

## PELVIC RECURRENCE AFTER EXCISION OF RECTUM FOR CARCINOMA

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Recurrence in the pelvis after excision of the rectum for carcinoma implies some form of incomplete removal of the primary tumour or metastases in its immediate neighbourhood. Little is known of the incidence of pelvic recurrence or of the factors responsible for its development, though the painful effects of these surgical failures are only too often seen in the out-patient department. These considerations prompted an investigation into the pathology of pelvic recurrence in a large series of patients with rectal cancer in the hope of finding methods of prevention.

### Material and Methods

**Radical Excisions.**—At St. Mark's Hospital during the 25-year period 1928–52 there were 1,596 survivors from radical operations for removal of the rectum for cancer. All these operations were of the excision type—that is, they removed the anal canal as well as the rectum and were not of a restorative nature. Moreover, all these operations were “radical” in the sense that in each case it was thought by the surgeon that the primary growth and all known metastases had been completely removed.

**Palliative Excisions.**—These include those operations of the excision type in which the surgeon was of the opinion that growth had been left behind, mostly because of incomplete local excision or because of the presence of hepatic metastases. During 1928–52 there were 200 operation survivors in this group.

**Anterior Resection.**—There were 217 survivors after anterior resection during the 10-year period 1948–57. Of these, 177 were “radical” and 40 “palliative” as defined above. In this group the operations were nearly always palliative because of the presence of hepatic metastases.

The attempt to follow up all these patients has been successful in 98.5% of the cases. Approximately half the patients continued to attend the out-patient department at regular intervals and thus received experienced aftercare. The remainder, usually living at a considerable distance from London, were followed up by means of biannual questionnaire letters. When death occurred in the absence of recent examination at St. Mark's Hospital, the opinion of the local practitioner on the cause of death was requested. Obviously only a thorough post-mortem examination in each case could establish beyond doubt whether or not there was a recurrence, and this was possible in only a very few patients.

### Definition of Pelvic Recurrence

In this study the term “pelvic recurrence” refers to the presence of symptoms and signs, the most likely explanation of which was the growth of residual carcinoma in the pelvic region.

These clinical manifestations—for radical non-restorative operations, for example—are listed in Table I. A perineal nodule, mass, or ulcer was evident in 48 patients, and in a further 26 cases similar lesions were found in the vaginal wall. Histological proof of malignant growth was

obtained by biopsy in about one-third of these cases. Perineal abscess was the presenting symptom in four patients, and in each case a biopsy was confirmatory. A

TABLE I.—Clinical Manifestations of Pelvic Recurrence (155 Cases)

Perineum .. .. .	96	Pelvis .. .. .	42
Mass or ulcer .. .	48	Pelvic mass .. .	32
Sinus .. .. .	8	“Pelvic recurrence” ..	5
Abscess .. .. .	4	Prostate and bladder ..	5
Vaginal mass .. .	26		
“Perineal or local recurrence” ..	10	Pain .. .. .	17
		Pain alone .. .. .	10
		“and other symptoms” ..	7

persistent perineal sinus existed in eight cases, seven of which showed malignancy in the biopsy section. Thus there were 86 cases with visible or palpable lesions in the perineum. In a further 10 patients the general practitioner stated that local or perineal recurrence had taken place without adding any further details.

In a further group of 37 cases the recurrence appeared to be more deeply seated. Here the main symptom was pelvic or referred pain associated with a palpable mass deep in the pelvis. Five other cases presented with urinary symptoms and cystoscopy revealed bladder involvement, this being confirmed by biopsy in four patients.

Finally there were 17 cases in which pain was the principal complaint and no palpable recurrence could be detected. In 10 of these patients pain was the only symptom, but in the remainder the pain was accompanied by weakness, paresis, swelling of the legs, or urinary symptoms. No pathological confirmation was obtained in any of these 17 cases, but the operation findings, in conjunction with the short survival time, left little doubt that these were also examples of pelvic recurrence.

