

POSTERIOR GASTRO-ENTEROSTOMY IN THE TREATMENT
OF PEPTIC ULCERATION.

THE LONG TERM RESULTS.

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INTRODUCTION.

One of the more pressing problems of today is that of peptic ulceration. Whether measured in terms of human suffering, state economy or hospital services the problem is one of considerable magnitude. A large amount of research has been applied to the subject, widening our knowledge of the normal and abnormal stomach and duodenum and of the "ulcer" patient. Despite fifty years of research the problem still exists.

Of the many lines of investigation which have been followed, one of the more tedious and, at the same time, more valuable, has been the assessment of the effect of various forms of treatment. A large number of reviews of different types of treatment, both surgical and medical, have been reported resulting in the abandoning of the unsuccessful and perseverance in the more-or-less successful.

The vogue for some types of treatment was short-lived; in others disaffection of the advocates has been a more gradual process and often with considerable bigotry on the part of the antagonists and protagonists. The operation of gastro-enterostomy has been a striking example of this process. It is noteworthy that in 1926, the operation, after twenty years application, was hailed by eminent authorities in such glowing terms as - "There is probably no operation in surgery which/

which has added more to the sum of human happiness than gastro-jejunosotomy" (Sir D'Arcy Power) and "I am an ardent and a sanguine advocate of this operation than which I think there is none in all surgery more completely satisfactory" (Lord Moynihan). It is indeed remarkable to find, after a further period of twenty years, the same operation subjected to almost general criticism amounting in some instances to vituperation. There may be many reasons for this change. The type of ulcer being dealt with may have become more severe or the ulcer bearing patients may have become less resistant. The incidence of the disease has increased. It is also possible that the results following gastro-enterostomy were never so good as reported and were never sufficiently bad to earn the operation its present reputation. At least the vicissitudes of gastro-enterostomy should be remembered as a corrective in the light of the almost equally glowing reports which attend those operative procedures which are now replacing it.

Gastro-enterostomy still has its advocates. Indeed, within the past five years, as a result of some disillusionment in other forms of treatment, there has been renewed interest in the operation. It was felt, therefore, that a review of the long-term results was necessary to ascertain especially what place this procedure has in the treatment of peptic ulceration and/

and to find what effect such factors as age, sex, chronicity of ulcer, etc. have on the results. There was also the possibility that the extensive application of the operation, viewed as an experiment on the human subject, might throw even a flicker of light on etiology.

PART 1.

1. Historical.

It is now half a century since Doyen first performed a gastro-enterostomy for duodenal ulceration. Since then the operation has been performed innumerable times. Early claims were enthusiastic and up to 1930 it was the procedure confidently employed. The popularity was based on the supposedly high incidence of good results, technical ease of performance and low mortality. Enthusiasm gave way to doubt as the frequency of gastro-jejunal ulceration became increasingly recognised. Thereafter, more and more surgeons fell in line with early advocacy of Billroth, Finsterer and Lewisohn for gastric resection in duodenal as well as gastric ulceration. Today, gastro-enterostomy has been largely superseded by the more radical operation in the more specialised clinics; nevertheless the short circuit operation still holds favour in a few clinics and is the procedure generally preferred by the occasional gastric surgeon. The earlier gastrectomies, though reducing the incidence of secondary ulceration, carried no guarantee of permanent clinical cure. Balfour (1944) estimated 9 per cent recurrence of ulcer after partial gastrectomy while Reinhoff (1945) found 8 per cent of chronic duodenal ulcers completely resistant to partial gastrectomy. The operation has, accordingly, increased in the extent of the resection, /

resection, the difficulty of its performance and has carried a mortality, which, only in the most skilled hands, is less than 5 per cent. Though the protection against secondary ulceration is now well-nigh full, Visick (1948), the operation has produced new syndromes, which, as yet incompletely studied, are in a considerable percentage of cases disabling.

More recently, vagotomy has been added to the repertoire in an attempt to produce more certain cure by a less formidable procedure. The early encouraging results have not been sustained. Recurrences do occur. There are other complications, for example gastric retention and diarrhoea. To overcome gastric retention, vagotomy has recently been combined with gastro-enterostomy, making the treatment of peptic ulcer by vagotomy more difficult to assess.

Such, then has been the broad trend of surgical treatment in peptic ulceration and it cannot be claimed that surgical treatment has been eminently satisfactory. It is too early to appraise vagotomy, especially combined with gastro-enterostomy. It is probably too early to evaluate "measured radical gastrectomy" in view of the sequelae, not always transient, which may occur. After fifty years it seems timely to take stock of what has been achieved by the operation of gastro-enterostomy.

Throughout the changing fashion of gastric surgery there have/

have been those who have championed the cause of gastroenterostomy and who have claimed by figures or impression that the results are not as bad as have been consistently asserted. Results up to 1935 were generally favourable, and the incidence of proved and suspected ulceration was small. In this country Wilkie (1934), Walton (1934) and Moynihan (1934) reported recurrence rates of 3.5 per cent, 3.4 per cent and 1 per cent respectively. Two large scale investigations by Luff (1928) and Garnett Wright (1935) revealed evidence of recurrence in 2.8 per cent and 8 per cent respectively. In America there were many favourable reports. For example St. John (1930) 6.9 per cent, Balfour (1930) 4 per cent, Hartwell et al (1930) 4 per cent and Eliason and Johnson (1936) 8.5 per cent of unsatisfactory results are representative of many. Barber and Bogatko (1938) reviewing their own results in 153 cases and the results from published papers of various American Surgical clinics amounting to almost 1600 cases found an incidence of marginal ulceration ranging between 1.6 - 7 per cent. As in most of these papers the length of follow-up is loosely designated - in this instance between 1 and 17 years. The number of cases followed 5, 10 and 15 years is not stated. At the same time dissension was evident in the reported results of Marshall and Kieffer (1934) 24 per cent, Lewisohn (1925) 34 per cent and Berg (1930) 30 per cent./

cent. Since then published results due to waning enthusiasm and longer follow-up have been generally less favourable and gastrectomy has more and more gained ground as the procedure of choice in the surgical treatment of peptic ulceration. This preference has not been unanimous. Darling (1939) has questioned the policy of abandoning gastro-enterostomy, an operation which he claims carries an operative mortality of 1 per cent, for gastrectomy with a mortality of 6 per cent, just because 4 per cent develop gastro-jejunal ulceration. Walton's (1944) follow-up shows an incidence of 4 per cent gastro-jejunal ulceration after posterior gastro-enterostomy for duodenal ulcer with or without stenosis and reserves partial gastrectomy for the 4 per cent of patients who develop jejunal ulcer subsequently. Heuer et al (1942) and, more recently, Cooper (1948) have reviewed the past experience of the New York Hospital in gastro-enterostomy and their results lend themselves to the view that "gastro-enterostomy is a useful and often curative procedure which has a definite place in the repertory of gastric surgery".

Its place in the treatment of organic pyloric stenosis has seldom been disputed. Reid and Marcus (1948) in their review substantiate that belief. They reported 98 per cent satisfactory results in patients alive over ten years after operation. Thomson (1948) and Patey (1948) are less enthusiastic./

enthusiastic. Indeed, as long ago as 1935 Garnett Wright cast doubt on this belief.

2. Critical observations on the literature.

The literature on the subject is voluminous. It deals mainly with the results of the operation, the effect of the short circuit on gastric secretion and motility, and an appraisal of the probable causes of failure. The author is of the opinion that little benefit would accrue from a detailed discussion of a hundred or more reviews. However, the following critical observations are germane to the present study.

1. Excluding vagotomy, the results of which have not been assessed over a sufficiently long period, the controversy in the literature, pertaining to the surgical treatment of peptic ulcer, hinges on the relative merits of gastro-enterostomy and gastrectomy. Among the advantages of the former are its low mortality and freedom from those syndromes which follow gastrectomy, such as "dumping", post-prandial hypoglycaemia, failure of the patient to gain weight and microcytic anaemia. Its chief disadvantage is the incidence of secondary ulceration, variously estimated at 4 - 40 per cent. Further disadvantages of gastrectomy are the higher fatality rate and a risk, though small, of stomal ulceration. When stomal ulcer does develop its operative management is considerably more difficult and dangerous/

dangerous than that of jejunal ulcer following gastro-enterostomy. Moreover, the convalescence after the more radical procedure is longer and more uncomfortable.

2. Throughout the literature pertaining to the controversy, close attention is paid to the operative mortality figures and in many cases the comparison is not without danger. Mortality figures without the age distribution of the patients cannot be fairly compared. Gastrectomy performed for uncomplicated peptic ulcer in patients under 40 years of age carries a very low mortality. In the fifties, sixties and seventies the operation is hazardous and it is in these age groups, when the incidence of recurrent haemorrhage is greatest, that resection is most indicated. Many gastro-enterostomy series are, therefore, loaded in the older age groups and there is no doubt that the fatality rate in gastrectomy in many series has been improved by the exclusion of the elderly. Indeed, it has been stated by Aird (1949) that the general fatality rate after gastrectomy for duodenal ulcer in this country cannot be much less than 10 per cent. Moreover, age alone is not an accurate measure of a patient's fitness to withstand an extensive operation, and where his fitness is in doubt the natural tendency is to employ a less formidable procedure. Caution is, therefore, necessary in comparing mortality rates.

3./

3. A study of the literature reveals also a lack of uniformity in the reporting of results. Comparison of the results of two series of cases of peptic ulceration treated by gastro-enterostomy and gastrectomy or any other therapy can, therefore, be fallacious. One of the most common methods of reporting results is to state, for example, that in X cases operated upon, one to ten years ago, the percentage incidence of poor results was Y. This statement is perfectly accurate, but one series may consist largely of short follow-up cases and another a large proportion of cases followed for a longer period. Comparison of two series or two methods of treatment on this basis would be inaccurate. Another method commonly employed is to state the average follow-up period for the group of cases, thus, for example, X cases surviving operation and followed for an average period of 7.5 years had an incidence of recurrence of Y per cent. The statement implies that X cases were followed 7.5 years which is not true and comparison with a series of equal average follow-up period may be inaccurate. One group may contain a high proportion of cases followed one year and another with cases followed fourteen years. The only accurate method of reporting results and the method which allows of fair comparison of one series and another is to give the poor results and cases followed for each year after operation. These are converted to percentages and recorded as an accumulating percentage giving a curve/

curve which represents the entire experience for each year of follow-up. This is the method used in the present study.

4. In view of the relapsing nature of the disease, a few authors and in particular Cooper (1947) have taken into account relapses and remissions on a year to year basis - a case may be a poor result one year and a good result for the next five years. This method no doubt gives a more accurate picture and at the same time a brighter prospect than the cumulative method but one of the chief points of investigation in this present review was the ability of gastro-enterostomy to "cure" peptic ulceration. There is no doubt that many patients, though not cured, derived benefit by having longer remissions than before operation.

Most previous papers have dealt with relatively short-term results. The object of this study is to present long-term results believing, as Lord Moynihan stressed in his Hunterian Lecture in 1923, that "the years certainly teach much that the days never knew".

PART II.

PARTICULARS OF SURVEY.

1. CLINICAL MATERIAL.

The material in this review consists of 330 posterior gastro-enterostomies performed for peptic ulceration during the 14 years between 1st January, 1924 and 31st December, 1937. All cases were under the care of one surgical unit in the Western Infirmary, Glasgow. All patients came from Glasgow and adjacent districts.

2. OPERATION AND POST-OPERATIVE CARE.

The indication for operation was generally lack of response to medical treatment, influenced by the belief, at that time that the results following gastro-enterostomy were good. This explains the comparatively large number - namely 66, with histories of only 1 - 4 years duration.

In 6 cases the gastro-enterostomy was performed at the time of closure of a perforation. In two cases, gastro-enterostomy with ligation of adjacent vessels was performed because of continued bleeding which had failed to respond to conservative treatment. The remainder were elective operations. The operations were performed by the senior surgeon and his first assistant. Most of the patients were discharged after a stay in hospital of 21 to 28 days. A few received further care in a Convalescent Home. All patients, after discharge, had attempted to/

to follow the dietary instructions - the majority for some months, but few persisted for more than a year. Thereafter, dieting was sporadic, usually during periods of relapse. Many had taken advantage of the wartime priority in milk and eggs. Antacid powders were taken according to symptoms. Almost all the patients had made one return visit to the hospital but few had paid more than three visits. Thereafter, except those who suffered complications such as haemorrhage and perforation or who were re-admitted to this and other institutions for medical and surgical treatment, the majority had been uninfluenced by further intensive treatment. They provide, therefore, a series of peptic ulcers modified only by a short-circuit operation making possible an assessment of the effect of gastro-enterostomy per se as a treatment in peptic ulceration.

3. FOLLOW-UP.

An attempt was made to trace all the survivors and recall them for examination. 165 patients were traced by letter and were interviewed. 21 now at a distance in the U.K. or abroad could be contacted only by letter-questionnaire. With the help of the Almoner, Red Cross workers and other voluntary organisations, 50 were traced and found to have died. The information available from their records, relatives, family doctors and death certificates allowed of some assessment, albeit secondhand. The remaining 70, despite all effort, remained untraced because of change of address. Many of these had been resident in an area/

area which had suffered from "enemy action". The total number of cases traced was 260 out of the 330, i.e. 78.7 per cent. The investigation was carried out during 1948.

