26	14	30	100

*Operability*

There are many standards of operability and, as already indicated, all of them are subject to great variation in interpretation. It is, nevertheless, convenient in the presentation of an account of the results to divide cases into groups.



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In a previous communication (1948) all cases in Stages I, II, and III of the above classification were regarded as operable, but it would appear that this standard is too low. It is now recognised that Stage III cases are too advanced for treatment by radical mastectomy, and, in order to conform to modern standards, only Stages I and II will now be included in the operable category. The definition of operability will then read as follows:—

The primary tumour, which may be of any size, may show any degree of skin involvement up to and including ulceration, but there must be no isolated skin nodules or other manifestation of invasion of the cutaneous lymphatics. The extent of skin involvement must not be so great as to necessitate skin grafting when radical mastectomy is performed, and the tumour must not be fixed to the pectoral muscle. The axillary glands of the same side may be enlarged, but they must not be fixed. The supraclavicular glands must not be enlarged, and there must be no clinical or radiographic evidence of more distant metastases.

It will be observed that Stages I and II constitute 56 per cent. of the total cases referred. During the period when radical mastectomy was employed it was found that in 60 per cent. of the cases in Stage I and in 15 per cent. of the cases in Stage II, the axillary glands were not involved on histological examination. When the two stages are taken together to form the operable group it may therefore be presumed that in 40 per cent. of cases the axillary glands will not be histologically involved, while in the remaining 60 per cent. the glands will be found to be invaded by malignant cells.

For further convenience in the presentation of the results, the advanced cases have been divided into two groups according to whether or not distant metastases were present.

TABLE II

1941-45	Operable Cases	Advanced Without Distant Metastases	Advanced With Distant Metastases	Total
No.	749	387	198	1334
%	56	29	15	100

*Operative mortality*

The operations were performed by upwards of forty different surgeons, and, while only eleven post-operative deaths (death within a month from any

cause was regarded as a post-operative death) are known to have taken place, it was decided to add another eleven deaths to the total to allow for any possible further post-operative deaths in patients whose operation was performed outside the Royal Infirmary. These added deaths are almost certainly in excess of the number which actually took place, but as the exact number was unknown it was decided to err on the safe side so as to avoid any criticism that might arise.

Of the eleven known deaths there were only four in patients under 65 years of age. The remaining seven occurred in elderly debilitated patients.

*Untraced cases*

No case is untraced.

*Histological confirmation*

Of the operable cases, 97 per cent. are histologically proven, and of the total there is histological confirmation in 87 per cent. The cases not histologically proven are mainly those too advanced for any surgical treatment.

*Calculation of survival rate*

The method adopted is that advised by Dr. Lewis-Faning of the Medical Research Council. A full account of the method cannot be given here, but briefly it may be stated that, while the five year survival rate of the cases treated in the period 1941-45 is mainly determined by the cases treated in 1941 and 1942, the rate is influenced by the cases treated in the later years. By allowing the more recently treated cases to influence the five year survival rate, a figure is obtained which is more reliable than that based on the 1941 and 1942 cases alone.

For comparison the five year survival rate, calculated by the more usual method, is given at the end of Table V. It so happens that there is no great difference between this figure and that obtained by the method adopted. The method advised by Dr. Lewis-Faning, however, has the great advantage that the five year survival rate is based on a much larger number of cases and is therefore to be preferred.

## SURVIVAL RATE OF ALL OPERABLE CASES IN THE PERIOD 1941-45

As has been stated, the main method of treatment in this period was simple mastectomy and radiotherapy. Full treatment was possible in almost all cases, but, whether fully treated or not, every case

classified as operable has been included in the following table.

TABLE III

SURVIVAL RATE OF ALL OPERABLE CASES IN THE PERIOD 1941-45

TOTAL CASES 757

Years After Treatment	Number of Cancer Deaths	Number Exposed to Risk	Chance of Dying in Any One Year	Survival Rate %
1	49	757	·065	93·5
2	69	704·5	·098	84·4
3	58	477	·122	74·1
4	34	317	·107	66·2
5	10	161·5	·062	62·1

As will be observed from the last column the five year survival rate is 62·1 per cent.

During the period 1935-40 the main method of treatment was radical surgery and post-operative radiotherapy, and of the 411 operable cases 50·1 per cent. were alive at the end of five years.

Statistical examination shows that this difference in the survival rates is significant, and the findings, so far as the five year survival rate is concerned, suggest that radiotherapy is a better method of treatment of the axilla. The findings obtained in the advanced cases without distant metastases support this observation.

#### SURVIVAL RATE OF ALL ADVANCED CASES WITHOUT DISTANT METASTASES IN THE PERIOD 1941-45

Treatment by simple mastectomy and radiotherapy was possible in only a limited number of cases, but as in the previous table, all cases, whether fully treated or not, and all untreated cases, are included.