It must be emphasized that low backache and pain, either perineal or pelvic, are the most constant symptoms in this form of recurrence after excision of the rectum, being present in almost every case. In the absence of other supporting evidence, such as induration, ulceration, or lump, a firm diagnosis of local recurrence cannot be made, although in any patient with persistent pelvic pain recurrence must be regarded as highly probable.

The time interval from operation to the appearance of a pelvic recurrence was analysed for 138 out of the 155 radical excision cases: 80% (111 cases) occurred within two years of surgical treatment and about 17% (23 cases) between two and five years; only four patients developed their recurrence more than five years after surgical treatment.

The five-year-survival rate of patients with pelvic recurrence after the radical excision operations was only 9.7% (15 out of 155 cases). Fourteen died after more than five years and one is still alive at 16 years, the recurrence apparently being successfully treated by local excision.

### General Incidence of Pelvic Recurrence

From a study of the available history after radical non-restorative operations it was decided that pelvic recurrence had taken place in 155 (9.7%) of the 1,596 patients. This

figure must be regarded as of a minimal nature; the true incidence is probably higher. Among the 200 survivors after *palliative* non-restorative operations 50 (25%) developed a pelvic recurrence. After *radical* restorative operations 13 (7.3%) out of 177 patients developed a pelvic recurrence, and in similar operations of a *palliative* nature 4 (10%) out of 40 were likewise affected.

### A. Factors Influencing Incidence After Radical Excision Operations

#### 1. Level of Primary Tumour

For many years it has been the custom at St. Mark's Hospital to divide rectal cancers into three groups according to their position. The classification into lower, middle, and upper thirds of the rectum (the latter group including recto-sigmoid) is based on consideration of the height of the growth above the dentate line, measured both *in situ* sigmoidoscopically and on the excised specimen, and the relationship of the growth to the peritoneal reflection. Anatomically all these tumours are sited at or below the lower border of the sacral promontory. As a rough guide it may be said that tumours in the lower third are entirely below the peritoneal reflection, those in the upper third entirely above, while middle-third growths are astride the reflection. The number of cases and the incidence of pelvic recurrence within these three groups are given in Table II. It will be seen that the incidence of recurrence after removal of lower-third tumours is more than double that after excision of upper-third cancers (14.5% as compared with 5.2%). This result conforms with the findings of Gilchrist and David (1948), who stated that local recurrence is more common in patients with extraperitoneal lesions than in those with intraperitoneal lesions.

TABLE II.—Relationship of Incidence of Pelvic Recurrence to Level of Primary Tumour

Level of Primary Tumour	No. of Cases	Pelvic Recurrence	
		No.	%
Lower third of rectum ..	607	88	14.5
Middle " " " ..	508	42	8.3
Upper " " " and recto-sigmoid ..	481	25	5.2
Total ..	1,596	155	9.7

The high incidence of pelvic recurrence in lower-third tumours can be explained by anatomical considerations. The lower third of the rectum is closely encased by the narrowing pelvic funnel and lacks the protective coat of fat and mesentery found at a higher level. If an operation specimen of rectal cancer removed by synchronous combined excision is cut open along its anterior aspect and stretched out on a metal frame it will be seen that there is a "bare area" around the lower third of the rectum where the bowel is very close to the bony pelvis laterally and posteriorly and to the vagina or prostate anteriorly. It is here that the surgeon is often unable to make an adequate local excision of the primary tumour. By current methods, which probably represent the limits of surgical excision in this area, it may be impossible to excise a margin of even one centimetre of healthy tissue around the tumour once it has spread beyond the tissues of the rectal wall. This cannot be regarded as adequate local excision.

