

**Organization:** Any general X-ray department should be capable of carrying out the screening examinations of the chest or œsophagus during out-patient clinics. The instant enema requires simple apparatus and takes about ten minutes. By dealing with ulcerative colitis in this way the number of formal enema examinations is reduced.

**Acknowledgments:** I would like to thank my colleagues for their help and interest, especially Dr F Avery Jones and his team in Medical Out-patients at St Mark's Hospital.

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## The Long-term Results of Surgical Treatment of Cancer of the Rectum

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For many years the standard method of expressing the effectiveness of surgical treatment of cancer of the rectum has been the crude five-year survival rate. Little, however, is known about the effects of treatment over longer periods of time. The five-year survival rates of the St Mark's Hospital series of cases of rectal cancer have already been published (Dukes 1957, Dukes & Bussey 1958, Bussey *et al.* 1960). The series is now sufficiently large, and has been studied for long enough for more extended survival rates to be prepared.

During the twenty-five year period from 1928 to 1952, 2,083 patients survived operations for the removal of a malignant tumour of the rectum. For simplification, cases with multiple cancers of the large bowel, whether synchronous or metachronous in nature, have been excluded. The operations included a few local excisions but the great majority were excisions of the rectum by the perineal, perineo-abdominal or synchronous-combined methods. Although the operability rate was less than 50% at the beginning of the period, it had risen by 1952 to over 90%, the overall figure being 72.5%. Thus this group of patients represents about three-quarters of the total cases seen during a twenty-five year period. Not all the operations could be considered to be curative for in 11.5%, or about one in nine, it was thought that there was incomplete removal of either the primary growth or its metastases. These operations were considered to be palliative only.

All the 2,083 patients had their operations at least ten years ago and half of them twenty years

ago. Only about 1% of the group was lost to follow-up and these patients were considered to have died in the year during which the last news of them was obtained.

The crude survival rate of the 2,083 patients has been calculated for periods of five, ten, fifteen and twenty years, the results being shown in Fig 1. Of each thousand, 483 were alive at the end of five years. The figures for ten years and fifteen years are 344 and 247 respectively, finally falling to 178 after twenty years. That is, nearly half survived five years and almost one-fifth twenty years out of a group whose average age at the time of operation was about 60 years. These results are impressive but they give no direct information about recurrence or its effect on survival. Nor do they tell the surgeon in what proportion of patients his efforts were successful in curing the patient of the disease. The reason for this is that the crude five-year survival rate is obtained after deduction of all deaths within the period, whether these were due to cancer or to other causes. Until these two factors are separated little more can be learned about the incidence of recurrence. This problem was recognized thirty years ago by some surgeons who tabulated their results under such headings as 'dead from cancer', 'dead from other causes', 'alive free from cancer' and 'alive with recurrence'. The results were

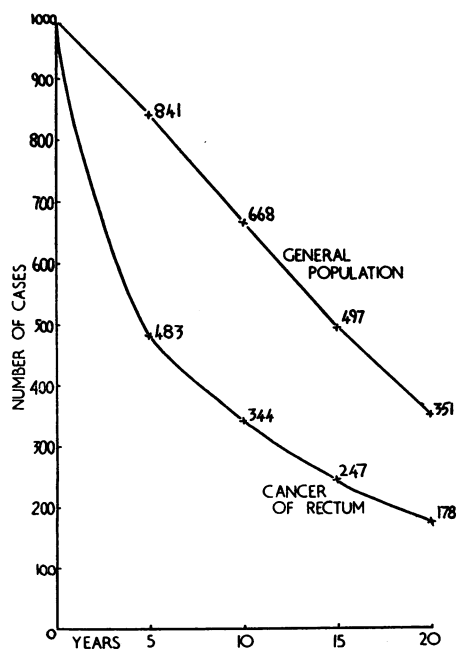


Fig 1 Comparison of the survival rate of patients treated surgically for cancer of the rectum at St Mark's Hospital with that of a group of the general population of similar age and sex distribution

called 'cure rates' rather than survival rates. These early attempts to separate cancer and non-cancer deaths failed then, as they would now, owing to the lack, in most cases, of accurate information about the cause of death.