The cases in this group are essentially those where the disease was too advanced to be treated by radical mastectomy, but was still to some extent localised, so far as could be ascertained by clinical and radiographic examination. The group therefore includes all cases where the primary tumour was fixed to the pectoral muscle or to the underlying ribs, and all cases where there were fixed axillary glands or glands present in the supraclavicular region.

It will be seen from Table IV that 29 per cent. of these cases were alive at the end of five years. This remarkably high figure clearly demonstrates that radiotherapy is an effective method of treatment of

TABLE IV  
SURVIVAL RATE OF ALL ADVANCED CASES WITHOUT DISTANT METASTASES IN THE PERIOD 1941-45

TOTAL CASES 389

Years After Treatment	Number of Cancer Deaths	Number Exposed to Risk	Chance of Dying in Any One Year	Survival Rate %
1	89	389	·229	77·1
2	79	299·5	·264	56·8
3	47	181·5	·259	42·1
4	17	93	·183	34·4
5	8	51·5	·155	29·0

the axilla even when the axillary involvement is gross.

#### SURVIVAL RATE OF ALL CASES IN THE PERIOD 1941-45

The analysis would not be complete without consideration of the results obtained in all the cases taken together.

TABLE V

SURVIVAL RATE OF ALL CASES REFERRED IN THE PERIOD 1941-45

TOTAL CASES = 1345

Years After Treatment	Number of Cancer Deaths	Number Exposed to Risk	Chance of Dying in Any One Year	Survival Rate %
1	260	1345	·193	80·7
2	197	1081	·182	66·0
3	113	684·5	·165	55·1
4	55	423	·130	47·9
5	19	218	·087	43·7

Calculation of the survival rate by the more usual methods gives almost the same result:

Total cases referred during 1941 and

1942, less deaths from intercurrent

disease . . . . . = 459

Number alive at the end of five years = 197

Five year survival rate . . . . . = 42·9%

It will be observed from Table V that the five year survival rate of all cases referred during the period 1941-45 was 43·7 per cent. It is interesting once again to compare this figure with that obtained during the period 1935-40, when the main method of treatment was radical mastectomy and post-operative radiotherapy. There were 790 cases referred during this earlier period and the five year survival rate was 32·4 per cent.

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From the information already presented (see Fig. 2) it can be stated with considerable confidence that the results obtained in the period 1941-45 are based on unselected cases. In all probability the results are less influenced by selection than any figures hitherto published. It is almost superfluous to add that if the cases had been more carefully selected much better results could have been published.

A final table is presented for interest. It shows the results obtained in all cases without clinical or radiographic evidence of distant metastases.

TABLE VI

SURVIVAL RATE OF ALL CASES WITHOUT CLINICAL OR RADIOGRAPHIC EVIDENCE OF DISTANT METASTASES IN THE PERIOD 1941-45

TOTAL CASES = 1146

Years After Treatment	Number of Cancer Deaths	Number Exposed to Risk	Chance of Dying in Any One Year	Survival Rate %
1	138	1146	.120	88.0
2	148	1004	.147	75.0
3	105	658.5	.160	63.0
4	51	410	.124	55.2
5	18	213	.085	50.5

The table shows that where there was no evidence of distant metastases one out of every two patients is alive at the end of five years.

#### TECHNIQUE OF SIMPLE MASTECTOMY AND RADIOTHERAPY

A full account cannot be given of all the technical details of treatment by simple mastectomy and radiotherapy, but the following is a brief summary of the essential points.

The method of treatment is a combination of two procedures which must be co-ordinated if the best result is to be obtained.

The following points are of importance in the surgical aspect of treatment:

1. Pre-operative preparation by iodine is contra-indicated because it lowers the skin tolerance to radiotherapy.
2. The skin incision and the undermining of the skin flaps should be as limited as possible so that tissue spaces outside the area to be irradiated will not be contaminated with malignant cells liberated during the operation.

3. Excessive skin should not be removed, for tension on the skin flaps may be associated with failure of the wound to heal and delay in the application of radiotherapy. Tightly stretched skin flaps do not tolerate radiation well. Skin grafting does not overcome the difficulty, for grafts do not tolerate X-ray treatment well.

4. Where the primary tumour is mobile on the pectoral fascia, the fascia should not be removed, as this promotes fibrosis of the pectoral muscle. If the tumour is firmly fixed to the pectoralis major, the muscle should be removed together with the breast.

5. If there are no palpable axillary glands no dissection should be performed, but superficial mobile glands in the subpectoral region and outside the axillary fascia may be removed. Any further dissection of the axilla will defeat the whole purpose of the treatment method advocated.

