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Long-term Prognosis of Ulcerative Colitis*

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In attempting to define the natural history of any chronic disease considerable difficulties are encountered in the evaluation of follow-up data collected from patients at varying stages in their illness. In idiopathic ulcerative colitis the difficulties are magnified by the irregularly relapsing course usually pursued by this condition.

We have previously described the factors influencing the early course of colitis in 204 "first-attack" patients; that is to say, patients who present to us in their initial attack of colitis during 1952–63 (Watts, de Dombal, Watkinson, and Goligher, 1966). During this same period another 261 "relapse" patients came under our care. These patients were not seen in their initial attack, but presented to us during relapses of a pre-existing colitis.

In the present paper we analyse the course and outcome of all patients in both groups who have survived, without resort to surgical treatment, their first referred attack (either the initial attack of colitis or a relapse of long-standing disease). Such a method of analysis automatically excludes from this study all patients referred to this clinic specifically for surgical treatment after medical treatment had failed elsewhere.

Clinical Material and Methods

This paper is based on a survey of 465 patients with idiopathic ulcerative colitis admitted to hospital or referred to a combined medical and surgical colitis clinic under our personal care during 1952–63.

There were 275 females and 190 males, the female: male sex ratio being 1.45. The composition of the series according to sex and age at the onset of symptoms is illustrated in Table I.

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The age of distribution is remarkably similar between the sexes, 50% of the cases beginning at 20 to 39 years, 26% at 40 to 59, 15% before 20, and only 9% from 60 years onwards.

Of the 204 first-attack patients 20% presented within two months of the onset of symptoms, 60% within three months, and 90% within six months. Of the 261 relapse patients almost two-thirds presented within 10 years of the onset of symptoms.

The diagnosis in each patient was made during life on the basis of characteristic symptoms, in association with typical changes either on sigmoidoscopic or on radiological examination. Microscopical examination and culture of the stools were performed in the majority of patients, and revealed no specific infective cause for the symptoms. Several patients diagnosed at first as suffering from colitis and subsequently found to be suffering from Crohn's disease of the colon or ileum were excluded from this survey.

In the conduct of this survey all 465 personally compiled case histories were analysed, the great majority of patients having been seen and examined by sigmoidoscopy in the clinic at six- or twelve-monthly intervals since their original presentation. A barium enema examination was performed in most patients at two-yearly intervals. Further information was obtained in many cases from private medical practitioners, and from the case histories of other hospitals to which the patient had been admitted for the treatment of colitis.

All the surviving patients were traced, and all but eight were personally interviewed by one of us during the latter part of 1963; each of the remaining eight patients answered a detailed postal questionnaire.

TABLE I.—Composition of Series by Sex and Age at Onset of Symptoms

Age at Onset (Years):	Male	Female	Total
0–9	3	4	7
10–19	27	36	63
20–29	42	71	113
30–39	51	67	118
40–49	27	48	75
50–59	23	24	47
60–69	10	22	32
70–79	7	2	9
Unknown		1	1
Total patients	190	275	465

The detailed cause of death has been ascertained in each of the 41 patients dying during the period studied, 20 of them having died during the period of follow-up subsequent to the first referred attack. A detailed necropsy report was obtained in 32 of the 41 deaths.

Analysis According to Patient-years Under Observation

The study of detailed progress reports kept in this clinic has enabled us to use the concept of a "patient-year" of observed follow-up. For the purposes of this analysis a patient-year is defined as *one complete year of observed follow-up of an individual patient*. Patients began their contribution to the total of patient-years under observation at the end of their first referred attack, and ceased to contribute at the time of review or death.

The concept of a patient-year has been used previously in colitis (Flood, Lepore, Hiatt, and Karush, 1956), and more recently in the analysis of the prognosis of patients after operation for peptic ulcer (Pulvertaft, 1964). Such a concept offers two advantages. Not only does it increase the material available for analysis—in that one patient followed up for 10 years will contribute 10 patient-years—but this concept also permits allowance to be made for changes in the extent and severity of ulcerative colitis.