A difficulty arising in most follow-up investigations is the disposal of "lost" cases. The ratio of good to poor results in this group can remain only a matter of opinion, though Cooper (1948) believes there is support for the view that the ratio is the same in the lost as in the followed group. Hollander and Mage (1943) were of the same opinion though they proceeded to a complicated statistical method of analysis based upon maximum and minimum percentages of failures for each follow-up year. The author is of the opinion that since the 70 cases were untraced for reasons stated, it is a fair presumption that the 260 traced is a reasonable sample. The untraced cases are, therefore, not considered.

Of the 260, 8 are known to have died of Carcinoma of Stomach, 3 of these within 2 years of operation. These 3 are included in the assessment and failure curve as it is a risk which the operation carries. It is not always possible at operation to determine the exact nature of a mass at the pylorus or to establish the innocence of a gastric ulcer especially where radiological findings suggest simple ulceration.

It is probably inaccurate to claim this study as a "follow-up". The ideal "follow-up" demands that the patient be seen at regular intervals; that the patient be seen during his or/

or her periods of complaint; that all cases should be traced. This study is, therefore, deficient. Many were seen for the first time 11 - 22 years after the event. It is, accordingly, little more than a recapitulation, but it is as accurate as a previous history can be and in many cases more so, since documentary evidence was obtained from other centres where the patients had reported. This deficiency, however, has the advantage that the series represents peptic ulceration treated by gastro-enterostomy without superadded medical treatment of more than sporadic intensity.

The distribution of the cases by operation year and their places in this follow-up are shown in Table I. Table II lists the cases according to diagnosis.

Table I./

TABLE I. - DISTRIBUTION OF CASES BY YEAR OF OPERATION.

Year	Operative Deaths	Traced Alive	Traced Dead	Untraced	Total.
1924	2	2	2	4	10
1925	0	6	2	1	9
1926	3	10	2	6	21
1927	1	9	1	7	18
1928	2	12	5	7	26
1929	2	14	1	4	21
1930	5	17	5	6	33
1931	3	22	5	6	36
1932	1	20	2	6	29
1933	2	17	7	5	31
1934	0	21	8	5	34
1935	1	8	6	5	20
1936	2	14	0	3	19
1937	0	14	4	5	23
	24	186	50	70	330

TABLE II. - DISTRIBUTION OF CASES BY DIAGNOSIS.

Diagnosis	Operative Deaths	Traced Alive	Traced Dead	Untraced	Total.
Pyloric Stenosis	15	19	7	5	36
D.U.	15	156	30	61	262
G.U.	4	8	11	4	27
D.U. - G.U.	0	3	2	0	5
	24	186	50	70	330

4. ASSESSMENT OF RESULTS.

Owing to circumstances beyond the control of the author, Barium meal investigation was possible in only a few cases. The assessment of the result is based essentially on symptoms, history of complications, further hospitalisation for peptic ulceration and radiological findings, where available. It follows, therefore, that the unsatisfactory results are proved or suspected secondary ulceration. Though stomal ulcer is probably not the only cause of continuing pain and dyspepsia after gastro-enterostomy, it is, by far, the most common. It has been pointed out by Moynihan (1930) that an ulcer, either the old one or a new one, is the cause of pain and haemorrhage which develops after a short circuiting operation.

The results have been divided into satisfactory and unsatisfactory. Those entirely free from symptoms and those in whom indigestion was not in excess of that to which normal man is heir, were considered satisfactory. The unsatisfactory are those who at any time since operation

- (1) have had pain of "ulcer" type
- (2) have suffered from haematemesis or melaena
- (3) have been hospitalised for medical or surgical treatment of peptic ulceration
- (4) have or have had X-ray evidence of marginal ulceration or reactivation of the original ulcer.

As/

As regards melaena, only those in whom it caused at least a minor degree of constitutional upset were considered to have bled. Loss of working time was not used in assessment as it was found to be variable and that many patients had continued to work though suffering fairly severe symptoms. The cases grouped as unsatisfactory were not all poor results. Many, though not cured, benefited by the operation. Accordingly, these results have been further graded into severe, moderate and mild.

5. GRADES OF SEVERITY.

Severe: Pain as severe or more severe than before operation.

Those who have had complications or who have required further operation because of peptic ulceration.

Moderate: Pain less severe and more easily controlled by food and alkalies.

Mild: Pain, slight and infrequent and with dyspepsia (flatulence, heartburn, etc.) requiring diet restriction and alkali therapy amounting to some limitation of the normal mode of life.

6. FAILURE CURVE.

The onset of symptoms after operation has been dated as accurately as patients can, admittedly difficult, in a retrospect extending 10, 15 and 20 years. In some cases it has been/

been possible to check this in the records of this hospital and of other hospitals where the patients have been admitted.

The percentage of unsatisfactory results in each follow-up year has been calculated separately for the three groups of patients - those interviewed, those contacted by questionnaire and those known to have died. The relapse rate in each group being reasonably comparable, the percentage of unsatisfactory results per follow-up year for the entire group of patients traced (excluding the immediate post-operative deaths) was calculated and plotted in a failure curve.

For the purpose of this study, any patient having symptoms which amount to an unsatisfactory result is considered as such from the onset of recurrence through the remaining years of follow-up. That is, the curve is charted on the basis "once a recurrence, always a recurrence". There has been no modification of the curve for those who, e.g. have had only 4 years symptoms in 18 years follow-up. Similarly, those cases modified by further surgical or medical treatment have been considered failures from the onset of symptoms. This method, no doubt, presents a more gloomy picture than a year-to-year assessment would, but it was felt that, in view of the years that had elapsed since operation, the more simple method was a sufficient tax on the memory of the patient and limited the scope of his imagination.

7. RESULTS.

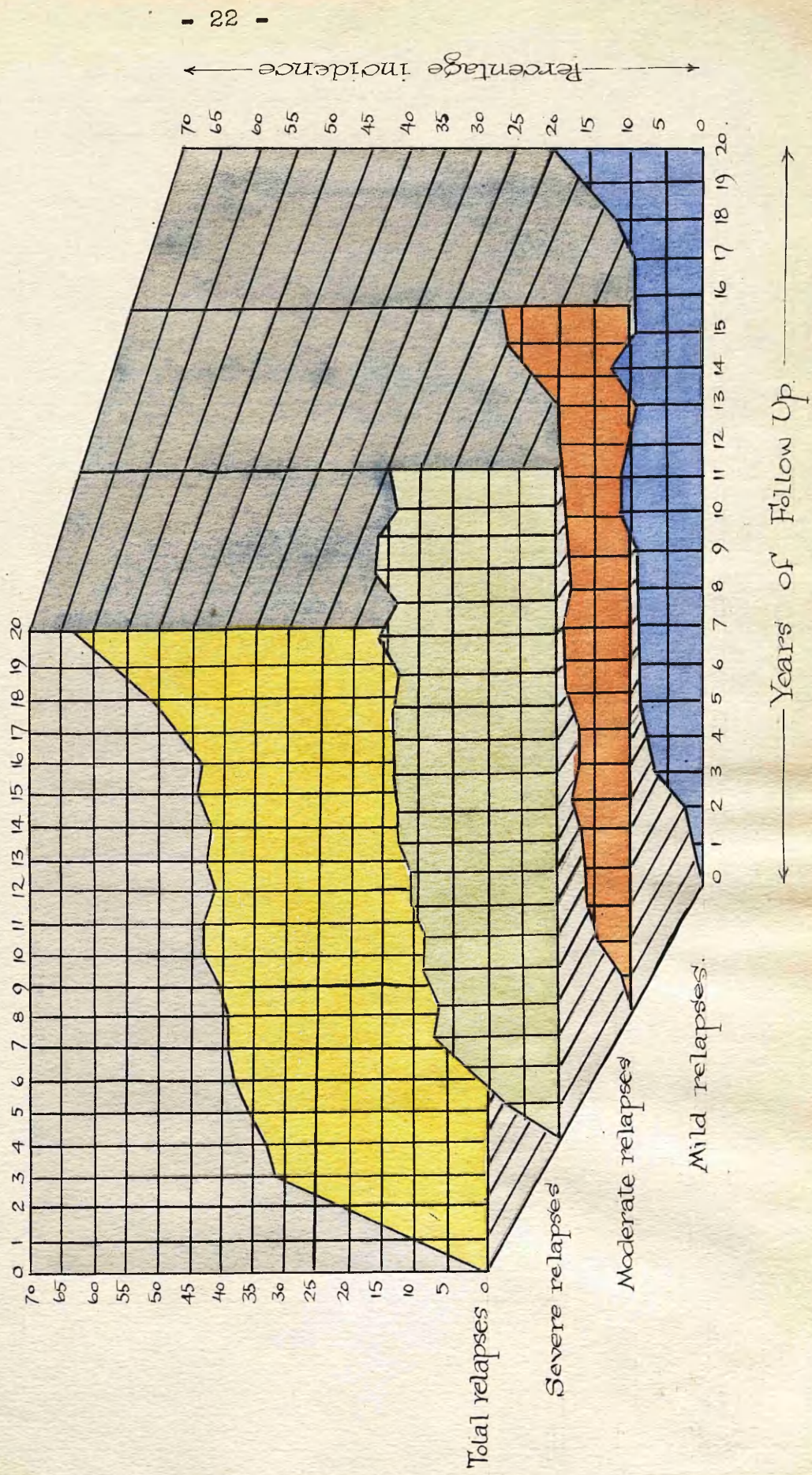
The failure curve is shown in Fig. 1. The figures for the failure curve are listed in Table III. After the 20th year, the numbers observed are small and are not included. Curves for severe, moderate and mild relapses are also shown in Fig. 1 with relevant figures in Table III.

TABLE III./

TABLE III. - THE INCIDENCE OF SEVERE, MODERATE, MILD AND TOTAL RELAPSES PER FOLLOW-UP YEAR.

<u>F-U. Year</u>	<u>Cases Observed</u>	<u>Relapses.</u>			<u>Total Relapses.</u>
		<u>Severe</u>	<u>Moderate</u>	<u>Mild</u>	
1	236	21(8.89)	3(1.27)	1(0.43)	25(10.59)
2	228	33(14.47)	10(4.38)	9(3.95)	52(22.80)
3	226	41(18.14)	13(5.75)	16(7.08)	70(30.97)
4	224	40(17.85)	13(5.81)	19(8.48)	72(32.14)
5	221	43(19.45)	15(6.79)	20(9.05)	78(35.29)
6	220	43(19.54)	18(8.18)	20(9.09)	81(36.63)
7	216	46(21.29)	17(7.84)	20(9.26)	83(38.42)
8	212	47(22.17)	16(7.55)	20(9.44)	83(39.15)
9	212	49(23.11)	17(8.02)	20(9.44)	86(40.57)
10	206	48(23.30)	18(8.73)	23(11.16)	89(43.20)
11	199	47(23.71)	17(8.54)	22(11.05)	86(43.21)
12	182	43(23.62)	14(7.70)	19(10.44)	76(46.75)
13	163	40(24.54)	13(8.00)	16(9.81)	69(42.33)
14	154	36(23.37)	13(8.44)	16(12.21)	65(42.20)
15	131	33(25.18)	12(9.22)	13(9.92)	58(44.27)
16	111	26(23.42)	11(9.91)	11(9.91)	48(43.24)
17	91	25(27.47)	9(9.89)	9(9.89)	43(47.24)
18	70	19(27.14)	9(12.85)	8(11.42)	36(51.42)
19	54	13(24.07)	9(16.48)	9(16.48)	31(57.40)
20	40	10(25.00)	7(17.50)	8(20.00)	25(62.50)

Fig 1. Incidence of Total, Severe, Moderate and Mild relapses.



The onset of relapses following on gastro-enterostomy is most marked in the first 3 years. Thereafter, there is a steady but slow increase in incidence. From the 10th to the 16th years, the curve is remarkably steady between 40 - 50 per cent. After the 16th year, there is a sharp rise but during this period there is a rapid decline in the number of patients, only 40 having been observed at the 20th year and the rise may be due partly to chance. Furthermore, it is difficult to be certain that those late onset relapses were not, in fact, recrudescences in patients who had relapsed earlier and that only those attacks in recent memory were noted. The patients were closely questioned on this point and, as far as could be ascertained, those late onset relapses were, in fact, the first recurrences of symptoms. Comparison of the individual curves for severe, moderate and mild relapses, reveals that the early onset relapses are more severe. The impression is also gained that the increase in the unsatisfactory results after the 16th year of follow-up is due mainly to less severe relapses.

It has been said, that if a gastro-enterostomy does well for 5 years, there is every chance of its continuing to do so. This aphorism is not confirmed by the results of the present study. Although the onset of relapse is most marked during the first 5 years, thereafter there is a gradual increase in incidence. Two cases in this series had their first recurrence of symptoms in the 19th year of follow-up, one moderate and the other mild. It/

It would seem essential, therefore, in the assessment of any form of treatment, for peptic ulceration, surgical or medical, that the cases should be followed for at least five years. At the end of that period the major recurrence will have been recorded, though as far as gastro-enterostomy is concerned a considerable percentage relapse after that period. Garnett Wright (1935) noted as a result of the collective enquiry of the Fellows of the Association of Surgeons that in 25 per cent of cases of gastro-jejunal ulceration, more than 3 years elapsed before the onset of symptoms.