#### 2. Resectability Rate

The proportion of patients with carcinoma of the rectum operated on at St. Mark's Hospital in the 25-year period under consideration steadily increased from 46.6% in the first five years (1928-32) to 92.7% in the last five-year

period (1948-52). This increase is in part explained by the fact that more advanced growths have been operated on in recent years, and it is not unreasonable to suspect that an increase in the incidence of pelvic recurrence might be part of the price paid for the higher resectability rate. However, a study of Table III, in which both the resectability rate and the incidence of pelvic recurrence for various five-year periods are compared, reveals that the recurrence rate was higher in the first two periods than in the last three, and that there has been no significant rise as the operability rate rose. The higher incidence in the earlier years is probably related to the different type of operation then used for excising the rectum.

TABLE III.—Comparison of Incidence of Pelvic Recurrence by Five-Year Periods

Period	No. of Operation Survivors	Pelvic Recurrence		Resectability Rate (%)
		No.	%	
1928-32	165	26	15.8	46.6
1933-37	239	28	11.7	57.6
1938-42	285	17	6.0	69.2
1943-47	422	42	10.0	79.0
1948-52	485	42	8.7	92.7
Total	1,596	155	9.7	

#### 3. Type of Operation

The incidence of pelvic recurrence following excision of the rectum by three different methods is shown in Table IV. It will be seen that the highest rate followed perineal excision (14.7%), while the lowest is that for synchronous combined excision (8.1%). For perineo-abdominal excision the incidence rate for recurrence is 8.5%, and the difference between this figure and that for synchronous combined excision is not significant.

TABLE IV.—Relationship to Type of Operation

Operation	No. of Operation Survivors	Pelvic Recurrence	
		No.	%
Perineal excision ..	327	48	14.7
Perineo-abdominal excision ..	609	52	8.5
Synchronous combined excision ..	629	51	8.1
Other operations ..	31	4	12.9
Total ..	1,596	155	9.7

The difference between the local recurrence rates for perineal and combined excisions is important in explaining the larger proportion of such recurrences in the earlier years of the period under consideration. During the years 1928-37 the perineal excision was the standard operation for excision of the rectum, only a few combined excisions being performed. In subsequent years the reverse was true and practically all operations were of the combined type.

In seeking an explanation why the perineal excisions should carry a higher local recurrence rate it is worth considering the fact that the series of cases undergoing this operation contained a higher proportion of low rectal cancers. As has already been shown, these have a higher local recurrence rate.

#### 4. Histology of Primary Growth

A comparison has been made between the histology of the general series of rectal cancers and that of the cases with pelvic recurrence. The results are shown in Table V. It will be seen that, whereas only 5.7% of the tumours classified as low-grade malignancy later developed pelvic recurrence, 63 of 319 (19.7%) carcinomas of high-grade malignancy subsequently suffered in this way. The reason for this probably lies in the fact that there is a higher incidence of more extensive local spread in high-grade than

TABLE V.—Relationship of Incidence of Pelvic Recurrence to Grade of Malignancy of Primary Growth

Grade	No. of Cases	Local Recurrence	
		No.	%
Low	297	17	5.7
Average	969	73	7.5
High	319	63	19.7
Not stated	11	2	—
Total	1,596	155	9.7

in average-grade or low-grade tumours (Dukes and Bussey, 1958). Moreover, high-grade tumours have a greater infiltrative capacity, and the surgeon's sense of adequacy of the completeness of excision of the primary tumour is more likely to be at fault than in differentiated growths.

Of the 155 cases of pelvic recurrence, 49 (31.6%) were mucus-secreting growths, meaning that they were carcinomas which on histological examination appeared to be secreting substantial quantities of epithelial mucin. In the general series of rectal cancers at St. Mark's the incidence of mucus-secreting growths is 13.2% of the whole group. This high incidence of mucus-secreting carcinomas in patients who get pelvic recurrence is difficult to explain, but it may be related either to special difficulty in assessing the margin of local spread of colloid growths as they extend into the perirectal tissues or to an enhanced capacity for survival of malignant cells lying within pools of mucin.

