and the sum of the individual requirements may then be compared with the family intake actually obtained. More usually the scale of requirements may be used to reduce the family intake to a unit value—the so-called “man value” basis. By these means one family may be compared with another and the manipulation of the results generally is greatly facilitated. Now let us consider the shortcomings of this method.

1. Many assumptions have to be made, even in the collection of the data. If any members of the family take meals away from home the amount consumed by them is a matter of guesswork. The same applies if visitors are entertained during the period of investigation.

2. At best the “family” method gives only average results. Individuals within the group may not behave in the predicted manner, and the results obtained therefore have little or no individual significance. To cite a particular instance, if a mother were to starve herself to death for the sake of the other members of the family, the result would merely be a somewhat subnormal intake for the family on the “man value” basis.

3. The use of a scale of requirements to reduce an accurately measured group intake to a unit value is fraught with danger. Requirements are always a matter of judgement, and every investigator either selects one of the thirty-eight scales of requirements already proposed or introduces yet another more in keeping with his own ideas. When, therefore, the same family intake is reduced to a unit value basis, the results shown may vary by 30 per cent., according to the reducing scale adopted.

4. The scales of requirements in current use are scales of calorie requirements. Everything that we know about requirements indicates that a different scale of requirements should be used for each food constituent investigated. It is in fact a serious mistake to apply a scale of calorie requirements to evaluate intakes of calcium—or iron—or indeed of anything other than calories. This mistake, however, is still frequently made (Cathcart and Murray, 1936; Newcastle, 1936). It is no excuse to plead that requirement scales for calcium or iron are not in existence. Better far to give no results for these ions than to give results which are incorrect and misleading. Actually, scales have been drawn up on these lines, and that suggested by Stiebeling and Ward (1933) is probably the best in existence at the present time.

Conclusions

The food intake of a family may be ascertained with considerable accuracy, but the result has little meaning, and the reduction of this result to a unit value basis gives at best an average without individual variations and is achieved only by making some very daring and wholly unwarranted assumptions. Obviously the family method can never be used to assess requirements, since an arbitrary scale of requirements is invariably used in manipulating the results.

It is difficult indeed to understand why the family method of investigation has had such a vogue, but this point lies quite outside the scope of the present critique. The question is rather whether it should ever be used again. If no other method of studying food intakes were available there would of course be no question, but it is difficult to see what advantages, if any, the family method has over the individual method. Any result obtained by the former technique can be obtained with greater accuracy and without assumptions by the latter. The individual method of study is not difficult, and we would urge those desirous of making nutritional investigations to

give it a trial rather than to follow slavishly a method the results of which are so very difficult to interpret.

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THE TREATMENT OF NON-STENOSING PEPTIC ULCER*

BY

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This discussion has been limited advisedly to the treatment of non-stenosing peptic ulcer, because where stenosis has established a mechanical obstruction there can be no difference of opinion as to the appropriate treatment. Mechanical obstruction demands surgical relief.

In the treatment of non-stenosing ulcers there has been a movement during the past decade, in practice rather than in opinion, towards conservative measures. The best surgical opinion has always upheld a sane conservatism. It was a favourite *obiter dictum* of Lord Moynihan's that he never operated on a case of duodenal ulcer until it had been cured nine times by a physician. But there is no doubt that some years ago there were numerous surgeons who regarded all chronic peptic ulcers as suitable grist for their mill, though, being what are known as “practical surgeons,” they were not given to airing their views in the medical literature. The swing of medical opinion that has effectually prevented this wholesale and indiscriminate operating upon non-stenosing ulcers is, it will be agreed, a good thing. But in a discussion such as this we should not be influenced greatly by the vogue of the moment, but should seek to inform medical opinion on the more controversial points of treatment, and to lay down clear and precise indications as to the place of surgery in this field.