At the 20th year of follow-up, 62.5 per cent would appear to have relapsed to a varying degree. However, the number observed over this period is small, only 40. In approximate round figures it may be said, that after a period of between 15 - 20 years 50 per cent have remained symptom-free. Compared to their pre-operative state 25 per cent are no better or worse, 12.5 per cent are improved but still suffer considerable disability and 12.5 per cent, though experiencing dyspepsia and pain of slight degree, are markedly improved.

8. OPERATIVE MORTALITY.

24 patients died as a result of the operation - a mortality rate of 7.2 per cent. The causes of death can be conveniently grouped. Table IV.

TABLE IV./

TABLE IV. - CAUSES OF DEATH IN IMMEDIATE POST-OPERATIVE PERIOD.

<u>CAUSE.</u>	<u>No. OF DEATHS.</u>
Chest complications	7
Cardiac failure	9
Peritonitis	4
Haemorrhage	4

Two of the patients who died from haemorrhage came to operation because of continued haematemesis despite medical treatment and were in poor condition. The haemorrhage continued. Two of the deaths from cardiac failure occurred in young people during operation under chloroform anaesthesia. With present day resources of sulph-drugs and penicillin, it is felt that some of the deaths from chest complications and peritonitis might not have occurred. Indeed for comparison, in 56 gastro-enterostomies performed by the same unit during the 5 year period 1943 - 1947 there were two deaths - an operative mortality of 3.6 per cent. Both of these were cases of severe haematemesis in patients over 50 not responding to medical measures and operated on as a last resort. It is doubtful if gastro-enterostomy has a place in the treatment of continued or massive haematemesis.

The age distribution of the operation fatalities is shown in Table V.

TABLE V./

TABLE V. - AGE DISTRIBUTION OF PATIENTS AND OPERATIVE MORTALITY.

<u>Age Group</u>	<u>Operations</u>	<u>Operative Deaths</u>	<u>Percentage Incidence.</u>
Under 40	171 (51.8%)	8	4.6
40 - 49	86 (26.1%)	5	5.8
50 and over	73 (22.1%)	11	15.0
	<u>330</u>	<u>24</u>	

Under the age of fifty years the mortality rate remains within reasonable limits. In patients over fifty, the mortality mounts rapidly. It is worthy of note that of the 330 patients operated upon, 48.2 per cent were 40 years and over, 22.1 per cent being 50 years and over. Moreover, Table V underlines the necessity for giving age distribution with mortality rate. Without the former, the latter is meaningless when comparisons are to be drawn and this is especially so in the gastro-enterostomy/gastrectomy controversy. Gastrectomy in patients over 50 years of age is a formidable procedure and in many cases has been avoided. In Visick's (1948) large series of gastrectomies, however, 24 per cent were in the 50 years and over age group with an operative mortality of 6.1 per cent. Gastrectomy for haematemesis was not included in his series.

PART III.

A. - ANALYSIS OF UNSATISFACTORY RESULTS.

1. PATHOLOGY.

The assessment of this series has been mainly clinical. The precise pathology in most cases is, therefore, unknown. Even when available, radiological and gastroscopic confirmation is not always possible and the diagnosis must rest on clinical grounds. However, accurate information was available in 33 cases. Table VI.

TABLE VI. - SITE OF ULCERS IN 33 CASES - X-RAY DIAGNOSIS.

<u>LESION</u>	<u>No. OF CASES.</u>
Gastro-jejunal ulcer	21
Active duodenal ulcer	11
Active gastric ulcer (originally D.U.)	1

Due to the difficulty in diagnosing marginal ulceration, there has been considerable doubt as to which is the more common - re-activation or persistence of activity of the original duodenal ulcer or stomal ulcer. Cooper (1948) points out that many of his patients at one time or another had X-ray findings suggestive of re-activation of the original duodenal ulcer but when definite proof was available at subsequent operation, the majority were found to have marginal ulcers. Holman and Chenoweth/

Chenoweth (1942) noted that when bleeding occurs in a patient who has had a gastro-enterostomy for a duodenal ulcer, the haemorrhage in most cases originates from a marginal ulcer rather than from a persisting or recurrent duodenal ulcer. It should, therefore, be related that in the cases in this series which came to operation, as far as could be detected, marginal ulcer was the cause of symptoms in all except two cases. The two exceptions were in patients in whom the stoma had closed, with recurrence, in exact replica, of their pre-operative symptoms. When the stoma was reformed, radiological healing of the duodenal ulcer took place. The operation findings in both these cases suggested that marginal ulceration and resultant fibrosis had produced closure of the stoma. One further case is of interest in this connection in that he suffered perforation of a stomal ulcer 5 years after gastro-enterostomy and a perforation of a duodenal ulcer 5 years later. A recent Barium Meal examination reveals the stoma to be inefficient and the presence of an active duodenal ulcer. It would appear, therefore, that symptoms which recur after a short circuiting operation are most commonly due to marginal ulcer and that the operation performed for duodenal ulcer generally achieves its purpose, namely healing of the original duodenal ulcer with a great hazard of producing a secondary ulcer at the stoma. This would appear to be a point of considerable practical importance when operative measures are contemplated in continued haematemesis in patients who have previously undergone gastro-enterostomy.

The/

The findings in the present investigation and in those of the authors mentioned, indicate that the lesion is most commonly situated at, or near, the stoma.

Barber and Bogatko (1938) in whose hands the operation admitted of few failures, enquiring into the causes of failure, apportioned most blame to adhesions between the afferent and efferent loops. Stomal ulcer was incriminated in only 2 per cent. The present author is of the opinion that these adhesions are most commonly the result of inflammatory reaction around the stomal ulcer. Adhesions due to other causes such as operative trauma and talc must be equally common in gastrectomy. Cannon and Blake (1905) and, more recently, Kay (1949) have suggested that a poor clinical result in certain cases of gastro-enterostomy, where symptoms cannot be attributed to gastro-jejunal ulceration, may be due to failure of the emptying mechanism which is controlled by the jejunum. The former writers claimed that in gastro-enterostomy control of emptying was maintained by rhythmic contractions and rings of constriction in the jejunum which alternately let down and hold back the gastric contents. This control must also be present in gastrectomy and when it fails, the symptomatology is that of "dumping" a syndrome which has been insignificant in the present series. It would seem, therefore, that failures after gastro-enterostomy are largely due to secondary ulceration though/

though radiological and gastroscopic examination may fail to reveal it.

No case of gastro-jejunocolic fistula occurred in the patients traced.

2. SYMPTOMATOLOGY.

The main symptoms are shown in Table VII.

<u>SYMPTOM.</u>	<u>No. OF CASES.</u>	<u>PERCENTAGE OF SERIES.</u>
Pain	91	38.5
Haemorrhage (all)	29	12.3
Haemorrhage without pain	8	3.3

(a) PAIN.

Pain of all degrees of severity and periodicity was the predominant symptom. It was of ulcer type and except in more severe cases, was readily relieved by food and antacids. Many of the patients were unable to differentiate their recurrence from their original complaint. Others appreciated a change in site and distribution. In 45 patients, the pain was less severe and less intractable than the pre-operative pain, a feature previously noted by Alvarez (1939) and for which the patients were grateful.

(b) HAEMORRHAGE.

Gastro-intestinal/

Gastro-intestinal haemorrhage occurred in 29 cases, 26 haematemesis and 3 in whom melaena was sufficient to cause constitutional upset. 8 cases had had no pain whatever, though there had been periods of marked digestive upset such as heart-burn, flatulence, waterbrash, etc. 38 cases had haemorrhage before operation and 12 of those had further bleeding after operation, 26 being free from this complication. On the other hand 17 patients who had no pre-operative haemorrhage, had bleeding after operation.

Two patients died as a result of haematemesis.

Many patients had more than one episode of bleeding.

Table VIII.

TABLE VIII.

Episodes of Bleeding.

No. of Haemorrhages.	1	2	3	4	5
No. of Patients.	17	4	5	2	1

(c) PERFORATION.

There were 5 perforations in 4 patients. All were marginal ulcers except in the patient mentioned above who sustained both duodenal and marginal perforations. All were successfully sutured.

3. INCIDENCE OF MAJOR COMPLICATIONS.

Table IX gives the number of major complications - perforation/

perforation and haemorrhage and elective operations for relief of symptoms, in each follow-up year 1-20. The table is compiled only for patients suffering from duodenal ulcer and gastric ulcer. Pyloric stenosis is not included. Indeed only one patient in the pyloric stenosis group was classed as a severe relapse, having subsequently undergone three elective operations for relief of symptoms. The main reason for excluding those cases is to allow of more fair comparison with the figures produced by Illingworth et al (1946) in their investigation into the progress after perforated peptic ulcer.

TABLE IX.

INCIDENCE OF MAJOR COMPLICATIONS AND ELECTIVE SECONDARY OPERATIONS AFTER GASTRO-ENTEROSTOMY. COMPARISON WITH FIGURES OF ILLINGWORTH ET AL (1946).

<u>F-U Year</u>	<u>Cases Observed</u>	<u>Perforation.</u>	<u>Haemorrhage.</u>	<u>Elective Operation.</u>
1	211	0 (1.7)	0 (0.8)	0 (2.7)
2	204	0 (1.4)	2 (0.98)(1.3)	3 (1.47)(2.2)
3	202	1 (0.49)(2.4)	2 (0.98)(1.5)	1 (0.49)(1.8)
4	200	1 (1.5)	3 (1.5)(1.2)	1 (0.50)(0.90)
5	197	2 (0.01)(2.4)	8 (4.04)(0.6)	0 (1.8)
6	196	0	3 (1.53)	1 (0.51)
7	193	0	5 (2.59)	1 (0.51)
8	190	1 (0.52)	4 (2.08)	0
9	190	0	3 (1.56)	1 (0.52)
10	184	1 (0.54)	2 (1.08)	0

Table IX continued on next page.

TABLE IX. (contd.)

<u>F-U</u> <u>Year</u>	<u>Cases</u> <u>Observ-</u> <u>ed</u>	<u>Perforation.</u>	<u>Haemorrhage.</u>	<u>Elective</u> <u>Operation.</u>
11	179	0	3 (1.67)	0
12	165	0	4 (2.42)	1 (0.60)
13	149	0	0	2 (1.34)
14	140	0	1 (0.71)	0
15	118	0	1 (0.84)	1 (0.84)
16	102	0	1 (0.98)	0
17	84	0	2 (2.38)	1 (1.19)
18	63	0	0	0
19	48	0	0	0
20	36	0	0	0

The figures in Table IX refer not the patients involved but the number of incidents per follow-up year. As shown in Table VIII several patients had more than one haemorrhage. Some 11.5 per cent of patients suffered a major complication, including elective operation within 5 years of undergoing a gastro-enterostomy. 1.5 per cent perforated, 7.5 per cent suffered haemorrhage and 2.5 per cent sought relief for their symptoms by further operation. Comparable figures from the investigation into the progress after perforation of peptic ulcer by Illingworth et al (1946) are shown in red. Within 5 years of undergoing operation for perforation 20 per cent suffered/

suffered a major complication, 8.4 per cent having perforated, 5.4 per cent having bled and 9.4 per cent having undergone elective operation. It would seem, therefore, that gastroenterostomy has a considerable effect, reducing the incidence of major complications in peptic ulceration by about 10 per cent.

B. - FACTORS INFLUENCING RESULTS.

1. SITE OF ULCER.

For the purpose of this study cases with combined gastric (i.e. lesser curve) and duodenal ulcers have been grouped with gastric ulcers. Pyloric ulcers have been grouped throughout with duodenal ulcers. As for the total series, the relapse rate in duodenal ulcers, gastric ulcers and pyloric stenosis has been calculated for each follow-up year. Tables X, XI and XII show total relapse rates and the incidence of severe, moderate and mild recurrences. For brevity, figures for 1, 2, 3, 4, 5, 10, 15 and 20 years only are shown. The total relapse rates for D.U., G.U. and pyloric stenosis are graphed in Fig. II.

TABLE X.

TABLE X. - DUODENAL ULCER.

INCIDENCE OF SEVERE, MODERATE, MILD AND TOTAL RELAPSES.

<u>F-U.</u> <u>Year</u>	<u>Cases</u> <u>Observed</u>	<u>Relapses.</u>			<u>Total</u> <u>Relapses.</u>
		<u>Severe</u>	<u>Moderate</u>	<u>Mild</u>	
1	186	13(6.99)	1(0.53)	1(0.53)	15(8.05)
2	181	26(14.36)	4(2.21)	4(2.21)	34(18.78)
3	180	36(20.0)	7(3.89)	11(6.11)	54(30.0)
4	179	37(20.67)	7(3.91)	13(7.26)	57(31.84)
5	179	40(22.34)	8(4.46)	15(8.39)	63(35.19)
10	169	46(27.21)	12(7.10)	17(10.06)	75(44.37)
15	107	30(28.03)	8(7.48)	10(9.35)	48(44.86)
20	32	8(25.0)	6(18.75)	6(18.75)	20(62.5)

TABLE XI./

TABLE XI. - GASTRIC ULCER.

INCIDENCE OF SEVERE, MODERATE, MILD AND TOTAL RELAPSES.