However, another method is now available which is applicable to large groups of cases such as the St Mark's Hospital series. This consists of assembling from the general population a group of individuals which is precisely similar to the rectal cancer group in respect of number as well as age and sex distribution. The survival rates at various periods of such a control group can be estimated from the Registrar General's Life Tables. The survival curve thus obtained for the control group corresponding to the St Mark's series is also shown in Fig 1. The number of survivors per thousand at five, ten, fifteen and twenty years is 841, 668, 497 and 351 respectively. Thus, even if a surgeon cures every case of rectal cancer he operates on, he cannot expect to have more than about 85% alive at the end of five years. The actual number has already been shown to be 48.3%, which is 57.5% of the maximum expected figure of 84.1%. The figure of 57.5% is known as the corrected survival rate and is perhaps better understood as the 'cure' rate. This concept, which sometimes causes confusion, may be clarified by reference to Fig 2. The left hand column shows 517 deaths and 483 living patients, a crude

survival rate of 48.3%. The method for obtaining the corrected survival rate is seen on the right. An estimated total of 159 deaths from other causes before the end of five years is first removed. Of the remaining 841 patients, a further 358 (42.5%) also died before the end of five years and since other causes have already been accounted for, it is probable that these deaths are due to recurrent cancer. The 483 survivors (57.5%) are 'cured' if the ability to survive five years is the only criterion.

Recurrences, however, are known to occur after five years and it is to be expected that the apparent cure-rate of 57.5% at that time will not be maintained over longer periods. This is confirmed when the corrected survival rate is calculated at five-year intervals up to twenty years. At the end of ten, fifteen and twenty years the corresponding survival rates are 51.4%, 50.4% and 49.8% (Fig 3). The differences between these three figures are not statistically significant and for practical purposes it can be said that little, if any, further fall in the cure rate occurs after ten years. The general position in regard to recurrence may be stated thus: the great majority of patients who are going to die from recurrence do so before five years and only relatively few between five and ten years. After ten years, recurrence has a negligible effect on the cure rate, which by then is stabilized at approximately 50%. By coincidence this figure is close to the crude five-year survival rate.

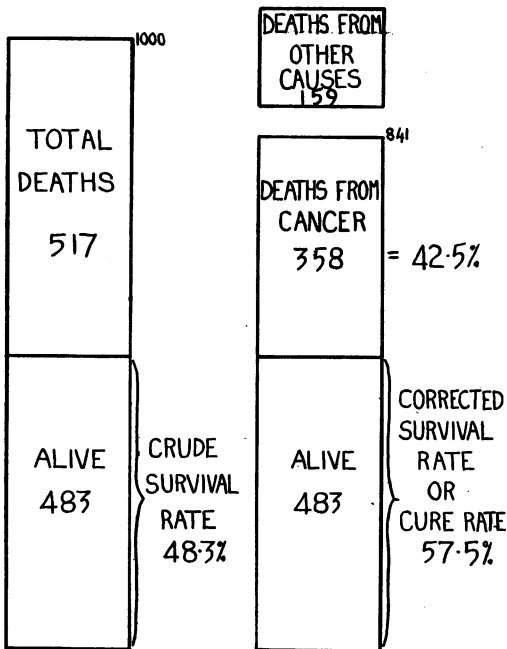


Fig 2 Comparison of the crude and corrected five-year survival rates of patients treated surgically for cancer of the rectum

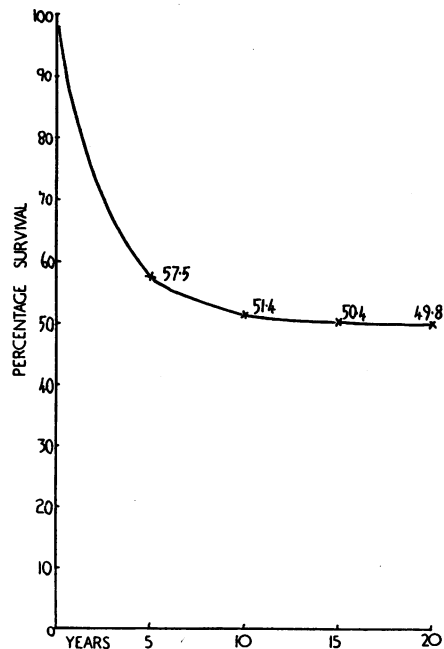


Fig 3 Corrected survival rate or 'cure' rate of patients treated surgically for cancer of the rectum. St Mark's Hospital series 1928-52 (2,083 operation survivors)