6. If the patient is very stout it is better to carry out a radical mastectomy, because in stout patients it is difficult to deliver an adequate dose of X rays to the axilla.

7. Supraclavicular glands should never be removed, because these glands are easily and effectively dealt with by radiotherapy.

8. Adhesive should not be applied to the skin after the operation, because this lowers the tolerance of the skin to radiation.

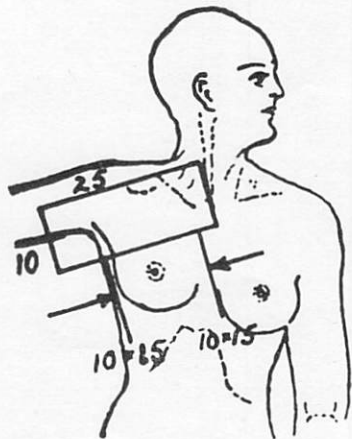
The following points are of importance in post-operative treatment by radiotherapy:

1. Only one full course of X-ray treatment should be given. The practice of repeated courses at intervals of three to six months has no place in the treatment of any form of malignant disease where cure is to be attempted, and is just as illogical as partial removal of a tumour at intervals of three to six months.
2. X-ray treatment should be commenced as soon as possible after the operation; the usual interval is two weeks.
3. Four fields are used and every field is treated every day. The axilla is irradiated by two opposed fields and the anterior field extends up to include the supraclavicular region. The chest wall must be treated by tangential or glancing fields so as to



avoid lung fibrosis. The arrangement of the fields is shown in Fig. 3.

- An adequate dosage must be given, and in Edinburgh the patients receive a minimal tumour dose of 3750 r in a period of three weeks. This is the same dosage as is given when clinically obvious local recurrences are treated, and it is important not to give less.



better methods may be recognised without undue delay. The view has been expressed that the publication of results of selected cases has greatly confused the issue and has tended to convey the impression that radical mastectomy is a highly successful method of treatment of breast cancer.

When radical mastectomy is the only method of treatment available, and when all cases coming to a large general hospital are taken into account, the five year survival rate is unlikely to exceed 25 per cent.

A brief account of the method of treatment by simple mastectomy and radiotherapy has been presented. The five year survival rate of all cases coming to the Royal Infirmary in the period 1941-45 is 43.7 per cent.

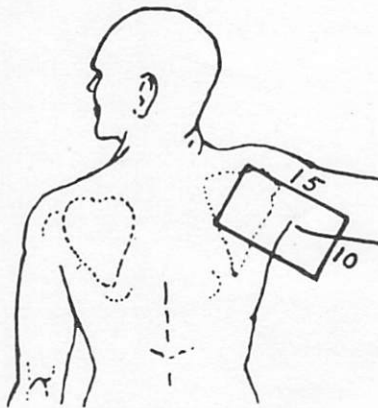


FIG. 3.

- The X-ray apparatus must be sufficiently powerful to deliver an adequate depth dose in the axilla and it is doubtful if effective radiotherapy can be given with an apparatus of lower voltage than 250 kV. Heavy filtration is employed and the half-value layer of the beam is 3.7 mm. cu.

#### ACKNOWLEDGMENTS

In conclusion I would like to express my thanks to my surgical colleagues in Edinburgh, without whose support it would have been quite impossible to have carried out the investigation.

Fig. 2 has been reproduced by kind permission of the Hon. Editors of the *Proceedings of the Royal Society of Medicine*.

#### SUMMARY

An account has been presented of the method of treatment at present in use in Edinburgh. It must be accepted as representing but one direction in which the survival rates of breast cancer may be improved. There may be other better methods.

Considerable emphasis has been placed on the importance of assessing the true value of a method of treatment so that

The most important feature of this method is the substitution of radiotherapy for surgery in the treatment of the axilla. The decision to do so was taken because when the axilla is not involved by malignant cells it appears unnecessary to carry out an axillary dissection, and when the axilla is involved the results of surgical dissection are poor.

The fact that a five year survival rate of 29 per cent. was obtained in the advanced cases without distant metastases indicates that radiotherapy, even in such adverse circumstances, is an effective method of treating the axilla. It is therefore not surprising that this same method of treatment in operable cases should be associated with a survival rate much higher than that obtained by radical mastectomy.

A high standard of radiotherapy is essential and adequate dosage must be given. *It is most important to appreciate that simple mastectomy and a low standard of radiotherapy will be associated with results poorer than those obtained by radical mastectomy without any radiotherapy.*

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## VI. THE SURGICAL ASPECT OF CARCINOMA OF THE BREAST

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PROPOSE to review some of our findings in the treatment of cancer of the breast, over a period of ten years, from 1937 to 1946. It should be made

clear at the outset that all the results of treatment submitted in this communication are based on a personal series of cases which have been under my