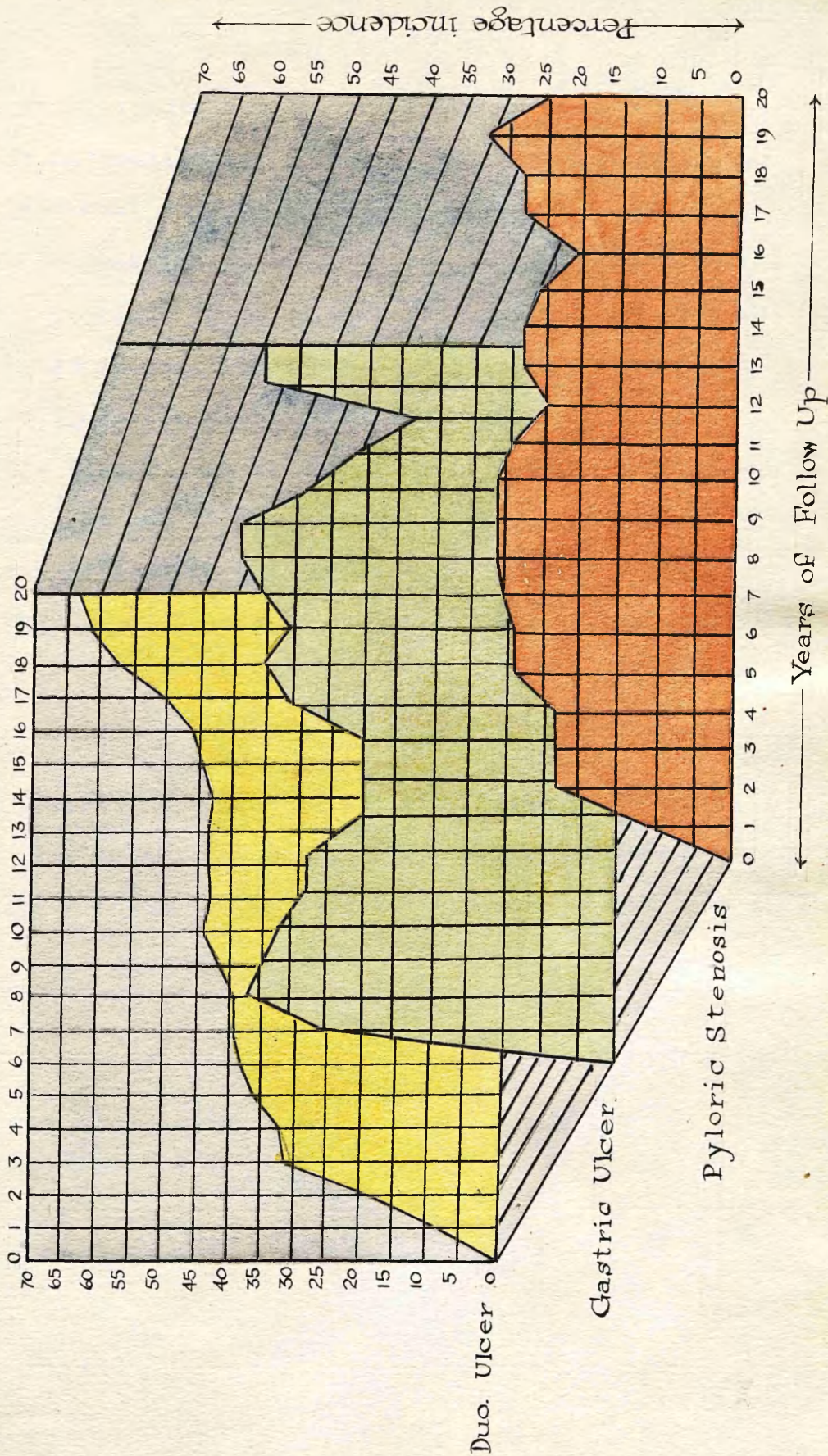
<u>F-U.</u> <u>Year</u>	<u>Cases</u> <u>Observed</u>	<u>Relapses.</u>			<u>Total</u> <u>Relapses.</u>
		<u>Severe</u>	<u>Moderate</u>	<u>Mild</u>	
1	25	8(32.0)	2(8.0)	0(0)	10(40.0)
2	23	6(26.09)	3(13.04)	3(13.04)	12(52.17)
3	22	5(22.72)	3(13.64)	3(13.64)	11(50.0)
4	21	5(23.82)	3(14.28)	2(9.52)	10(47.62)
5	18	3(16.66)	3(16.16)	2(11.11)	8(44.44)
10	15	2(13.33)	3(20.0)	2(13.33)	7(46.66)
15	11	2(18.18)	2(18.18)	2(18.18)	6(54.54)
20	4	1(25.0)	0(0)	1(25.0)	2(50.0)

TABLE XII. - PYLORIC STENOSIS.

INCIDENCE OF SEVERE, MODERATE, MILD AND TOTAL RELAPSES.

<u>F-U.</u> <u>Year</u>	<u>Cases</u> <u>Observed</u>	<u>Relapses.</u>			<u>Total</u> <u>Relapses.</u>
		<u>Severe</u>	<u>Moderate</u>	<u>Mild</u>	
1	25	0(0)	0(0)	0(0)	0(0)
2	25	1(4.0)	2(8.0)	3(12.0)	6(24.0)
3	25	1(4.0)	2(8.0)	3(12.0)	6(24.0)
4	25	1(4.0)	2(8.0)	3(12.0)	6(24.0)
5	24	1(4.16)	3(12.5)	3(12.5)	7(29.16)
10	22	1(4.55)	3(13.63)	3(13.63)	7(31.81)
15	13	0(0)	2(15.38)	1(7.69)	3(23.07)
20	4	0(0)	0(0)	1(25.0)	1(25.0)

Fig. 2. Comparison of total relapses in Duodenal Ulcer, Gastric Ulcer and Pyloric Stenosis.



The results show a heavy incidence of relapses in both gastric and duodenal ulcer groups. In the duodenal group, the relapses mount rapidly to 35 per cent in 5 years. In the subsequent 15 years, a further 27 per cent relapse. In the gastric ulcer group, these relapses include 6 cases of carcinoma of stomach, explaining the large failure rate in the first few years. In the group with obstructive symptoms, though considerably better, the relapse rate is surprisingly high. However, all but one of the relapses were of moderate or mild severity in contrast to the duodenal and gastric ulcer groups. Even so, this relapse rate is much in excess of that generally expected.

2. SEX.

The results according to sex are listed in Tables XIII and XIV. The total relapse rates for males and females, and the respective incidence of severe relapses is shown in Fig.III.

TABLE XIII./

TABLE XIII. - FEMALES.

INCIDENCE OF SEVERE, MODERATE, MILD AND TOTAL RELAPSES.

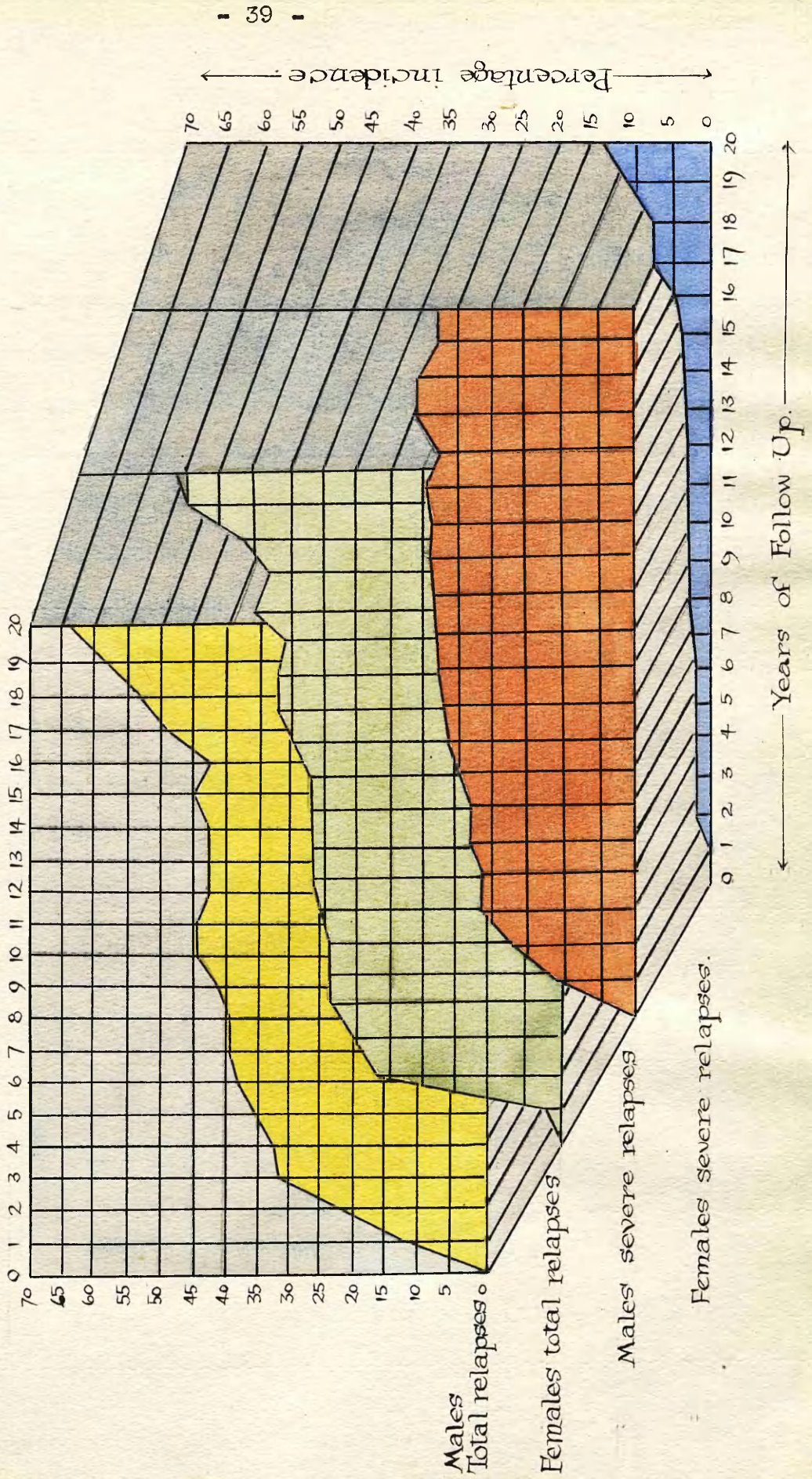
<u>F-U.</u> <u>Year</u>	<u>Cases</u> <u>Observed</u>	<u>Relapses.</u>			<u>Total</u> <u>Relapses.</u>
		<u>Severe</u>	<u>Moderate</u>	<u>Mild</u>	
1	36	0(0)	1(2.77)	0(0)	1(2.77)
2	35	1(2.86)	5(14.28)	3(8.57)	9(25.71)
3	35	1(2.86)	5(14.28)	5(14.28)	11(31.42)
4	35	1(2.86)	5(14.28)	6(17.14)	12(34.28)
5	35	1(2.86)	5(14.28)	6(17.14)	12(34.28)
10	33	1(3.03)	5(15.15)	6(18.18)	12(36.36)
15	24	1(4.17)	4(16.66)	5(20.83)	10(41.66)
20	7	1(14.28)	1(14.28)	2(28.57)	4(57.13)

TABLE XIV. - MALES.

INCIDENCE OF SEVERE, MODERATE, MILD AND TOTAL RELAPSES.

<u>F-U.</u> <u>Year</u>	<u>Cases</u> <u>Observed</u>	<u>Relapses</u>			<u>Total</u> <u>Relapses.</u>
		<u>Severe</u>	<u>Moderate</u>	<u>Mild</u>	
1	200	21(10.5)	2(1.0)	1(0.5)	24(12.0)
2	193	32(16.58)	5(2.59)	6(3.10)	43(22.27)
3	193	40(20.72)	8(4.14)	11(5.70)	59(30.56)
4	189	39(20.63)	8(4.23)	13(6.87)	60(31.73)
5	186	42(22.58)	10(5.37)	14(7.53)	66(35.48)
10	173	47(27.16)	13(7.51)	17(9.82)	77(44.49)
15	107	32(29.91)	8(7.47)	8(7.47)	48(44.85)
20	33	9(27.27)	6(18.18)	6(18.18)	21(63.63)

Fig 3. Comparison of Total and Severe relapses in Males and Females.



The total relapse rate for male and female is remarkably similar but inquiry into the type of relapse reveals that in females, the recurrences are much less severe. The one female, classed as a severe relapse, suffered from marginal ulceration both after gastro-enterostomy and gastrectomy.

It is seen, therefore, that the results to be expected in women are much superior to those in men. It should also be noted that of the 35 females in the series, 13 were cases of pyloric stenosis, 2 had a previous history of perforation and 3 of haematemesis of duodenal origin. The remaining 18 were uncomplicated peptic ulcers, 2 gastric and 16 duodenal.

3. AGE AT OPERATION.

The results according to age at the time of operation are shown in Tables XIV, XV, XVI, XVII and the total relapse rates in each age group are shown in Fig. IV.

TABLE XV./

TABLE XV. - PATIENTS UNDER 30.

THE INCIDENCE OF SEVERE, MODERATE, MILD AND TOTAL RELAPSES
PER FOLLOW-UP YEAR.