The change in practice to which I have alluded has been brought about partly by the unfortunate results of indiscriminate surgery, but chiefly by improved medical technique. The almost universal use of fractional gastric analysis has provided a much better guide to treatment than to diagnosis. Far more attention has been devoted to diet, and it has been widely realized that diet is more important than alkalis in the continuous neutralization of hyperchlorhydria which is the aim of medical treatment. There is also a praiseworthy tendency in many quarters to test the results of medical treatment by repeated radiological studies, though, as we shall see later, there are dangers in placing too much reliance on the picture of an ulcer crater.

These advances in medical technique compel our admiration and approval. A less admirable development of recent years has been the widespread use by patients of the various proprietary alkaline powders and medicines, often in large doses over a prolonged period and often with serious toxic results. On the recent vogue of treatment by histidine injections I will merely say that in my

* Read in opening a discussion in the Section of Surgery at the Annual Meeting of the British Medical Association, Belfast, 1937.

judgement it has no convincing scientific foundation save that of psychotherapy, and venture to predict that it will soon have its day and cease to be.

Duodenal Ulcer

The proper treatment of non-stenosing duodenal ulcer is medical. Few, I imagine, will dispute this statement, or deny that if the medical treatment is thorough, including an adequate period of rest in bed at the start and the most punctilious regulation of diet and manner of life in the later stages, the results will usually be good. But cases are not uncommon in which medical treatment fails because the patient is unable or unwilling to carry out instructions as to diet, or for various other reasons. When medical treatment has repeatedly failed or is for social reasons impracticable, ought we to refuse the patient the benefit of surgery until, after years of suffering, he can provide evidence of pyloric stenosis? Some would answer "Yes," but I would not count myself as one of these pessimists.

Another indication for surgery in duodenal ulcer is the occurrence of severe haemorrhage, in one or more attacks. I do not now advocate operation during or immediately after a grave haemorrhage, for I believe the risks are too great. But a serious haemorrhage is very prone to recur, and our aim should be to prevent the chance of a recurrence if we can do it with reasonable safety. The grave emergency can generally be tided over by blood transfusion, and then, when the pulse rate and volume and haemoglobin percentage show that we can operate with safety, we should not delay longer if the patient is on general grounds a good surgical risk and if we are sure that he has a chronic ulcer. I do not dwell on acute perforation as an indication for surgery, since that is outside the realm of controversy.

The Choice of Operation for Duodenal Ulcer

We have not solved the problem, however, when we have laid down the indications for operation. An equally important question is, What operation should we perform? Where the main indication for operation is the prevention of recurrent haemorrhage I am sure that the right answer is this, that the first essential is to excise the ulcer, and with it the vessel that has been bleeding. Gastro-enterostomy alone is a very ineffective operation for a bleeding duodenal ulcer, and gastro-enterostomy combined with excision of the ulcer is both difficult and dangerous. The most effective method of excising the ulcer is to include the first part of the duodenum in some form of gastrectomy. This both controls the source of the bleeding and averts the danger of a recurrence. But where the ulcer is a penetrating one on the posterior wall of the duodenum with great surrounding fibrosis its excision may involve too much danger. In such cases it may be more prudent to leave the ulcer alone, divide the pre-pyloric portion of the stomach some two inches above the pyloric sphincter, and do a high Polya gastrectomy. The ulcer will be left in a cul-de-sac of duodenum removed from contact with acid gastric juice, and may be relied upon to heal without delay.

We must now consider the choice of operation for simple non-stenosing duodenal ulcers with no history of haemorrhage. It is comparatively rarely that we are called upon to operate on such cases, but in recent years opinion has been more divided as to the best operation to perform in this condition than upon any question in gastric surgery. We may, I think, exclude from our consideration such operations as gastro-duodenostomy in its various