It is surely illogical to regard a colitic patient as a unit in terms of prognosis, for his prognosis is constantly changing as the clinical course of his colitis changes. Accordingly, the severity and the extent of colitis have been reclassified in our patients during *each* year of follow-up on the basis of information gathered during that year.

Each patient-year has been classified according to the following criteria.

1. Maximum Severity of Disease

The course of the disease was defined thus: (a) *Remission-year*: symptoms of colitis minimal or absent. (b) *Attack-year*: one or more attacks of colitis in that year. The maximum severity of disease at any stage during the year was defined as mild, moderate, or severe, according to the previously defined criteria of Truelove and Witts (1955). This method of assessment is therefore a most critical one in that exacerbations of colitis symptoms lasting only a few weeks still require classification of the year in which they occur as an attack-year.

2. Extent of Disease

The extent of rectal and colonic involvement in each year was classified into one of the following categories:

Rectum.—Mucosal disease in whole or part of the rectum on sigmoidoscopy. No radiological evidence of disease in the colon.

Substantial Involvement.—Mucosal disease in the rectum on sigmoidoscopy. Radiological evidence of disease in part of the colon, but not extending proximal to the hepatic flexure.

Total Involvement.—Mucosal disease in the rectum on sigmoidoscopy. Radiological evidence of disease throughout the colon.

3. Age

The patient's age was adjusted separately for each year of follow-up.

4. Outcome of Each Patient-year

The outcome of each patient-year after the first attack was defined according to the following categories:

Remission.—Normal health was regained, with either absent or infrequent and minimal bowel symptoms.

Improved.—Normal health was usually regained, but bowel symptoms persisted, though these were never incapacitating.

Unchanged.—The symptoms were unchanged by medical treatment.

Radical Surgery.—Total or subtotal excision of the colon and rectum was performed, usually with establishment of an ileostomy, because of the failure of medical treatment to control the disease.

Deaths.—Death during the year (a) related to colitis, while under medical treatment; (b) after radical surgery, during the early post-operative course before discharge from hospital; (c) incidental to the disease.

Unknown.—The outcome as regards general health and symptoms was unknown, but the year did not culminate in death or radical surgery, the total incidence of which is known.

The outcome is also considered separately in terms of the medical failure rate, which is the proportion of patient-years during which medical treatment failed, the patient either undergoing radical surgery or dying either of colitis or of causes related to this disease.

Course of Ulcerative Colitis

In all, 1,380 patient-years of observed follow-up were analysed in which the patient was under medical supervision at the time of observation. (There were also 497 patient-years after radical surgical treatment, but these are not analysed in this study, which attempts to define the natural history of this disease prior to any radical surgery.)

We now attempt to elucidate those factors which affect the course of the disease.

Course of Disease for Whole Series

Of 1,324 patient-years in which the course was known 737 (55.7%) were spent in remission, and in 587 (44.3%) one or more attacks of colitis occurred (Table II).

TABLE II.—Overall Course of Colitis During 1,324 Patient-years of Observed Follow-up

	No. of Patient-years*	% of Total
Remission years	737	55.7
Attack years	587	44.3
Maximum severity in each attack-year { Mild	361 (61.5%)†	
Moderate	140 (23.9%)	
Severe	86 (14.6%)	

* Excludes 56 patient-years in which the course of colitis was not known.
† Figures in parentheses indicate percentage of total attack-years.

Further analysis of the 587 attack-years shows that the colitic attack of maximum severity was mild in 61.5%, moderate in 23.9%, and severe in 14.6%

Effect of Duration of Symptoms on Course of Disease

The duration of symptoms from the onset of colitis has been estimated separately for each patient-year after the first referred attack. The course has been defined for each decade after the onset of symptoms; the results are presented in Table III. These illustrate that the course of colitis is not affected by the duration of symptoms. The proportion of attack-years in the

TABLE III.—Course of Disease According to Duration of Symptoms*

Course	Years after Onset of Symptoms			
	0-9	10-19	20-29	30-49
Attack-years	415	106	46	19
Remission-years ..	559	112	47	19
Unknown years ..	25	13	17	—
% of attack-years ..	42.6	48.6	49.5	50.0

* Excludes two patient-years where duration of colitis is unknown.

first decade (42.6%) is shown to be slightly less than that in subsequent decades (49%), but this difference is far from statistical significance ($\chi^2=2.39$; $n=3$; $P>0.5$).