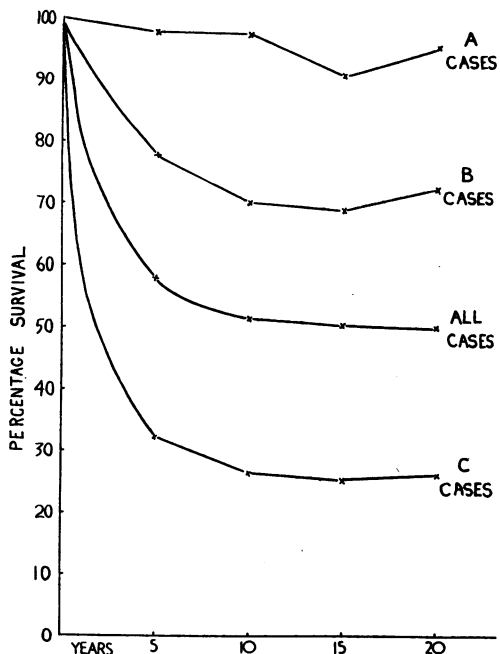


Fig 4 Comparison of corrected survival rates of Dukes' A, B and C groups of rectal cancer

The effect of subdivision of the cases into Dukes' A, B, C classification is seen in Fig 4. Those cases limited to the bowel wall (A cases) maintain over the twenty-year period a high level of survival in the region of 95%. The cure-rate of B cases (those with spread to the perirectal tissues but no lymph metastases) falls to 77% at the end of five years and then flattens out to a final figure of about 70%, while the C cases (with lymphatic metastases) decline steeply at first and achieve only a 25% survival after ten years.

Survival curves for patients whose rectal cancers were classified histologically into low, average and high grades of malignancy are presented in Fig 5. Certain irregularities will be seen after the fifteen-year period is reached. The calculation of the corrected survival curve demands the use of relatively large numbers of cases. Subdivision of the series and losses by death have reduced the numbers in some instances below those required for calculation of the correction factor. The general trends are, however, apparent up to fifteen years and these may be continued up to twenty years without risk of serious error. The final cure rates for the low, average and high grades of malignancy may reasonably be expected to be in the region of 70%, 44% and 24% respectively. These results may be summarized by saying that about three-quarters of the low grade cancers of the rectum are cured, half the average grade, and that only one-quarter of the high grade tumours are likely to be cured.

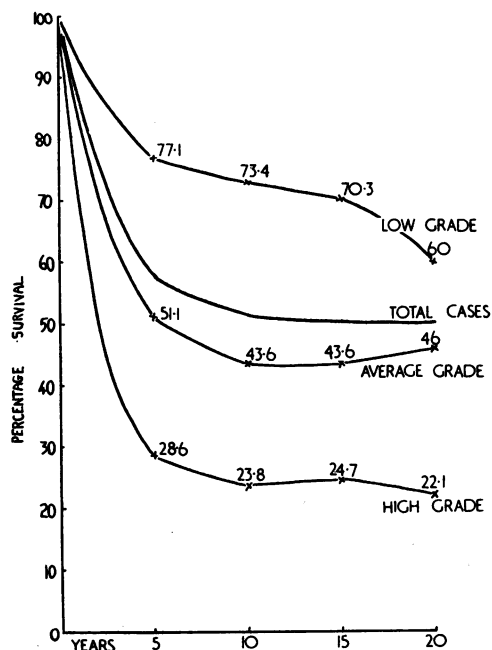


Fig 5 Relationship between histological grading and corrected survival rates of patients treated surgically for cancer of the rectum. St Mark's Hospital series 1928-52 (2,083 operation survivors)

**Conclusions**

Studies of the crude and corrected survival rates for periods of five, ten, fifteen and twenty years after surgical treatment of cancer of the rectum at St Mark's Hospital show: (1) That about half of all patients are cured of their disease. (2) That the incidence of recurrence is highest in the first five years after operation, falls steeply during the second five years, and is negligible after ten years. (3) That both the Dukes' classification and the grade of malignancy are confirmed as useful guides to prognosis.

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