forms, which have never achieved great popularity among surgeons in these islands, and other "fancy operations," and limit our attention to the question of posterior gastro-enterostomy versus gastrectomy. Posterior gastro-enterostomy is an operation with a very low mortality—not more than 2 per cent. in competent hands—and the vicious-circle vomiting so often met with twenty years ago has been eliminated by modern technique; but over it hangs the dread of gastro-jejunal ulcer, and gastro-jejunal ulcer is a far worse calamity than the duodenal ulcer to which it may succeed. What is the risk of this calamity after a posterior gastro-enterostomy? The most careful and comprehensive inquiry into this problem was the collective investigation carried out for the Fellows of the Association of Surgeons of Great Britain and Ireland by Garnett Wright and published in 1935. In a series of 1,730 cases of duodenal ulcer treated by posterior gastro-enterostomy he found an incidence of gastro-jejunal ulcer amounting to 8.49 per cent. But there are certain difficulties in accepting this figure as the whole truth. No fewer than 1,004 other cases were untraced, and it is a matter of speculation whether that large number contained a higher or a lower incidence of gastro-jejunal ulcers than the cases that were traced. My own opinion, for what it is worth, is that the incidence would be somewhat higher. Then there was a series of 507 gastric ulcers in this investigation with the surprisingly high incidence of 10.45 per cent. of gastro-jejunal ulcers. This is surprising, for the reason that operations for gastric ulcer are in the experience of most surgeons far less likely to be followed by gastro-jejunal ulcer than are operations for duodenal ulcer. Garnett Wright very justly ascribed this anomaly to the inclusion in this gastric group of many "pyloric ulcers" that should more properly have been described as duodenal. A correction of this classification, had it been possible, would have swollen still further the incidence of gastro-jejunal ulcer. I think it is not unfair to conclude that if we take the work of surgeons of repute all over the country we may consider that posterior gastro-enterostomy for duodenal ulcer is followed by gastro-jejunal ulcer in about 10 per cent. of cases. I do not forget that Sir James Walton (1934), in a personal series of 893 duodenal ulcers, all of which were traced, found only 3.24 per cent. of gastro-jejunal ulcers; but that is gastric surgery at its best, and I suggest the figure of 10 per cent. for gastric surgery of good average quality. Some may estimate the incidence as even higher.

This conclusion is a grave indictment against the operation of posterior gastro-enterostomy for the non-stenosing duodenal ulcer, and this is the reason why many surgeons in this country, and I think more surgeons on the Continent, are abandoning gastro-enterostomy except where stenosis is present. There is good evidence for the belief that gastrectomy, by permanently lowering the secretion of hydrochloric acid, involves a much lower risk of anastomotic ulcer later, but it is a more difficult operation, with a higher mortality, and is certainly no operation for the occasional surgeon.

What is the operative mortality of gastrectomy for duodenal ulcer? It is higher, I believe, than that of the same operation when performed for gastric ulcer, because of the greater technical difficulties, and it may be estimated as somewhere in the region of 6 per cent. But it is essentially capable of reduction in competent and experienced hands, though it is too much to hope that gastrectomy for duodenal ulcer will ever carry as low an operative mortality as gastro-enterostomy.

The conclusion I submit is the following. Where the gastric analysis shows a high hydrochloric acid curve, as it commonly does in young men with duodenal ulcer, the

risk of gastro-jejunal ulcer later is so grave that we should do a high gastrectomy, preferably of the Polya type. In duodenal ulcer in women the risk of recurrent ulcer is much less, and here, if the test meal shows a low acid curve, gastro-enterostomy is a very satisfactory operation. In elderly patients who are poor risks by reason of cardiac or pulmonary degeneration there is also less danger of recurrent ulcer, and where some operative measure is inevitable the less severe operation of gastro-enterostomy should be performed.

Gastric Ulcer

Although gastric ulcers share with duodenal ulcers a common, and largely uncertain, aetiology, their surgical treatment presents very different problems. As we have seen, our treatment of a duodenal ulcer is conditioned by the fear of a more or less remote gastro-jejunal ulcer. Operations for gastric ulcers, however, because of the much lower gastric acidity, are very rarely followed by anastomotic ulcers. But gastric ulcers carry their own special nightmare—the dread of carcinoma. Carcinoma in the first part of the duodenum is so rare that it may almost be said not to occur there, nor does a cancer of the pyloric end of the stomach ever spread into the duodenum. But the stomach is the commonest site of cancer in the body.