5. Extent of Spread of Urinary Tumour

(a) Lymphatic Spread

Of the 1,592 cases in this series that have been classified according to the Dukes (1932) grouping into A, B, or C cases, 830 (247 A cases and 583 B cases) were free from lymphatic metastases and in 762 lymphatic deposits were present (C cases). The proportion of patients in each group who developed pelvic recurrence was 4% and 16% respectively (Table VI).

TABLE VI.—Relationship of Incidence of Pelvic Recurrence to A, B, and C Cases

	No. of Cases	Pelvic Recurrence	
		No.	%
A cases	247	2	0.8
B "	583	31	5.2
C "	762	122	16.0
Unclassified	4	—	—
Total	1,596	155	9.7

The association of a high pelvic recurrence rate with the presence of lymphatic metastases could be explained by the high incidence of extensive local spread and high-grade tumours in patients with lymphatic metastases (Dukes and Bussey, 1958). But it is possible that some pelvic recurrences are due to incomplete excision of involved lymph nodes on the lateral wall of the pelvis and obturator glands rather than to incomplete excision of the primary tumour and its local spread in continuity.

(b) Extent of Local Spread

Table VII shows the effect of extent of local spread of the tumour by direct continuity. Information concerning the degree of local spread was not available for those specimens excised in the first 10 years of the period under study, but accurate data existed for 1,189 cases operated on during the years 1938-52. In 211 of the specimens the growth was confined to the bowel wall, and only 2 (0.9%) of these developed a pelvic recurrence. Slight or moderate local spread was present in 592 cases, of which 35 (5.9%)

subsequently had recurrence in the pelvis. The proportion of local recurrence rose, however, to 16.8% (65 out of 386 patients) when the direct spread in continuity was of an extensive nature. It is not surprising to find that a high incidence of pelvic recurrence is associated with extensive local spread of the primary tumour.

TABLE VII.—Relationship of Incidence of Pelvic Recurrence to Extent of Local Spread

Extent of Spread	No. of Cases (1938-52)	Pelvic Recurrence	
		No.	%
Nil	211	2	0.9
Slight	592	35	5.9
Extensive	386	65	16.8
Not noted	407*	53	13.0
Total	1,596	155	9.7

\* Information about extent of local spread is not available for the 407 cases examined during the first 10 years (1928-37).

It is necessary to consider in some detail why pelvic recurrence should follow radical excisions of the rectum for growths with only slight spread, bearing in mind that "radical" means that the surgeon believed he had completely removed the primary growth and all known metastases. One of the most likely reasons is that at the time of operation the surgeon had a false sense of completeness of excision of the primary tumour. Palpation of the tissues surrounding a growth is, after all, only a very rough guide to the extent of spread. Moreover, the anatomical arrangement of the tissues around the lower third of the rectum, as already described, suggests that it is often not possible to leave an adequate margin of healthy tissue around the tumour once it has spread through the muscle layers of the rectal wall.

A review of the operation notes of the 65 cases of pelvic recurrence mentioned above in which the direct spread in continuity was of an extensive nature shows that in 44 (68%) the surgeon had some operative difficulty in removing the primary tumour. In one of these the bowel was perforated during operation. In 34 cases with only slight direct spread in continuity there were 17 (50%) cases in which operative difficulties were recorded, and in four of these the bowel was perforated. Of the two cases of pelvic recurrence in which the original primary growth was confined to the bowel wall, one was a perineal excision for a Dukes C2 case, and in retrospect it would seem probable that the recurrence was due either to an inadequate margin of excision at the proximal limit of the specimen or to involved glands left behind on the lateral walls of the pelvis. In the other patient the growth was in the lower third of the rectum and was of a high grade of malignancy. The recording of "no spread" beyond the tissues of the rectal wall could have been inaccurate or else the recurrence was due to spillage of cells during dissection. The patient died of widespread and rapidly growing secondaries only nine months after her radical operation.