F-U. Year	Total Observed	Relapses.			Total Relapses.
		Severe	Moderate	Mild	
1	44	7(15.9)	0(0)	0(0)	7(15.9)
2	44	11(25.0)	2(4.54)	2(4.54)	15(34.08)
3	44	16(36.36)	2(4.54)	3(6.82)	21(47.72)
4	44	16(36.36)	2(4.54)	4(9.10)	22(50.0)
5	44	18(40.90)	2(4.54)	4(9.10)	24(54.54)
10	43	21(48.83)	3(6.97)	4(9.36)	28(65.16)
15	27	12(44.44)	2(7.41)	4(14.81)	18(66.66)
20	12	4(33.33)	2(16.66)	2(16.66)	8(66.66)

TABLE XVI. - PATIENTS 30 - 39 YEARS.

THE INCIDENCE OF SEVERE, MODERATE, MILD AND TOTAL RELAPSES
PER FOLLOW-UP YEAR.

F-U. Year	Cases Observed	Relapses			Total Relapses.
		Severe	Moderate	Mild	
1	81	6(7.42)	1(1.23)	2(2.46)	9(11.11)
2	79	14(17.73)	3(3.79)	2(2.53)	19(24.05)
3	77	14(18.19)	4(5.19)	5(6.49)	23(29.87)
4	77	15(19.48)	4(5.19)	5(6.49)	31(31.16)
5	77	15(19.48)	4(5.19)	7(9.09)	26(33.76)
10	75	18(24.0)	6(8.0)	10(13.33)	34(45.33)
15	46	14(30.43)	4(8.69)	5(10.88)	23(50.0)
20	17	5(29.41)	2(11.76)	5(29.41)	12(70.58)

TABLE XVII. - PATIENTS 40 - 49 YEARS.

THE INCIDENCE OF SEVERE, MODERATE, MILD AND TOTAL RELAPSES
PER FOLLOW-UP YEAR.

F-U. Year	Cases Observed	Relapses.			Total Relapses.
		Severe	Moderate	Mild	
1	60	0(0)	1(1.66)	0(0)	1(1.66)
2	60	2(3.33)	1(1.66)	2(3.33)	5(8.33)
3	59	3(5.08)	2(3.39)	5(8.47)	10(16.94)
4	59	4(6.78)	2(3.39)	5(8.47)	11(18.64)
5	58	6(10.34)	3(5.17)	5(8.62)	14(24.13)
10	54	7(12.96)	3(5.55)	5(9.26)	15(27.77)
15	35	5(14.28)	3(8.57)	3(8.57)	11(31.42)
20	8	0(0)	2(25.0)	1(12.5)	3(37.5)

TABLE XVIII. - PATIENTS OVER 50.

THE INCIDENCE OF SEVERE, MODERATE, MILD AND TOTAL RELAPSES
PER FOLLOW-UP YEAR.

F-U. Year	Cases Observed	Relapses.			Total Relapses.
		Severe	Moderate	Mild	
1	51	8(15.68)	3(5.88)	1(1.96)	12(23.52)
2	46	7(15.22)	4(8.69)	3(6.52)	14(30.43)
3	46	8(17.39)	5(10.87)	4(9.69)	17(36.95)
4	44	6(13.63)	5(11.37)	4(9.69)	15(34.09)
5	42	5(11.90)	5(11.90)	4(9.53)	14(33.33)
10	35	3(8.57)	5(14.28)	4(11.43)	12(34.28)
15	24	2(8.33)	3(12.50)	1(4.17)	6(25.00)
20	3	0(0)	2(66.66)	0(0)	2(66.66)

Percentage incidence

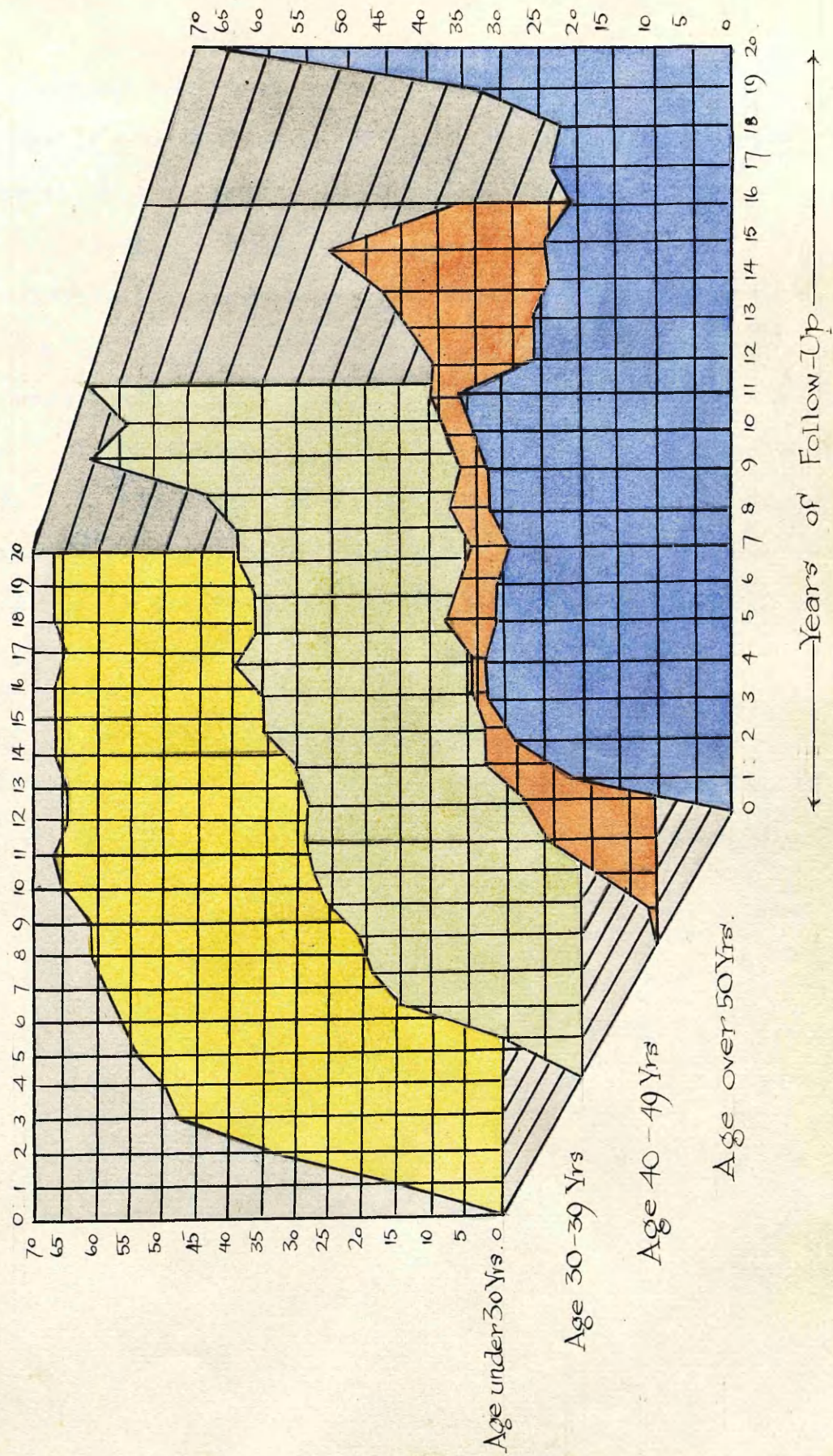


Fig 4. Total relapses according to Age Group at time of operation

The findings show improvement in the results with the increasing age of the patient. In the over 50 age group, the heavy incidence in the first 5 years is due to 5 cases of Carcinoma of Stomach. The incidence of mild and moderate relapses is remarkably constant in all decades, the improvement with age being in the lessening incidence of severe relapses. Further factors lending themselves to improvement in results with age are the distributions of the cases of pyloric stenosis and of the females. Of the former 25 patients, 12 and 10 are found in the 40-49 and over 50 years respectively. Of the 36 female patients, 13 and 11 are found in the 40-49 and over 50 groups respectively.

4. DURATION OF THE PRE-OPERATIVE ULCER HISTORY.

The duration has been grouped in 5 year periods. Tables XVIII, XIX, XX and XXI. The total relapse rates are shown in Fig. V.

TABLE XIX./

TABLE XIX. - PRE-OPERATIVE HISTORY - 1 - 4 YEARS.

INCIDENCE OF SEVERE, MODERATE, MILD AND TOTAL RELAPSES.

<u>F-U.</u> <u>Year</u>	<u>Cases</u> <u>Observed</u>	<u>Relapses.</u>			<u>Total</u> <u>Relapses.</u>
		<u>Severe</u>	<u>Moderate</u>	<u>Mild</u>	
1	66	8(12.12)	1(1.51)	0(0)	9(13.63)
2	63	11(17.46)	2(3.17)	1(1.59)	14(22.22)
3	62	14(22.58)	3(4.84)	5(8.06)	22(35.48)
4	62	15(24.19)	3(4.84)	5(8.06)	23(37.09)
5	61	16(26.23)	3(4.91)	5(8.20)	24(39.34)
10	53	16(30.19)	2(3.77)	3(9.43)	23(43.39)
15	35	13(37.14)	2(5.71)	3(8.57)	18(51.42)
20	15	5(33.33)	2(13.33)	3(20.0)	10(66.66)

TABLE XX. - PRE-OPERATIVE HISTORY - 5 - 9 YEARS.

INCIDENCE OF SEVERE, MODERATE, MILD AND TOTAL RELAPSES.

<u>F-U.</u> <u>Year</u>	<u>Cases</u> <u>Observed</u>	<u>Relapses.</u>			<u>Total</u> <u>Relapses.</u>
		<u>Severe</u>	<u>Moderate</u>	<u>Mild</u>	
1	76	9(11.84)	1(1.31)	0(0)	10(13.15)
2	71	12(16.90)	2(2.81)	1(1.41)	15(21.12)
3	71	13(18.31)	3(4.22)	1(1.41)	17(23.94)
4	69	11(15.94)	3(4.34)	2(2.90)	16(23.18)
5	69	13(18.84)	3(4.34)	4(5.80)	20(28.98)
10	66	18(27.27)	4(6.06)	6(5.09)	28(42.42)
15	45	13(28.89)	3(6.66)	4(8.89)	20(44.44)
20	16	3(18.75)	2(12.5)	5(31.25)	10(62.5)

TABLE XXI. - PRE-OPERATIVE HISTORY - 10 - 14 YEARS.

THE INCIDENCE OF SEVERE, MODERATE, MILD AND TOTAL RELAPSES PER FOLLOW-UP YEAR.

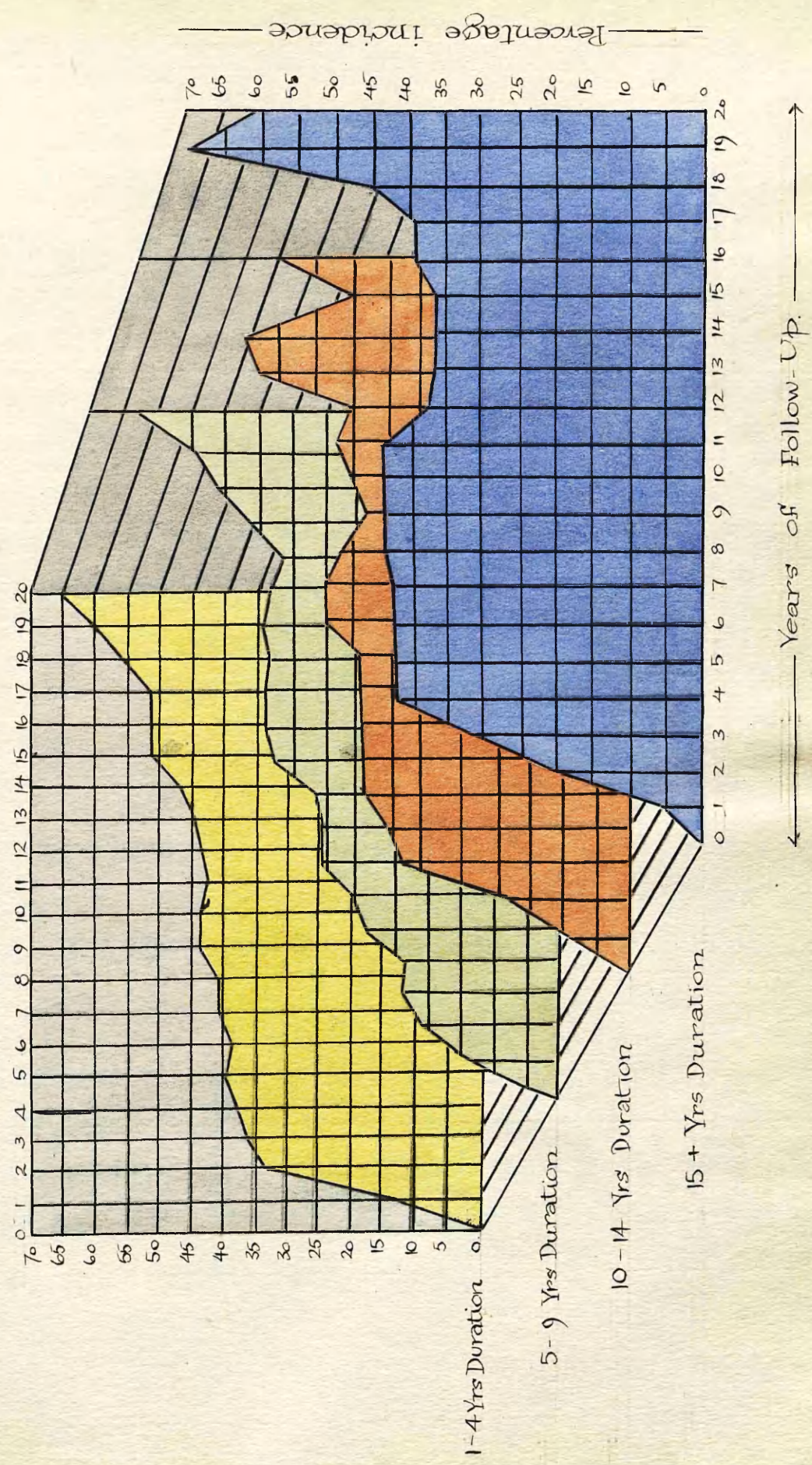
F-U. Year	Total Observed	Relapses.			Total Relapses.
		Severe	Moderate	Mild	
1	57	4(7.02)	2(0)	1(1.75)	5(8.77)
2	56	8(14.28)	2(3.57)	4(7.15)	14(25.0)
3	56	11(19.64)	2(3.57)	6(10.71)	19(33.92)
4	56	11(19.64)	2(3.57)	7(12.50)	20(35.71)
5	54	10(18.51)	2(3.71)	8(14.81)	20(37.03)
10	52	12(23.17)	3(5.77)	8(15.38)	23(44.23)
15	28	5(17.85)	2(7.15)	5(17.85)	12(42.85)
20	4	1(25.0)	1(25.0)	0(0)	2(50.0)

TABLE XXII. - PRE-OPERATIVE HISTORY - OVER 15 YEARS.