Comparison of First-attack and Relapse Patients

The combined subsequent course of the group of patients who presented in the first attack of their disease was first compared with the course of patients who presented with a relapse of chronic disease (Fig. 1). There is very little difference in the proportion of attack-years in these two groups of patients, that in the first-attack patients being 40% and in the relapse patients 45%.

FIG. 1.—Comparison of the course of colitis in "first-attack" and "relapse" patients.

In presenting a comprehensive account of the course of this disease the similarity of these two groups of patients has enabled us to combine our follow-up experience of both the first-attack and relapse patients.

Course According to Extent of Colitis

When the course of colitis is analysed according to the extent of involvement at the time of the first attack illogical results are obtained (Table IV). The subsequent course is found to be

TABLE IV.—Comparison of Course in Relation to Extent of Disease in Colon and Rectum (a) at Time of First Attack, and (b) During Each Patient-year*

		Extent at First Attack			Extent in Each Patient-year		
		Rectum (234)	Subst. (263)	Total (99)	Rectum (295)	Subst. (160)	Total (280)
% in remission	..	56.4	55.5	64.6	56.9	50.8	55.7
% with attack	..	43.6	44.5	35.4	43.1	49.2	44.3

Figures in parentheses denote numbers of patient-years analysed in each category.
* Excludes all patient-years in which the course or extent of disease was unknown.

almost identical in patients with rectal and substantial involvement; and, indeed, patients with total involvement at the time of the first attack appear to fare better in terms of remission-years than the patients with lesser degrees of involvement, though this difference is not statistically significant ($\chi^2=2.56$; $n=1$; $P>0.1$).

The futility of basing any assessment of the subsequent course of the disease on the extent of involvement in the first attack is further emphasized by an analysis of the maximum severity of attack during the subsequent attack-years (Table V). It can be seen that the proportion of severe attack-years is greater in patients with rectal involvement at the onset (23.5%) than in those with substantial (12.8%) or total (22.9%) involvement of the colon and rectum at this stage.

A likely explanation for these results is found when the extent of involvement at the time of the first attack is compared

with the extent at the time of review, death, or radical surgery in patients having at least one year of follow-up. We have already shown that the extent of involvement progressed in 23 (21.1%) of the 109 patients with rectal or substantial involvement at the time of the first attack, whereas the extent of involvement diminished in only 3 (3.4%) of 88 patients with total or substantial involvement at this initial stage (Watts *et al.*, 1966). Table VI confirms these findings. Of the 297 patients who came to review, radical surgery, or died during the first decade after the onset of symptoms 71 (23.9%) had disease confined to the rectum; but after this decade in only 13 (9.9%) of 131 patients was the disease so confined. This difference is statistically significant ($\chi^2=11.27$; $n=1$; $P>0.001$).

TABLE V.—Comparison of Maximum Severity of Attack in Each Attack-year in Relation to Extent of Colitis (a) at Time of First Attack, and (b) During each Attack-year

Maximum Severity of Attack	Extent at First Attack			Extent in Each Patient-year		
	Rectum (102)	Subst. (117)	Total (35)	Rectum (127)	Subst. (295)	Total (125)
Mild	61.8	66.7	62.9	80.3	58.7	50.0
Moderate	14.7	20.5	14.3	14.2	27.1	25.0
Severe	23.5	12.8	22.9	5.5	14.2	25.0

Figures are percentages of total attack-years analysed for each category (totals are given in parentheses at the head of each column).

Excludes patient-years in which the extent or course of colitis was unknown.

TABLE VI.—Extent of Disease in Each Patient at Review, Death, or Surgery, According to Duration of Colitic Symptoms at the Time

Extent of Disease	Duration of Colitic Symptoms	
	0-9 Years (297 Patients)	10 Years and Over (131 Patients)
Rectum	23.9%	9.9%
Substantial involvement	45.8%	51.9%
Total	30.3%	38.2%

Excludes 37 patients with other or unknown extent of disease.