Review of the operation notes of all the 155 radical non-restorative cases with pelvic recurrence shows that in 105 (67.7%) operative difficulties and/or extensive local spread might well be the cause of the recurrence. The probable sites in these 105 cases from which such spread may not have been removed are:

Lateral ligaments, pelvic wall	24
Vagina	17
Prostate	11
Bladder	8
Peritoneum	8
Sacrum	6
Seminal vesicles	6
Lymph nodes	1
Unspecified	28

In 43 patients the source of the recurrence was obscure, but in seven cases it appeared that surgical implantation was the most probable cause.

#### 6. Surgical Implantation

It is possible that malignant cells may be transferred surgically from the growth to other parts of the operation field (Goligher, Dukes, and Bussey, 1951; Boreham, 1958; Keynes, 1961). This could happen during the perineal operation if the surgeon's dissection passed close to the palpable margin of spread into the perirectal tissues. For anatomical reasons it would appear that in tumours of the lower third of the rectum this must be a common occurrence, and it is really surprising that the pelvic recurrence rate for lower-third growths is not higher than the 14.5% reported here.

During the review of all the operation notes and pathological reports of the pelvic recurrence cases there were six in which the bowel was opened during operation. Such an accident could easily lead to spillage of malignant cells, and it would appear from a study of these six cases that surgical implantation was possibly the cause of the recurrence. In one other patient it was recorded in the operation notes that the growth was cut into during the perineal dissection, although the surgeon thought that he had completely removed the tumour. This surgical hazard was the most likely explanation of the patient's subsequent recurrence in the pelvis.

#### B. Factors Influencing Incidence After Palliative Excision (Non-restorative) Operations

This group comprised 200 cases. Half of these operations were regarded as palliative because of the presence of hepatic metastases. Peritoneal nodules, extensive lymphatic gland involvement, and miscellaneous reasons accounted for a further 33 in the palliative group. Of the total of 133 only 11 developed a pelvic recurrence. But in 54 patients the operation was palliative because of incomplete local removal of the primary tumour, and, as would be expected, 32 of these developed clinical evidence of pelvic recurrence, which merely shows that pelvic recurrence in most cases is the result of incomplete local excision.

The great majority of these pelvic recurrences after palliative operations (21 out of 32) were in tumours of the lower third of the rectum, in high-grade growths (13 out of 32), and in Dukes C cases (21 out of 32), as found after radical non-restorative operations.

#### C. Factors Influencing Incidence After Anterior Resections

There were 217 operation survivors after anterior resection during the 10 years 1948-57. Of these, 177 were radical and 40 palliative.

The 177 radical cases developed 14 (7.9%) pelvic recurrences. These included 4 (2.2%) with "suture-line recurrence," two of which were associated with more widespread recurrence of growth in the pelvis. We agree with Deddish and Stearns (1961) that so-called "suture-line recurrence" is often due to secondary invasion of the bowel from pelvic-wall recurrence and is not by any means always due to intraluminal spread and implantation of cells on to the granulating surface of the anastomosis. In fact, a study of the operation notes and pathological reports in the four cases referred to above suggests that the "suture-line recurrence" was as likely to be due to spread of cells into the wall of the anastomosis from without as to

implantation of cells on to the suture line from the lumen of the gut at the time of operation.

Of these four "suture-line recurrences" after radical anterior resection there was one which did not have irrigation with 1 in 500 (0.2%) perchloride of mercury, and this showed extensive lateral pelvic-wall and sacral as well as suture-line recurrence.

This is a relatively small series, but a study of the 14 cases does give some clues to the causes of pelvic recurrence after radical anterior resection.

At St. Mark's Hospital radical anterior resection for growths of a high grade of malignancy is avoided so far as is possible, which explains why only one of the 14 pelvic recurrences was a high-grade tumour. There was no pre-operative biopsy in this case. Of the 14 recurrences, 10 were in Dukes C cases and four in B cases. Seven out of 14 were recorded as tumours with extensive local spread and seven as slight local spread. Four of the 14 showed involvement of the peritoneal surface of the primary growth.