THE INCIDENCE OF SEVERE, MODERATE, MILD AND TOTAL RELAPSES PER FOLLOW-UP YEAR.

F-U. Year	Total Observed	Relapses.			Total Relapses
		Severe	Moderate	Mild	
1	37	1(2.70)	1(2.70)	0(0)	2(5.40)
2	37	1(2.70)	4(10.81)	3(8.11)	8(21.62)
3	37	2(5.40)	6(16.21)	4(10.81)	12(32.43)
4	37	4(10.81)	7(18.92)	5(13.51)	16(43.24)
5	37	4(10.81)	7(18.92)	5(13.51)	16(43.24)
10	35	4(11.43)	7(20.0)	4(11.42)	15(42.85)
15	22	2(9.09)	5(22.73)	1(4.54)	8(36.36)
20	5	0(0)	3(60.0)	0(0)	3(60.0)

Fig 5. Total relapse rates according to years of duration of pre-operative history



The length of the pre-operative history appears to influence the result. The incidence of severe relapses is noticeably higher in the 1-4 group than in the over 15 group. This finding is contrary to the generally accepted view that the more chronic the ulcer, the more intractable it is to all forms of treatment. It is possible that certain factors which make for a good result are operative in the last group (over 15). Compared to the 5-9 years group for example, the following distribution of females, pyloric stenosis and patients over 50 years of age is seen.

	<u>5 - 9 years.</u>	<u>15 years and more.</u>
Pyloric stenosis	11 (14.4)	7 (18.9)
Females	11 (19.3)	8 (21.6)
50	10 (13.33)	14 (27.8)

The improved results in the over 15 years group is to some extent influenced by these factors. Certainly the 4 severe relapses in this group were all in patients under 40 years of age.

5. GASTRIC ULCER AND CARCINOMA.

In the total series of 330 patients, there were 27 gastric ulcers and 5 patients in whom this lesion was combined with duodenal ulcer, making 32 gastric ulcers in all. The follow-up in these cases was as follows:-

Operative/

Operative deaths	4	} Traced 28.
Traced alive	11	
Traced dead	13	
Untraced	4	

Of the 13 known to have died, 6 were certified as having died of Carcinoma of Stomach. Autopsy was performed in only 3 cases.

The relevant details are shown in Table XXIII.

TABLE XXIII. - PATIENTS WITH GASTRIC ULCER KNOWN TO HAVE DIED FROM CARCINOMA OF STOMACH.

<u>No.</u>	<u>Age of Operation</u>	<u>Previous history in years</u>	<u>Died after Operation</u>	<u>X-ray</u>	<u>P.M.</u>
1	77	6	9/12	Simple	Yes
2	34	7	2	Simple	No
3	60	1	1	? Malignant	No
4	51	8	3½	Simple	Yes
5	63	10	4 3/12	Simple	Yes
6	54	10	5	Simple	No

The first 3 cases were presumably Carcinoma at the time of operation though the operative diagnosis was simple ulceration. As regards the question of Carcinoma developing in a pre-existing benign ulcer, the latter 3 cases are alone of interest. In only two of these was autopsy performed and the findings suggested "cancer/

"cancer ex ulcere". All 3 cases were more than 50 years of age.

Of 37 cases of duodenal ulcer and pyloric stenosis traced as having died, 2 were certified as dying of Carcinoma of Stomach; one aged 36 at time of operation died 10 years later, the other aged 52 died 4 years later.

Table XXIV lists the traced cases of gastric ulcer and duodenal ulcer + pyloric stenosis (excluding operative deaths) in age groups with the respective incidence of Carcinoma of Stomach.

TABLE XXIV. - AGE DISTRIBUTION OF PATIENTS WITH RESPECTIVE INCIDENCE OF CARCINOMA OF STOMACH.

<u>Age Groups</u>	<u>Gastric Ulcer.</u>		<u>Duodenal</u>	<u>Pyloric</u>
	<u>Cases</u> <u>Observed</u>	<u>Carcinoma</u> <u>Developed</u>	<u>Ulcer.</u> <u>Cases</u> <u>Observed</u>	<u>Stenosis.</u> <u>Carcinoma</u> <u>Developed</u>
10 - 19	0	0	3	0
20 - 29	3	0	38	0
30 - 39	3	0	78	1
40 - 49	6	0	53	0
50 - 59	6	2	28	1
60 - 69	5	1	12	0
70 - 79	1	0	0	0
	24	3	212	2

The number of gastric ulcers observed is very small and no significant conclusion could be safely drawn. They do, however, suggest that there is a danger in the treatment of simple gastric ulcer/

ulcer by gastro-enterostomy. Two of these cases were seen at autopsy to be "cancer ex ulcere". If we combine with these three cases, those erroneously diagnosed at operation as being simple and who died within a short time from Carcinoma of Stomach, the suggestion becomes a conviction.

6. SECONDARY OPERATIONS.

Secondary operations have been carried out on 17 patients. Several patients have undergone more than one operation. The details are listed in Table XXV. It will be seen that 12 patients underwent elective operation, two of these patients on more than one occasion - a total of 15 elective operations in all. 4 patients perforated, one twice. The remaining patient underwent emergency operation for small bowel obstruction due to intussusception of the jejunum through the gastro-enteric stoma. A stomal ulcer, which still causes severe symptoms, was an incidental finding at that operation. Patient No.4 on the list has had a particularly unhappy career. Apart from 2 elective and unsuccessful operations for the relief of her marginal ulcer symptoms, she has required emergency operations on three occasions for the relief of small bowel obstruction due to post-operative fibrous bands. Patients No.5 and 8 are particularly interesting. Each recurred after 5 years of entire freedom. Having suffered symptoms for 7 and 12 years respectively, it was found that in both the stoma had closed and that symptoms were due to active duodenal/

TABLE XXV.

No.	Sex	Operation	Original Diagnosis	Reurrence year of onset	Diagnosis	Indication for 2nd operation	Secondary Operation	Result
1	M	1931	D.U.	1	Marg. Ulcer	Pain	G. E. undone 1933	Reactivation of D.U.
2	M	1935	D.U.	2	Marg. Ulcer	Pain	Gastrectomy 1938	Died on 9th day after operation.
3	M	1931	D.U.	10	Marg. Ulcer	Pain	Gastrectomy 1944	Died on 4th day after operation.
4	F	1928	Pylorus Stenosis	1	Marg. Ulcer	Pain	Enlargement of Stoma and Division of Pylorus 1930 Gastrectomy 1934	Marginal ulcer persisted. Marginal ulcer reformed in 1 year. This patient has had 3 further operations for small bowel obstruction.
5	M	1929	D.U.	5	Active D.U. Stoma Closed	Pain Vomiting	G. E. reformed 1941	Patient has since been well.
6	M	1933	D.U.	7	Marg. Ulcer	Pain	Gastrectomy 1948	Too recent for comment.

Contd. on next page.

TABLE XXV. (contd)

No.	Sex	Operation	Original Diagnosis	Recurrent year of onset	Diagnosis	Indication for 2nd operation	Secondary Operation	Result
7	M	1937	D.U.	2	Marg. Ulcer	Pain recurrent haemorrhage	Gastrectomy 1946	Much improved but still has symptoms.
8	M	1925	D.U.	5	D.U. Stoma closed	Pain	G.E. reformed 1942	Symptom free.
9	M	1931	G.U.	1	G.U. Marg. Ulcer	Pain recurrent haemorrhage	Gastrostomy and diathermy 1933 Wedge resection 1935	Symptoms have persisted. Haemorrhage 1937 and 1944. X-ray active G.U., D.U. and (?) M.U.
10	M	1924	D.U.	1	Marg. Ulcer	Intussusception of small bowel	Relief of obstruction 1930. Stomal ulcer indented.	Ulcer symptoms have persisted.
11	M	1925	D.U.	13	Marg. Ulcer	Pain and haemorrhage	Gastrectomy 1948	Too recent for comment.
12	M	1930	D.U.	5	Marg. Ulcer	Pain and haemorrhage	Ligation of vessels 1937	Pain. No further haemorrhage.
13	M	1928	D.U.	1	Marg. Ulcer	Pain	Stoma enlarged 1930	Symptoms have persisted.

Contd. on next page.

TABLE XXV. (contd)

No.	Sex	Operation	Original Diagnosis	Recurrent year of onset	Diagnosis	Indication for 2nd operation	Secondary Operation	Result
14	M	1934	D.U.	3	Marg. Ulcer	Perforation	Suture of Perforation 1939	Symptoms have persisted.
15	M	1937	D.U.	2	Marg. Ulcer	Perforation	Suture of Perforation 1940	Symptoms but not severe.
16	M	1927	D.U.	1	Marg. Ulcer	Perforation	Suture of Perforation 1937	Symptoms have persisted.
17	M	1929	D.U.	1	D.U. Marg. Ulcer	Perforation	Suture of Perforation 1937	Symptoms have persisted.

duodenal ulcers. Reformation of the gastro-enterostomies has since resulted in complete freedom from symptoms. The Surgeons concerned both ventured the opinion that the closure of the stoma had resulted from marginal ulceration. The patients stated that their symptoms were exactly similar to those caused by their pre-operative duodenal ulcers. During this follow-up, the author has found that many patients have been unable to differentiate the symptoms they have from marginal ulcers from those they previously experienced and which were due to duodenal ulcers. It seems probable, therefore, that in the two patients concerned the early symptoms of recurrence were those of marginal ulceration and the later symptoms, when the stoma had closed were due to re-activation or recurrence of duodenal ulcers. As far as the patients were concerned there had been no change in the site of ulceration. It would be impossible to confute the speculation that ulceration at the stoma in these two patients produced no symptoms - ulceration producing inflammatory reaction sufficiently intense completely to obliterate the stoma.

These were the only two elective operations short of gastrectomy, which have produced relief for a reasonable period of time. 6 gastrectomies have been performed, 2 died within the immediate post-operative period, 1 has a marginal ulcer, 1 has mild symptoms of "dumping" character and 2 performed 9 months ago are symptom free.

It/

It may seem surprising, in view of the findings of the present study that about 40 per cent of patients have recurrences of considerable severity, that only 12 patients, 5 per cent have undergone secondary operation. It seems likely that the explanation lies largely in the lack of a systematic follow-up in these cases. A patient having subjected himself once to an operation for "cure" of his complaint without success is loath to seek further surgical help. During the present investigation 2 patients were advised to have further operation and have since had successful gastrectomies. No doubt had these patients had the benefit of a regular follow-up service many more would have accepted similar advice.

7. LATE DEATHS DUE TO PEPTIC ULCER.

In all 4 patients died from causes directly attributable to peptic ulceration. 2 died as a result of secondary operation. 2 died from haematemesis - both duodenal ulcer cases, one 7 years after operation when 61 years of age and the other 10 years after operation when 46 years of age. In two patients who died of Carcinoma of Stomach, the neoplasm would appear to have been secondary to benign ulceration. It is doubtful if the three cases who died of Carcinoma of Stomach within 2 years of operation would have been cured by gastrectomy. Nevertheless, since Carcinoma of Stomach is rarely diagnosed at a date so early that the operative signs favour innocence, there is a chance that satisfactory/

satisfactory results might have ensued. The duplicity of these ulcers underlines the danger of gastro-enterostomy on such occasions.

As those patients with active secondary ulceration enter the danger age of 45 years and onwards there is no doubt that several may succumb to haemorrhage.

PART IV.

DISCUSSION.