We have therefore preferred to define the course of the disease according to the extent of involvement during each observed patient-year of disease. It will be seen (Table IV) that there is no significant difference between the course—that is, the proportion of remission-years and attack-years—in patient-years with either rectal, substantial, or total involvement ($\chi^2=2.96$; $n=2$; $P>0.1$), there being about an even chance of an attack each year, whatever the extent of the disease.

However, further analysis of the attack-years (Table V and Fig. 2) illustrates that the maximum severity of disease in attack-years is closely related to the extent of involvement during each patient-year, the proportion of severe attack-years in patient-years with total involvement (25%) being significantly greater than in those with substantial involvement (14.2%) and with rectal involvement (5.5%) ($\chi^2=16.33$; $n=2$; $P<0.001$).

FIG. 2.—Factors which determine the frequency and severity of attacks of ulcerative colitis: the extent of colitis and the age of the patient at the time.

Course of the Disease in Relation to Age in each Patient-year

The results are shown in Table VII and Fig. 2; from these data it can be seen that the frequency of attack-years steadily

declines with advancing age, though the difference between the course in the various age groups just fails to reach statistical significance ($\chi^2=6.63$; $n=3$; $0.1>P>0.05$).

TABLE VII.—*Course of Disease in 1,324 Patient-years in Relation to Age of Patient in Each Patient-year*

	Age at Time of Each Patient-year			
	< 20	20-39	40-59	60+
Remission years	52	327	261	101
Attack „	51	275	206	51
Maximum severity in each attack-year {				
Mild (%)	29.4	61.1	68.0	47.0
Moderate (%) .. .	49.0	26.5	19.9	31.4
Severe (%) .. .	21.6	12.4	12.1	21.6

A further detailed analysis of the attack-years in these age groups is shown in Table VII and Fig. 2. It is shown that the proportion of severe attack-years is greater before the age of 20 and over the age of 60 than in the intervening age groups, though the differences are not statistically significant.

Outcome of Ulcerative Colitis

The subsequent outcome of all first-attack patients is compared with the outcome of all relapse patients in Table VIII.

TABLE VIII.—*Outcome in Patient-years After First Referred Attack (Shown Separately for Patients Presenting in Their First Attack, and for Those Presenting in a Relapse of Chronic Disease)*

Outcome	First-attack Patients	Relapse Patients
	% of 658 Patient-years	% of 714 Patient-years
Remission	83.8	79.7
Improved	6.9	8.9
Unchanged	1.1	1.9
Radical surgery .. .	5.0	5.4
Colitic deaths .. .	1.2	1.0
Incidental deaths ..	0.5	0.3
Course unknown .. .	1.5	2.9

As with the clinical course of the disease, so the outcome in these two groups of patients is almost identical, and the two groups of patient-years have therefore been combined for evaluation of the factors affecting the outcome.

Outcome According to Severity of Attacks of Colitis

The subsequent outcome was again analysed initially *according to the severity of the first attack of colitis* (Table IX). Per-

TABLE IX.—*Outcome During Course of Disease After First Attack According to Severity of Colitis (a) at Time of First Attack and (b) During Each Patient-year*

Outcome in Each Patient-year	Severity of Colitis in First Attack			Maximum Severity in Each Patient-year		
	Mild (276)	Mod. (197)	Severe (185)	Mild (358)	Mod. (140)	Severe (86)
% remission	88.0	73.6	89.7	79.1	51.4	38.4
% medical failure ..	4.7	5.6	7.6	3.1	11.4	51.2
% radical surgery ..	4.0	5.6	6.5	3.1	11.4	45.4
% colitic deaths .. .	1.1	1.0	1.6	0.0	0.7	14.4

Figures in parentheses denote numbers of patient-years analysed in each category.

haps not surprisingly, the severity of the first attack had little influence on the outcome during subsequent years, whether in terms of remission, medical failure rate, or mortality due to colitis.