A study of the operation notes and pathological reports of these cases reveals no explanation for the pelvic recurrence in four of the patients. In another four involvement of the peritoneal surface of the growth and subsequent implantation of malignant cells into the pelvic wound seems the most likely explanation. In six patients the growth showed extensive spread in continuity, and it is possible that the margin of normal tissue around the growth was inadequate.

The reasons why the 40 of the 217 anterior-resection cases were considered to be palliative are:

	No.	Pelvic Recurrence
Liver secondaries, mostly alone but sometimes with other factors ..	32	3
Incomplete local removal ..	5	2
Other reasons (lymph metastases, peritoneal involvement, spillage) ..	3	1

Of the six cases of pelvic recurrence one was "palliative" because of spillage of gut contents at the time of operation, and it is probable that this was the cause of the subsequent "suture-line recurrence" and secondary deposits in the peritoneal cavity. Another case of suture-line recurrence was in a patient who had incomplete removal of the primary tumour. Moreover, the clamp on the rectal stump slipped at operation, and spillage of malignant cells seems to be a contributory cause for the widespread pelvic recurrence that followed. The suture-line recurrence in this and a third patient seems to have been due to surgical implantation of cells outside (extramural recurrence) or within the wall of the anastomosis (intramural recurrence) rather than on to the suture-line from the lumen of the gut. The three (7.5%) suture-line recurrences after palliative anterior resection all developed despite irrigation of the bowel lumen with 1 in 500 perchloride of mercury.

The three pelvic recurrences after palliative anterior resections which did not also appear to have "suture-line recurrence" seem to have been due to incomplete removal of the primary growth; indeed, this was the reason why the operation was originally regarded as palliative.

#### Prevention of Pelvic Recurrence

It would appear that pelvic recurrence after radical operations for rectal cancer occurs despite the most careful attention to surgical technique. It is hard to see what more can be done at the present time by conventional surgical methods alone. However, there are adjuvant methods of treatment which might reduce the incidence

of pelvic recurrence. These are chemotherapy and radiotherapy.

In this hospital 1 in 500 perchloride of mercury has been used during the past 16 years—since 1946—for the irrigation of the bowel lumen during restorative operations to reduce the risk of intraluminal implantation of malignant cells on the suture line (Lloyd-Davies, 1948; Morgan and Lloyd-Davies, 1950; Goligher *et al.*, 1951; Keynes, 1961). This procedure does not prevent “suture-line recurrence” due to extramural or intramural implantation of malignant cells. However, the “suture-line recurrence” rate after radical anterior resection at this hospital is extremely low (2.2%), and it has been claimed that this low incidence is due to the practice of irrigation with perchloride of mercury (Keynes, 1961).

One in 500 perchloride of mercury has also been used in recent years to irrigate the pelvic cavity after excision operations. We have no evidence that this has yet made any difference to the pelvic recurrence rate. Such a procedure might prevent recurrence due to implantation of free malignant cells, but, as Keynes (1961) has pointed out, few of these pelvic recurrences after excision operations are likely to be due to implantation. On the contrary, our studies suggest that most pelvic recurrences are due to inadequate local excision of the primary tumour or metastases in its immediate neighbourhood. To destroy such residual tumour would require irrigation with a much more potent anti-cancer agent than perchloride of mercury. When a safe and effective chemotherapeutic agent is available its administration systemically or by local irrigation might be valuable in the prevention of pelvic recurrence.

In recent years there has been increasing interest in the value of radiotherapy in the treatment of rectal cancer. Williams and Horwitz (1956) reported the results of treatment of advanced cancer of the rectum with high-voltage x-ray therapy as a primary method of treatment. Most of these cases were, for one reason or another, unsuitable for surgery. Despite the advanced stage of the disease reached in these patients, radiotherapy gave a good palliative result in terms of relief of symptoms as well as a small but definite chance of cure. Moreover, Williams and Horwitz concluded that the results might be bettered by supervoltage radiotherapy.