1. GENERAL RESULTS.

It would appear from this study that, when followed over a considerable period of time, there is a gradual increase in the number of patients who have recurrence of symptoms after gastro-enterostomy for peptic ulceration. The onset of recurrence is most marked within the first five years, but, thereafter, relapses continue to occur. After a period of between 15 and 20 years, 50 per cent are found to have symptoms of peptic ulceration. Compared to their pre-operative state, 25 per cent are no better or worse; 12.5 per cent though improved suffer considerable disability; and a further 12.5 per cent are markedly improved. In 37.5 per cent cases, therefore, the result leaves much to be desired. This incidence of recurrence is high, though relapse rates from 4-40 per cent are to be found in the literature and in many publications it is notable that the longer the follow-up, the greater is the incidence of recurrence. Walton (1944) in his carefully controlled follow-up of over 1000 cases found an incidence of 4 per cent. In this present series, considering haemorrhage alone, the incidence is 12 per cent; haemorrhage and perforation together 14 per cent; haemorrhage, perforation and those patients, excluding haemorrhage and perforation, requiring re-operation for peptic ulceration 17.5/

17.5 per cent. It is possible as Walton (1944) and Tid#y (1944) suggest that there is a national and even a regional difference in the character of peptic ulceration.

In view of this high relapse rate, one is encouraged to enquire whether the operation has in any way altered the natural progress of the disease or the diathesis apart from changing the site of ulceration. In other words, how do the results of peptic ulcer uncomplicated by stenosis and treated by gastro-enterostomy compare with peptic ulcer uncomplicated by stenosis and under similar sporadic medical treatment. In order to get a comparison of peptic ulcers drawn from the same catchment area reference was made to the investigation of Illingworth et al (1946) into the progress after perforation. The two series are similar in that the patients were left to their own devices after in-patient and out-patient surveillance of several months; thereafter, their dietary control and drug administration was generally haphazard. They differ, of course, in that the present series was by and large under treatment a decade previously and also in the recent series, all cases were perforations. Both series are remarkably similar in age and sex distribution and indeed the distribution of gastric and duodenal ulcers is exactly comparable. 25 patients with pyloric stenosis who were observed 5 years have not been included in the figures since obstruction is not a factor in the/

the perforation series and would, by inclusion, improve the results of the present series. Cognisant of the fallacy of comparing two series which do not run concurrently, it is felt that the difference is sufficiently striking to warrant comparison. In table IX are shown the respective percentage incidences of major complications and elective operations and it is seen that, in peptic ulcer treated by gastro-enterostomy, this incidence is almost half of that which occurs within 5 years of perforation. The comparison is shown graphically in Fig. VI.

In the series of Illingworth et al, relapses were classified as severe and mild. Those classified in the present investigation as moderate fall within the severe group in the former. A comparison of the incidence of relapse can, therefore, be made and is shown for the 5th year of follow-up in Table XXVI. Fig.VII shows the comparison of the incidence of unsatisfactory results in the two series during the first five years follow-up.

TABLE XXVI. - COMPARISON OF INCIDENCE OF RELAPSES IN PRESENT SERIES AND THAT OF ILLINGWORTH ET AL (1946) AT 5TH FOLLOW-UP YEAR.

	No. of cases	Symptom-free	Relapses.	
			Severe	Mild
Illingworth et al	166	30%	50%	20%
Present series	197	63.9%	27.5%	8.6%

It is seen that by the end of the 5th year of follow-up slightly/

FIG. VI. - INCIDENCE OF MAJOR COMPLICATIONS AND ELECTIVE OPERATIONS AFTER GASTRO-ENTEROSTOMY. COMPARISON WITH FIGURES OF ILLINGWORTH ET AL (1946).

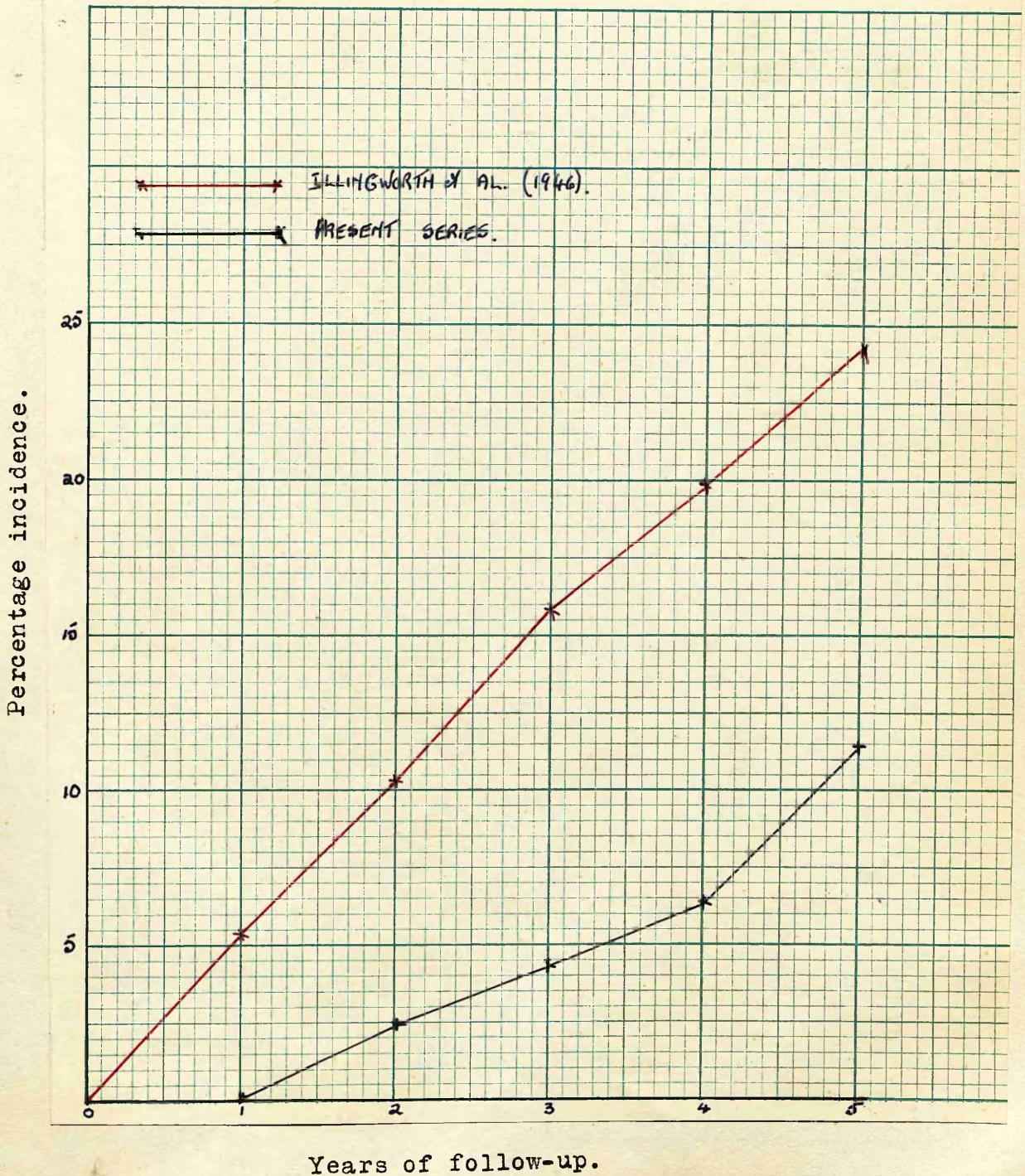
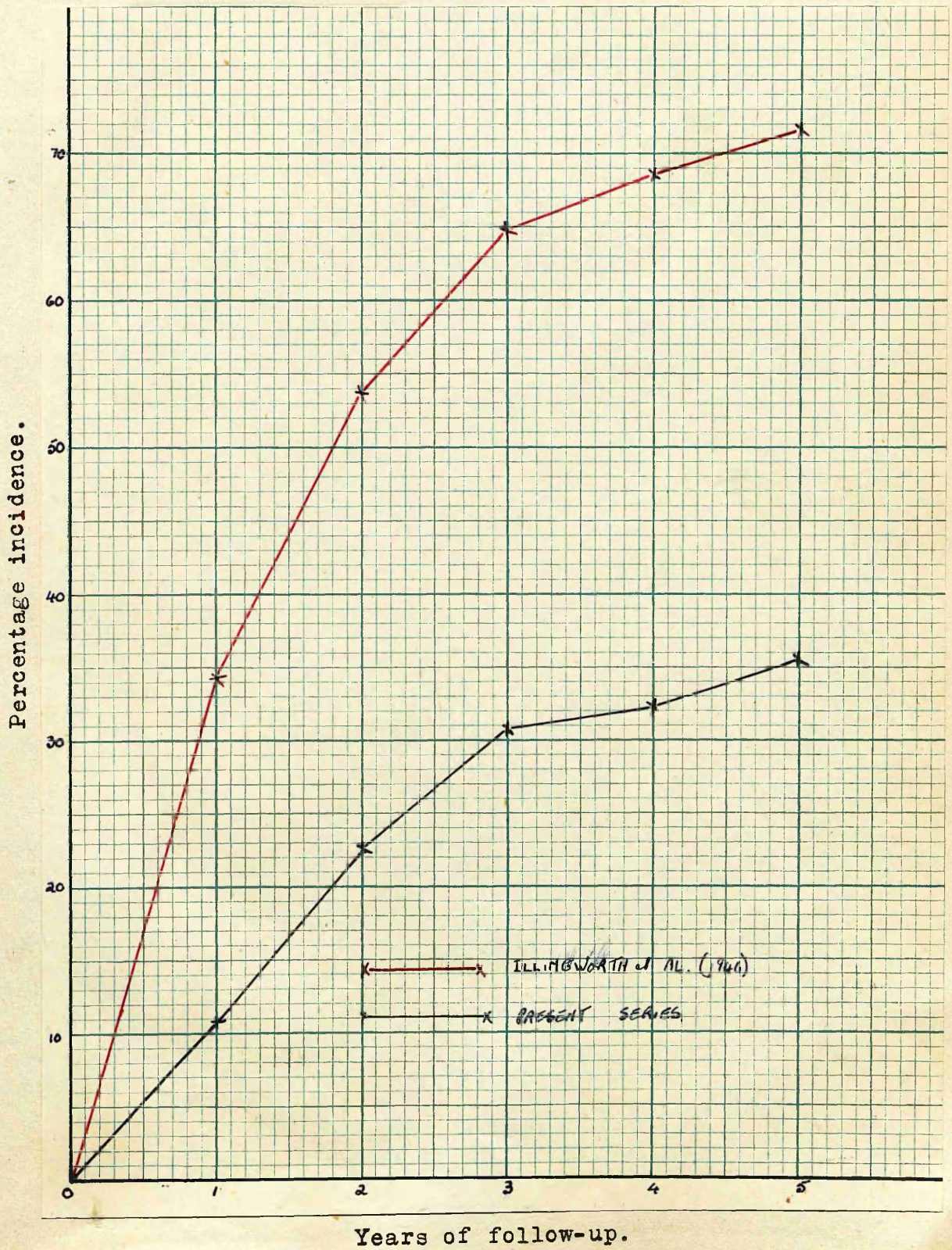


FIG. VII. - INCIDENCE OF UNSATISFACTORY RESULTS AFTER GASTRO-ENTEROSTOMY. COMPARISON WITH FIGURES OF ILLINGWORTH ET AL (1946).



slightly more than twice are symptom-free after treatment by gastro-enterostomy. The effect of a short-circuit operation alone is, therefore, considerable. Moreover, the operation, certainly as far as duodenal ulcer is concerned, invariably achieves the purpose for which it was performed. viz. the healing of the duodenal ulcer but carries with it at least a 50 per cent hazard of stomal ulceration within a period of about 20 years.

2. PYLORIC STENOSIS.

It has been generally accepted that the best results, following gastro-enterostomy, were obtained in those cases in which there was a degree of obstruction. According to Farquharson (1935) and Nicol (1942) the greater the degree of obstruction, pre-operatively, the better were the results. Wilkie (1926) anticipated 90 per cent good results where the duodenal ulcers were associated with some stenosis. More recently Reid and Marcus (1948) reported 98 per cent good results in patients alive 10 years and more and who had undergone posterior gastro-enterostomy for organic pyloric stenosis. There were 25 patients with pyloric stenosis in this series and the results are strikingly more favourable than in peptic ulcers without obstruction (Table XI). Even so, about 25 per cent suffered recrudescence of symptoms of varying degrees and although only one patient was classed as a severe relapse, some

15 per cent were moderately severe. These results compare unfavourably with those generally accepted as mentioned above. However, they do tend to agree with the experiences of Thompson (1948) and Patey (1948) - to quote the latter "my experience has been (and I know it is the exact reverse of what is generally taught) that, in cases of pyloric stenosis especially, gastro-enterostomy is liable to be followed by anastomotic ulceration". There is, therefore, even today, considerable divergence of opinion concerning the effectiveness of a short circuit operation in pyloric stenosis. There is no doubt, however, that when compared to the results in peptic ulcer without stenosis they are considerably better and that in some way or another the operative factor in improvement is the stenosis at the pylorus. The difference in results would seem to be due to the selection of cases and the variance of opinion as to what degree of obstruction at the pylorus constitutes pyloric stenosis. There is no doubt that the differentiation of spasmodic and organic pyloric stenosis is neither easy nor immediately obvious, especially when an element of each exists. When the spasm and oedema subside with the rest afforded by gastro-enterostomy, the degree of obstruction may no longer satisfy the criteria of pyloric stenosis although a degree of organic stenosis persists. It would appear, therefore, that such cases should be excluded by conservative measures directed at relief of the pylorospasm and the subsidence of/

of the inflammatory reaction around the ulcer. A period of medical measures such as rest in bed, gastric lavage, anti-spasmodic drugs and the correction of dehydration and chloride deficiency would be advisable before assessment of the definitive treatment.