It proved more fruitful, however, to analyse the outcome in each subsequent attack-year in terms of the maximum severity of attack in that year (Table IX, Fig. 3). The maximum severity of attack in each year is shown to have a profound effect on the remission rate, medical failure rate, rate of radical surgery, and mortality due to colitis. In severe attack-years the ultimate remission rate was only 38.4%, the rate of radical

surgery 45.4%, the medical failure rate 51.2%, and the mortality due to colitis 14.4%. On the other hand, mild attack-years were associated with a remission rate of 79.1%, a radical surgery rate of 3.1%, and no mortality due to colitis. Even though the χ^2 test is unreliable with such small absolute numbers of deaths, there is obviously an enormous difference in the mortality during severe attack-years (14.4%) and mild attack-years (nil).

FIG. 3.—Factors which modify the outcome during each patient-year: the severity and extent of colitis, and the age of the patient at the time.

Outcome According to Extent of Involvement

As we have shown previously for the course of the disease, so the outcome of the disease bears little relation to the extent of involvement of the colon and rectum at the time of the first attack. We have therefore also analysed the outcome according to the extent of involvement of the colon and rectum in each patient-year (Table X and Fig. 3).

TABLE X.—*Outcome During Course of Disease After First Referred Attack According to Extent of Involvement (a) at Time of First Attack, and (b) During Each Patient Year*

Outcome in Each Patient-year	Extent in First Attack			Extent in Each Attack-year		
	Rectum (236)	Subst. (263)	Total (104)	Rectum (307)	Subst. (610)	Total (198)
% Remission	88.1	85.6	76.9	91.9	81.3	69.5
% Medical failure ..	6.8	3.4	8.3	1.0	5.7	10.7
% Radical surgery ..	5.5	3.4	7.4	1.0	5.2	9.7
% Colitic deaths .. .	2.1	0.0	2.8	0.0	0.8	2.7

Numbers in parentheses denote total numbers of patient-years analysed in each category.

The extent of involvement during each patient-year is shown to exert a profound influence on the outcome of that year. In patient-years with total involvement of the rectum and colon the remission rate was only 69.5%, the medical failure rate 10.7%, and the mortality due to colitis 2.7%. On the other hand, in patient-years with involvement of the rectum alone the remission rate was 91.9%, the medical failure rate only 1%, and there was no mortality attributable to disease of this extent. Once again the χ^2 method of assessment is rendered unreliable by the small numbers of deaths where disease was confined to the rectum; yet there is clearly a considerable difference in mortality when the groups with rectal and total involvement are compared.

Outcome According to Age at Time of Each Patient-year

The remission rate is shown to be unaffected by age (Table XI, Fig. 3), but the medical failure rate in the age group 0 to

19 years is greater than in all older age groups. This difference in medical failure rate is statistically significant ($\chi^2=5.06$; $n=1$; $P<0.05$).

TABLE XI.—*Outcome During Course of Disease After First Referred Attack According to Age at Time of Each Patient-year*

Outcome	Age at Time of Each Patient-year			
	0-19 (103)	20-39 (634)	40-59 (479)	60-79 (164)
% Remission ..	77.7	80.5	84.6	79.8
% Medical failure ..	10.7	4.4	6.1	6.7
% Radical surgery ..	10.7	4.4	5.6	3.7
% Colitic deaths ..	1.0	0.3	0.8	4.9

Figures in parentheses denote total numbers of patient-years analysed in each group.

The most profound effect of age in this disease is on the mortality due to colitis in the patient-years of patients over 60. Thus the mortality due to colitis of all patient-years *under* this age does not exceed 1%, but in the group of patient-years *over* 60 years it is 4.9%.

It might be expected that such a high mortality in this age group would be associated with a greater extent of rectal and colonic involvement, but the incidence of patient-years with rectal involvement is in fact higher in elderly patients (Table XII). Conversely, the incidence of patient-years with total rectal and colonic involvement is diminished in the upper age groups, the differences being highly significant ($\chi^2=42.84$; $n=2$; $P<0.001$).