Leaming, Stearns, and Deddish (1961) have reported the results of pre-operative radiotherapy for rectal cancer at the Memorial Hospital, New York. Using the relatively small dose of about 1,500 r, they failed to show that radiotherapy significantly improved the overall five-year survival rate of patients with rectal cancer. However, they claim a significant increase in the five-year survival rate of Dukes C cases from 23 to 37%. The survival rate of Dukes A and B cases was not affected, nor was any improved survival shown when the cases were grouped according to age, sex, or grade of malignancy. It is curious that the improvement should be apparent solely in Dukes C cases and not in any other clinical or pathological groups. Moreover, Leaming and his colleagues make no observations on the relation between extent of local spread in operation specimens and the results of treatment, for it would appear from our study that radiotherapy is most likely to improve the survival rate of those patients who are at greatest risk from incomplete local removal, and these are not necessarily Dukes C cases. A further criticism is that no indication is given of how their patients were selected for radiotherapy.

Post-operative radiotherapy as an alternative to pre-operative treatment might have certain advantages. For

example, it should be possible to select those patients who are most likely to benefit from the treatment. One of the objects of this study was to find out which patients with rectal cancer carried the greatest risk of pelvic recurrence. If these can be identified by pathological examination of operation specimens, then they should be the ones treated by radiotherapy.

It would appear from this investigation that pelvic recurrence is commonest in tumours of the lower rectum. Table VIII shows that if all tumours of the middle and lower thirds of the rectum, other than Dukes A cases, were sent for post-operative radiotherapy, this would include 57.8% of all patients undergoing radical excision. The irradiation of these patients would cover over 85% of expected pelvic recurrences.

TABLE VIII.—*Pelvic Recurrence Cases (1937-52)*

	No. of Cases	No. with Pelvic Recurrence
Total radical cases .. .. .	1,189	101
Lower- and middle-third cases ..	821	87
“ “ “ “ “ A cases ..	134	1
No. of cases considered suitable for post-operative radiotherapy treatment (criteria: lower- and middle-third growths minus A cases) ..	687	86
Percentage of total .. .. .	57.8	85.1

Post-operative treatment has recently become a more practicable proposition. The introduction of supervoltage radiotherapy has made it possible for a much larger dose of x rays to be given to a specified and deep-seated volume with a decreased risk of damage to intervening or adjacent tissues. For this reason it is now possible to give a dose of about 6,000 r post-operatively with a reduced chance of ill-effects. Such a dose, given from the perineum to the aortic bifurcation and laterally to include the glands on the pelvic wall and in the obturator fossae, should destroy a large number of residual tumour deposits. On the other hand, post-operative radiotherapy has the disadvantage of acting on a tissue with a damaged or impaired blood supply, which reduces radio-sensitivity.

The disadvantages of radiotherapy, either pre-operative or post-operative, are the risk of radiation damage and the prolongation of treatment. It is now known that about 50% of all patients having surgical treatment for rectal cancer at St. Mark's Hospital are cured of their disease (Bussey, Dukes, and Lockhart-Mummery, 1960; Bussey and Morson, 1963). Of the other 50% most die with blood-borne metastases, but about 20% of these surgical failures die with pelvic recurrence. This is a not inconsiderable figure, and merits further efforts to improve the survival rate of rectal cancer by methods adjuvant to surgical treatment.

**Summary**

The clinical features and pathology of pelvic recurrence after removal of the rectum for carcinoma at St. Mark's Hospital are described.

The term “pelvic recurrence” is defined as the presence of clinical manifestations, the most likely explanation of which was the growth of residual carcinoma in the pelvic region.

About 10% of 1,596 patients who had a radical excision (non-restorative) operation for rectal cancer subsequently developed a recurrence in the pelvis. About 80% of these recurrences occurred within two years of surgical treatment and a further 17% between two and five years after opera-

tion. The incidence of pelvic recurrence after palliative excision operations was 25%.