It would seem apposite to consider the beneficial effect bestowed by pyloric stenosis on the operation of gastro-enterostomy. Accepting the postulate on which present-day medical and surgical treatment is based, viz. that acid peptic juice is the immediate cause of or the factor which perpetuates ulceration, it would seem that those patients who do well are those in whom there is achlorhydria or hypochlorhydria and whose acid level remains absent or deficient despite medical and surgical drainage of the stomach. It would appear that stenosis produces its depressing effect on the acid secretion by the consequent gastric retention. This retention results in dilution of the acid partly by accumulation of ingested food and fluid but also by exudation from the mucosa of the stomach comparable to the loss of fluid which occurs locally in acute dilatation of the stomach and into loops of small bowel which are obstructed. This finds clinical support in the fact that patients with pyloric stenosis often vomit a volume of fluid considerably greater than that ingested. The gastritis which occurs with gastric retention probably also causes an increased secretion of alkaline mucus. Institution of medical or surgical/

surgical drainage by lavage or gastro-enterostomy may result in a return to original acid levels, the prognosis for gastro-enterostomy then being similar to that in uncomplicated duodenal ulcer. It would appear, however, that where the stenosis has been marked, mostly organic, and of considerable standing the secretion of acid may be permanently depressed, presumably due to permanent damage to the oxyntic cells. In these cases after drainage, the acid level remains depressed and the prognosis after gastro-enterostomy consequently better. In those patients with long-standing pyloric stenosis, age is also a factor, the acid level being lower in the sixth and seventh decades. In the selection of patients with pyloric stenosis for treatment by gastro-enterostomy frequent estimations of the gastric acidity would indicate the degree of depression of the acid level and give signs of recuperation of the acid secreting cells. If hyperacidity in duodenal ulcer is a contra-indication to gastro-enterostomy, there seems to be no reason for its indicating the same operation in pyloric stenosis. The presence of "ulcer" pain associated with symptoms of pyloric stenosis may indicate an active ulcer and suggest that much of the stenosis is "spasmodic". Moreover, as Wolff and Wolff (1943) have shown, an active ulcer in the duodenum produces reflex hyper-secretion in the stomach. The degree of patency of the pylorus as measured by Barium Meal investigation or by the symptomatology is less helpful in selection than some measurement of the secondary/

secondary effects on the stomach which are a consequence of the stenosis. The argument so far is based on the acid theory of the genesis of peptic ulceration and which finds confirmation in the experiments of Mann and Williamson and the absence of marginal ulcers after gastro-enterostomy performed in the presence of gastric carcinoma. It would appear that the secondary effects on the stomach consequent on stenosis of the pylorus are most important. From a physiological point of view, obstruction at the pylorus per se, far from lessening the tendency to secondary ulceration, is more likely to increase it. The main stimulus to the production of alkaline bile, duodenal secretion and pancreatic secretion is provided by the passage of food through the duodenum and as has been shown by Mann and Williamson if the jejunal mucosa is exposed to gastric juice without the admixture of these juices an ulcer will form in practically every case. In the operation of gastro-enterostomy for pyloric stenosis, these secretions are undoubtedly present but there is every reason for their being present in diminished amount. Moreover, complete division of the pylorus in the presence of secondary ulceration has not been found to heal the ulcer. That there are other unknown factors which influence the results has been suggested by Nicol (1943) and Holman and Sandiesky (1938) who have found little relationship between the reduction in the concentration of free HCl and the clinical improvement produced by the operation. Indeed the latter/

latter authors found change in the acid secretion of the stomach to be exceptional and that high pre- and post-operative levels of free HCl were consistent with good results.

3. GASTRIC ULCER.

As regards gastric ulcer, the results were some 55 per cent unsatisfactory by the 20th year of follow-up. These results are markedly contrary to a common impression that gastro-jejunal ulceration is rare after gastro-enterostomy in gastric ulcer. On this score alone, gastro-enterostomy is not advised. Moreover, though the number of patients with gastric ulcer observed is small and no significant dictum can be issued, there is a danger of gastric carcinoma arising in simple ulceration. This danger is further stressed by the difficulty at operation of being certain that the ulcer being dealt with, despite its innocent appearance, is not already malignant. 3 cases in this series are examples. If gastrectomy for some reason, such as frailty of the patient, is not advised, there would appear to be no indication for a short circuit operation as medical measures alone will produce almost as good results Maingot (1948). Since gastric ulcers are potentially malignant careful periodic review of the ulcer by X-ray and direct vision is essential to assess healing and any tendency to malignant change. It has been shown by Gray and Lofgren (1948) that the true nature of a lesion in the stomach on/

on which gastro-enterostomy has been performed is often very difficult to determine. Roentgenographic examination of a lesion in the stomach after gastro-enterostomy is of necessity more difficult on account of the structural changes present. This is especially so when the lesion is situated in the stomach distal to the gastro-enteric stoma. The same authors stress that a high proportion of ulcerating lesions which develop in the stomach, even where gastro-enterostomy has been performed for duodenal ulcer, are malignant and are difficult to diagnose, for the clinical history and the X-ray findings by necessity are less accurate than in ordinary routine study of patients.

4. DUODENAL ULCER.

The original lesion in the majority of patients was duodenal ulcer. At the 20th year of follow-up there was an incidence of recurrence of 62 per cent. By the 10th year, as many as 45 per cent had relapsed, more than half of them seriously. As a treatment of duodenal ulcer, it cannot be advised unless in exceptional circumstances when compared to the results reported for gastrectomy. In patients under 40 years of age, there would appear to be no doubt that the latter operation is the preferable procedure. As is discussed below, it is in the older age groups, that doubt may exist. Until mortality and morbidity rates for gastrectomy are better known, it/

it is probably wise that that doubt be encouraged.

5. THE PLACE OF GASTRO-ENTEROSTOMY IN THE TREATMENT OF PEPTIC ULCERATION.

Heuer (1944) has produced a closely reasoned argument for a place for gastro-enterostomy in the surgery of peptic ulcer. In his own wide experience and from a study of the literature up to 1935 he found that the satisfactory results of gastro-enterostomy and gastrectomy on long and short-term follow-up was 10 per cent in favour of gastric resection, an advantage which he maintained was reduced by the lesser immediate mortality of the former operation. In his own series of 159 duodenal ulcers followed from 3 months to 10 years (only 85 patients followed from 5-10 years), he recorded 78.6 per cent satisfactory results. He gives no figure for the 10th year of follow-up and presumably on the basis of the present investigation some of the 75 patients not yet followed 5 years may relapse. His case for gastro-enterostomy is further based on his operation mortality 3.2 per cent and the recurrences after gastrectomy which he estimates at 8 per cent. It is obvious that, on these figures, a successful plea for the operation might be lodged. Based on the results of the present investigation no plea could be entertained more especially in view of the recent published figures of Visick (1948) for more radical gastrectomies showing that the recurrence rate is almost nil and that the operative mortality is no more than that of the less radical procedure.

In/

In view of the 50 per cent good results which have been achieved over a period of almost 20 years it seems pertinent to enquire if a selective policy would enhance the reputation of the operation. Taylor (1944) has claimed a marked reduction in his recurrence rate, to the region of 5 per cent, by pre-operative selection. He finds estimation of free HCl unreliable and bases his selection on gastroscopic appearances. He has found that where the mucosa is turgidly vascular and the rugae exaggerated, relapses tend to occur after gastro-enterostomy. Gastrectomy is advised in these cases. In an organ whose vascular arrangement is designed for marked and indeed rapid changes of circulation, the method would seem to be not infallible. Other gastroscopists Kay, Jamieson (personal communication) consider the mucosal appearances to be too labile to be reliable. The only factors gleaned from the present investigation which appear to have a beneficial effect on the result after gastro-enterostomy have been old age, pyloric stenosis and female sex. The beneficial effect of these factors, however, is not sufficiently marked either singly or in combination to warrant selection on these grounds alone if results, comparable to those after gastrectomy, are to be attained.

Until some means of selection is forthcoming, gastric resection remains the most certain method of cure of peptic ulceration. At the same time one cannot lose sight of the mortality of the radical operation which approximates to that of/

of gastro-enterostomy only in skilled hands. Extensive gastrectomy by "occasional" gastrectomists would tend to close the gap in the results of the two operations. More information is necessary regarding the mortality following gastrectomy in patients in their fifth and sixth decades - those decades in which haemorrhage is most lethal and in which gastrectomy is most indicated. There is no doubt that it is high. The mortality in those decades in the present series is high - 15 per cent, but this could undoubtedly be bettered today. If the disparity between the mortality rates in the two procedures in these decades is large, there may be controversial and even good grounds for advocating gastro-enterostomy in these people, since the present investigation reveals a promise of almost 60 per cent cure over a period of fifteen years. Gastro-enterostomy with a 60 per cent cure rate and a 10 per cent or lower mortality may have more to offer than the more radical operation in those decades. Vagotomy is too recent a procedure to allow of fair comparison but where it is combined with gastro-enterostomy the curative effect of the latter procedure alone will have to be taken into consideration in estimating the results of vagotomy.

If precise indications are to be listed the present study suggests that the operation of gastro-enterostomy has limited application in the treatment of peptic ulcer. It has no application in the treatment of gastric ulcer. It should be reserved for aged and frail patients, those with marked organic pyloric/

pyloric stenosis and those who for other reasons are unfit to withstand the hazards of gastric resection. The sex of the patient would be a helpful deciding factor, other indications being present since relapses in females are less severe. When the whole story has been told of the more fashionable procedures, it is possible that gastro-enterostomy may recoup a little of its former glory.

6. THE MODUS OPERANDI.

In discussing the failure of operation, one is apt to lose sight of the fact that for a period of between 15 and 20 years, 50 per cent of the patients were cured and a further 12.5 per cent had enjoyed considerable relief as a result of the operation. The failures can be readily explained on present day theories of causation of peptic ulceration. It seems surprising that a larger percentage, if not all, did not relapse. There is no ready explanation for the successes. It has not been possible in this investigation to demonstrate any clinical feature by which patients who remain cured by gastro-enterostomy can be differentiated from those who relapse though it has been shown that the operation has a definite and considerable curative effect. The modus operandi is not obvious. It has been presumed that its action is produced by more rapid dilution and neutralisation of acid gastric juice, but, as already mentioned this effect, as measured by the concentration/

concentration of free HCl, has no parallel in the clinical results, high post-operative concentrations being consistent with good results. Alvarez (1940), Anderson (1942) and Kay (1949) have shown that the motor activity of the stomach remains unaltered following gastro-enterostomy. The radiological studies of Case (1925) revealed that the stomach behaved as if no new opening were present and that the gastric wave ran towards the pylorus, endeavouring to empty the stomach through the natural channel. The emptying time was usually shorter than normal. The only deduction to be made is that some unknown factor influences the symptoms and healing to greater extent than does free HCl. It has been shown by Truesdale (1915) and confirmed by Horwitz et al (1928 and 1929) that as a result of gastro-enterostomy the muscle in the pyloric sphincter and antrum atrophies to a certain extent, a feature which may explain the relief of pain (if pain be due to spasm). A patulous sphincter would allow of more ready regurgitation of duodenal contents but at the same time would have a measurable effect on the acid level. Thus, by all standards of measurement, the operation produces little, apart from architectural, alteration. The mechanism by which gastro-enterostomy exerts its curative effect, therefore, remains a mystery.

GENERAL SUMMARY.

1. The broad trend of Surgical treatment in peptic ulceration is traced. Though the trend has been towards the more radical procedure of extensive gastrectomy several authorities maintain, with variable emphasis, that gastro-enterostomy is still a valuable procedure.
2. Attention has been drawn to the danger in comparing mortality rates where the age distribution of patients is not known.
3. Methods of reporting follow-up results is briefly discussed and the caution required in comparing results is stressed. A method of reporting results which allows of comparison with similarly reported results is used in the present investigation.
4. The material in this review consists of 330 posterior gastro-enterostomies performed for peptic ulceration between the years 1924 and 1937. Of these 270 were traced.
5. The results are given on a cumulative basis over a period of 20 years. The impact of site of ulceration, presence or absence of obstruction, age, sex and chronicity of ulcer on the results is analysed.
6. The curative effect of gastro-enterostomy per se as a treatment/

treatment of peptic ulceration has been estimated and found to be considerable.

7. The general results show that in round figures after a period of between 15 and 20 years, 50 per cent are found to have recurrence of symptoms; 25 per cent being no better or worse, 12.5 per cent slightly improved and 12.5 per cent markedly improved. 50 per cent are symptom free.

8. The pathology of recurrence is discussed and the author is of the opinion that this is largely due to secondary ulceration at the stoma.

9. The danger of performing gastro-enterostomy for gastric ulcer is stressed.

10. The place of gastro-enterostomy in the treatment of peptic ulcer is discussed and the only factors discerned which improve the results have been the presence of organic pyloric stenosis, old age and female sex. The tentative suggestion is made that when the mortality and morbidity rates for gastrectomy in the older age groups is better known, there may be a place for gastro-enterostomy in those age groups.

11. The mechanism by which the operation produces a favourable result is not obvious. Gastric acidity is, on the average, unchanged, /

unchanged, high post-operative levels being consistent with good results. The gastric motility is also unchanged.

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