TABLE XII.—*Extent of Involvement of Colon and Rectum in Each Patient-year According to Age at the Time*

Extent of Involvement at the Time	Age at Time of Each Patient-year		
	0-19 (% of 103 Patient-years)	20-59 (% of 1,113 Patient-years)	60-79 (% of 164 Patient-years)
Rectum	15.5	22.0	28.2
Substantial	36.9	58.0	60.8
Total	47.6	20.0	11.0

Discussion

Much of the difficulty in defining the prognosis of patients suffering from colitis has stemmed from inadequacy of follow-up and from lack of precision in defining the severity of attacks. In addition, it has been the usual practice in long-term studies to evaluate the result in terms of the total fatality rate and the numbers of patients coming to radical surgery, scant attention being given to the course of the disease between the time of the attack treated on referral and the condition of the patient at the time of review, even though many years may have elapsed in the interval.

In studying the prognosis of any group of colitic patients, obviously the time at which they first present is unrepresentative, because the disease at that time is unlikely to be in remission. It can therefore be expected that the outcome for the group during the period immediately after referral is much worse than in subsequent years, when many patients would be in remission at any one point in time.

Any patient who had survived the period of the first *referred* attack on medical treatment alone—whether this was the first attack in the illness or one of the subsequent relapses—then entered the phase of follow-up which we have analysed in terms of patient-years under observation. In this way we have obtained a total of 1,380 patient-years under medical observation and supervision during the years 1952 to 1963.

A separate analysis of the overall course and outcome of the two groups of first-attack and relapse patients has shown that there is little material difference, a view in agreement with that of Kellock and White (1957). We have therefore combined these two groups of patient-years in the total analysis, and are able to present a comprehensive picture of this disease, which

applies to any patient who has survived the first *referred* attack of colitis on medical treatment.

One of the most interesting findings is that there is no evidence that patients suffering from colitis have any less tendency to develop attacks with increasing duration of symptoms. This study illustrates that the proportion of attack-years remains fairly constant in subsequent decades, and, indeed, is lowest in the first decade after the onset of symptoms. Just over half of the total patient-years have been spent in remission, and in just less than one-half at least an attack of colitis occurred.

Subsequent Course

In view of recent studies by Edwards and Truelove (1963), we initially attempted to evaluate the course of the disease according to the extent of rectal and colonic involvement at the time of the first attack. Anomalous results were obtained. It was found that the relative proportions of subsequent attack-years and remission-years were the same in patients with rectal disease alone or substantial involvement, respectively, at the time of the first attack. Indeed, the patients with total involvement at onset fared better in terms of remission than patients with lesser degrees of involvement initially. Further analysis of the attack-years in these groups illustrated that severe attack-years were seen just as frequently during the subsequent course of patients with only rectal involvement as in those with total involvement at the time of the first attack.

The most probable explanation of these anomalous findings is that the extent of involvement of the bowel in any case of colitis is not necessarily static, but may alter at different stages of the disease. It is also relevant to this point that the longer the duration of symptoms the more extensively the bowel tended to be involved.

We therefore conclude that any attempts to predict the subsequent course of colitis on the basis of the extent of bowel involvement and the severity of the disease at the time of the first attack are open to serious error, and have related our assessment of the course to the extent of involvement in each patient-year. Our data demonstrate that the extent of involvement in each attack-year does profoundly influence the maximum severity of disease in that year, the proportion of severe attack-years increasing *fivefold* with increasing amounts of colonic involvement.

Analysis of the maximum severity of disease in each attack-year according to the age at the time shows that attacks of colitis are more commonly severe in patients under 20 and over 60 years of age; and it has also been shown that the medical failure rate in these two age groups is greater than in the intervening age groups.

Eventual Outcome

Previous studies on the progress of ulcerative colitis have also attempted to relate the outcome in this disease to the severity of the first attack and the extent of disease in the bowel at that time (Bone, Ruffin, Baylin, and Cassel, 1950; Edwards and Truelove, 1963). We have confirmed that these factors certainly affect the outcome of the first attack, but we have shown that they exert little influence on the subsequent outcome, a view in agreement with Cullinan and MacDougall (1957).

The present study has demonstrated that the outcome at any particular stage in the course of a patient with colitis is dependent on the severity and the extent of the disease at that particular time. Of course these two factors are interrelated in that we have shown that the incidence of severe attack-years is much greater in patients with total rectal and colonic involvement.