After radical anterior resection about 7% of patients developed pelvic recurrence and 10% after similar operations of a palliative nature.

The incidence of pelvic recurrence after radical excision operations for tumours of the lower third of the rectum is 14.5%, for middle-third tumours 8.3%, and for upper-third tumours 5.2%.

The particular liability of low rectal cancers to pelvic recurrence is explained by anatomical considerations which make adequate local excision difficult once growth has spread into the perirectal tissues.

Among other factors specially influencing the development of pelvic recurrence after restorative or non-restorative operations, whether radical or palliative, are tumours with lymphatic metastases, extensive local spread, and carcinomas of high-grade malignancy.

It would appear from this study that little more can be done to prevent pelvic recurrence by conventional surgical methods alone. It is suggested that radiotherapy be given a trial as an adjuvant method of treatment.

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This investigation was prompted by a report which suggested that women who develop cancer are characterized by certain personality traits (Hagnell, 1961). The report was based on the results of an epidemiological survey of the 2,550 inhabitants of two adjacent rural parishes in the south of Sweden: this survey, which was started in 1947, included an interview during which a personality assessment was made on each subject. Ten years later the procedure was repeated and the subjects' subsequent medical history was examined. During the follow-up it was found that a significantly high proportion of women who had developed cancer had been originally rated as *substable*. The rating was based on the Swedish system of personality assessment described by Sjöbring which has been used extensively in Sweden but is not well known in this country (for an account in English see Nyman, 1956). Sjöbring described four personality factors which he called *capacity*, *validity*, *stability*, and *solidity*: these are held to vary continuously and independently of each other in the general population. Deviation above and below the mean for each factor is referred to as either the "super" or the "sub" form. As we are concerned solely with the sub form of *stability* in this investigation, no further mention is made of these other factors. The *substable* personality is described as warm, concrete, naive, industrious, sociable, and tending towards personal relationships (Nyman, 1956). *Substability* in Sjöbring's system has traits in common with Cattell's (1950) "factor A" and Eysenck's (1959) "extraversion." With regard to the present investigation, it is of importance to note that Swedish investigators have found that *substability* is correlated with factors in body build and also with urinary excretion rates of certain steroids (Lindgård and Nyman, 1956).

We proposed, in the present investigation, to test the hypothesis that a group of women who developed cancer would obtain higher extraversion scores on a personality

questionary than would control groups of women without cancer.

## Method

The questionnaire used in the investigation was the Maudsley personality inventory (M.P.I.). This questionnaire yields two scores: one for neuroticism and one for extraversion. Extraversion, according to Eysenck (1959), refers to the outgoing, uninhibited social proclivities of a person. The M.P.I. has been used in many investigations in this country, and it has been shown to have a satisfactory reliability and validity (Eysenck, 1959, 1962). The questionnaire consists of a printed form of 48 questions—24 to measure neuroticism and 24 for extraversion. The patient responds by circling a "Yes," "No," or "?"

The investigation was carried out in a general hospital. The subjects were patients in two gynaecological and two surgical wards or were out-patients attending the surgical clinic. The sister or medical secretary handed patients the questionnaire and asked them if they would co-operate in a clinical investigation. No patient refused to co-operate. At the end of the investigation the questionnaires were collected and scored and the diagnosis of each patient was obtained. Of the 47 patients with a malignant tumour, 32 had cancer of the breast, 4 had cancer of the uterus, and 11 had cancer in other parts of the body.

Two control groups were used. A hospital control group consisted of 129 patients with various gynaecological and surgical conditions in whom there was definitely no evidence of tumour and who fell in the same age-group as the patients with cancer. Matching for age is important, since it has been found that extraversion scores decline significantly with age (Eysenck, 1959; Coppen and Kessel, 1963). A second control group of 31 subjects was obtained from a representative sample of the general population of the London area (Coppen and Kessel, 1963). This control