We have also shown that in such patients with total involvement there is a 2.7% mortality during each year of follow-up. This fact applies not only to patients having total involvement at the time of the first attack but also to any patients who develop total involvement during the course of their disease.

It may be thought that this 2.7% annual mortality for all patients with total rectal and colonic involvement would be an unduly pessimistic figure for patients in the younger age

TABLE XIII.—*Mortality Due to Colitis in Patient-years with Total Involvement of Colon and Rectum, According to Age in Each Patient-year*

	Age in Each Patient-year		
	0-19	20-59	60+
No. of patient-years with total involvement	49	223	18
Deaths due to colitis	1	5	2
Annual mortality	2.0%	2.2%	11.1%

groups; but Table XIII shows that the risks to patients with total involvement are indeed carried in all age groups (though they do become greater with increasing age).

Question of Prophylactic Proctocolectomy

This disquieting mortality in patients with *total* involvement must raise the question of prophylactic proctocolectomy among this small group of patients. We have attempted, therefore, to make a comparison between the observed mortality with present-day methods of treatment (that is to say, medical treatment, supplemented where necessary by excisional surgery) and the subsequent mortality in a group of 60 of our patients who underwent elective proctocolectomy.

The cumulative mortality over a period of 25 years in patients with total involvement undergoing present-day forms of treatment is shown in Fig. 4. The slightly irregular shape of this curve is due to a small difference in the mortality in each decade of symptoms. However, it is noteworthy that the risk due to colitis varied little with the duration of colitic symptoms. For comparison, the cumulative mortality of the 60 patients undergoing proctocolectomy for colitis during the limited period of this review is also shown in Fig. 4, this curve being derived from the data in Table XIV. This surgical mortality includes *all* deaths after surgery, both those in the early post-operative period and those in later post-operative years, which were related in any way to the disease or the operation. It is also of interest that the unrelated mortality was almost the same in the two groups of patients (0.56% per patient-year

FIG. 4.—Comparison of the cumulative mortality in (a) patients with total involvement of present-day treatment—that is, medical treatment supplemented by excisional surgery where necessary—and (b) patients after elective proctocolectomy.

in the group with total involvement, and 0.55% in the group after proctocolectomy).

TABLE XIV.—*Post-operative Mortality Among 60 Patients Undergoing Elective Proctocolectomy*

Post-op. Year	No. Patients Alive at Start of Year	No. of Deaths		No. Alive at End of Year	No. of Patient-years at Risk	q/x Probability of Death Due to Colitis	Alive but Not followed Further
		Colitis	Other Causes				
1	60	4	0	56	58.0	0.069	13
2	43	1	0	42	42.5	0.024	4
3	38	0	0	38	38	0.000	7
4	31	0	1	30	30.5	0.000	12
5	18	0	0	18	18	0.000	7
6	11	0	0	11	11	0.000	5

Subsequent years not analysed in detail (no mortality) because numbers are too small.

The cumulative mortality of patients with total rectal and colonic involvement exceeds that of patients undergoing elective proctocolectomy for colitis after approximately three years. We fully realize that the relatively short period of follow-up means that we have little information about patients more than 10 years after operation. However, there seems no reason to expect a large increase in mortality at this stage—indeed, our experience with the few patients who fall into this category suggests that they fare very well. On the basis of these results, it would seem reasonable to recommend elective, radical surgery to all patients with total involvement of the colon at *whatever stage of the disease this development takes place*.

The Elderly Colitic Patient

The alarming mortality in the group of patients aged over 60 years (4.9% *per annum*) has occurred despite the fact that the disease tends to be less extensive in them than in younger patients. Indeed, in patients aged under 20 years the overall course is less favourable in terms of remission, there is on average a greater extent of bowel involved, and the proportion of severe attack-years is equal to that in the patients aged over 60. However, these factors have not produced an elevation of the annual mortality (1% in this young group) but a higher rate of recourse to surgery (10.7%). Ulcerative colitis appears, therefore, to be a more formidable disease, less well controlled by medical measures and more often requiring surgical intervention, in the young and in the aged—and clearly surgery is better tolerated in the young than in the elderly.

It can also be argued that patients aged 60 or more with extensive colitis should certainly undergo prophylactic excisional surgery. The operative mortality will certainly prove to be greater than the mortality in young fit patients (because of the high incidence of intercurrent disease). However, Tanner (1950) has remarked that any surgical policy must be judged by its effect upon the overall mortality, and not the surgical mortality as such, which depends upon the type of risks accepted. Despite the higher surgical mortality and the difficulties in adapting to an ileostomy life at this age, we believe that these increased risks may well be justified in an attempt to lower the present 11.1% annual mortality in this small group of elderly patients with total involvement.

Summary

This paper presents an analysis of the long-term prognosis of ulcerative colitis, based on a survey of 465 patients who presented for treatment during 1952 to 1963, and using the concept of a "patient-year." Every patient was traced during 1963, and all but 8 of the 424 survivors were personally interviewed.

Ulcerative colitis is always likely to reassert itself at any time after the first attack is over; but in any large group of colitic patients just over half will spend each year in remission.

The initial severity and extent of disease give a poor guide to the ultimate outcome of patients with ulcerative colitis, partly because the disease shows a tendency in many patients to extend proximally.

Further analysis, however, shows that the severity and extent during each year profoundly influence the course and outcome during that year. Each patient-year in which a severe attack of colitis occurs carries a risk to life of 14%. Each patient-year in which there is total involvement of the colon and rectum carries a risk to life of 2.7%, and this risk is relatively unaffected by age or duration of colitic symptoms. It is argued that patients with total involvement should therefore be recommended to undergo elective proctocolectomy; for this form of treatment in the long run carries considerably less risk to life.

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Electrocardiogram in Alcoholism and Accompanying Physical Disease

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Evans (1959) drew attention to various abnormalities in the electrocardiogram (E.C.G.) found in those alcoholics presenting primarily with physical symptoms. Stimulated by this, and the subsequent annotations in the *British Medical Journal* (1960) and the *Lancet* (1960), the present study was undertaken to determine the extent of electrocardiographic changes and concomitant physical disease in alcoholics presenting as psychiatric problems.

Method

Thirty-seven consecutive patients admitted on account of alcoholism to the amenity-bed section (Craig House) of the Royal Edinburgh Hospital were screened by routine recording of standard 12-lead E.C.G.s (the Honeywell Cardioview, a transistorized portable machine, was used) before treatment was started. Treatment was with parenteral vitamins (Parentrovite), withdrawal of alcohol, substitution in the first instance by paraldehyde, and later, in most cases, with tranquillizers. Phenothiazines were generally avoided in view of the findings of Kelley *et al.* (1963) of T-wave changes even in low dosage (200 mg. thioridazine daily). In general chlordiazepoxide (Librium) was preferred. The E.C.G. was repeated at suitable intervals during admission.

Other data recorded included duration of history and daily intake of alcohol as admitted by the patient, age, height, weight, tobacco consumption, cardiovascular symptoms and physical signs, clinical and biochemical signs of liver abnor-

mality, presence of delirium tremens, and signs of peripheral neuropathy or of organic cerebral disease (including memory disorders). It was not possible to obtain complete information on every subject owing sometimes to lack of cooperation or premature self-discharge against medical advice.

Findings in the E.C.G.

Seventeen patients had normal E.C.G.s. Twenty had some abnormality of the varieties detailed below. Of these 20 repeat E.C.G.s were obtained in 16 after an interval of two days to three months.

Abnormalities in the E.C.G. included atrial fibrillation, nodal rhythm, and right bundle-branch block. Temporary depression of the ST segment was present in three cases. In two of these cloven T waves were present. All cases reverted to isoelectric ST segments within a few days of admission. An example is shown in Fig. 1.

T-wave Changes.—Characteristic changes in the configuration of the T wave in alcoholic cardiomyopathy have been

FIG. 1.—E.C.G. of a 45-year-old man. A, on admission with acute alcoholism, and B, one week later, after treatment. Note ST-T changes reverting to normal.

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