The Relation of Gastric Ulcer to Cancer

The danger of cancer supervening on a chronic gastric ulcer has been greatly exaggerated in many quarters. It is a long time since Wilson and MacCarty (1909) of the Mayo Clinic startled the medical world by the statement that 68 per cent. of all gastric ulcers removed at operation showed microscopical evidence of malignancy, and that 71 per cent. of all gastric carcinoma showed pathological evidence of a preceding simple ulcer. It has been proved by many succeeding investigators, approaching the problem from both the pathological and the clinical aspects, that the incidence of the so-called ulcer-cancer is far smaller than Wilson and MacCarty claimed. The site of election of gastric ulcers, which are mostly on the lesser curvature, differs in a striking way from that of cancer, which occurs most commonly near the pylorus, and Stewart's investigations on this point are visualized on the accompanying diagrams (Figs. 1 and 2). Stewart (1931), in a series of 277

FIG. 1.—Site of ulcer.

FIG. 2.—Site of carcinoma.

chronic ulcers removed by operation, found evidence of early carcinoma in 6.1 per cent. Newcomb (1932), in another careful pathological investigation, showed that 3.5 per cent. of gastric ulcers showed an early malignant change. My own opinion, based upon both histological and clinical evidence, is that malignant transformation of a simple gastric ulcer is a very rare event. In a series

of fifty-four cases of proved cancer of the stomach I found (1923) that the average duration of gastric symptoms before examination was 12.7 months, whereas in forty-five cases of proved simple chronic ulcer the average duration of symptoms was 10.3 years.

It is not, I would suggest, the frequency with which they become malignant that should influence our attitude to the treatment of gastric ulcers so much as the difficulty in many cases of arriving at an accurate diagnosis between simple and malignant ulcers. There is a type of slow-growing cancer of the stomach, by no means uncommon, which very closely simulates the clinical picture of gastric ulcer. In these cases the pain is at first periodic in character, and is relieved both by food and by alkalis. Appetite is often retained, and the gastric analysis in the early stages shows a high or normal acidity. The growth may be regarded as a simple ulcer for a year or two, and yet is a carcinoma from the beginning. The radiological appearance may be either doubtful or suggestive of simple ulcer.

In view of the rarity of simple ulcers and the frequency of carcinomata in the pyloric region lesions in that position that appear to be simple ulcers should always be regarded with suspicion. It is a sound rule that where a pre-pyloric ulcer has been treated medically for three weeks, and there is still occult blood in the stools, gastrectomy should be performed. Whenever a patient of cancer age presents a considerable ulcer crater in any part of the stomach with a short history of gastric pain a suspicion of malignancy should be entertained, no matter how innocent the radiological appearance may be. The following case illustrates this point dramatically.

A lady aged 60 consulted her doctor complaining of vague epigastric pain of a few weeks' duration and some loss of weight. She had never suffered from indigestion before. A radiograph showed a penetrating ulcer in the middle of the lesser curvature that was regarded as simple. Medical treatment was advised. Six weeks later she was rather better, and had put on a few pounds in weight. A second radiograph now showed that the ulcer crater was nearly filled up. After a further three months she was again losing weight and feeling rather more discomfort, in spite of medical treatment. A third radiograph taken less than six months from the onset of symptoms showed a definite carcinoma at the site of the original ulcer crater. I explored the abdomen and found widespread secondary deposits in the peritoneum, and was unable to do anything. It is certain, I think, in spite of the earlier x-ray appearance, that this was a carcinoma from the beginning.

Such a case teaches us most eloquently that in gastric surgery clinical history may be more reliable than radiological signs.

Whether the wider use of the flexible gastroscope will prove of great value in this difficult matter of distinguishing simple from malignant ulcers I do not know. When I think of the number of cases I have seen in which the innocent naked-eye appearance of the specimen after resection has been falsified by the microscopical evidence of malignancy, I am doubtful.

Quite apart from the urge that the fear of cancer gives us to radical measures for gastric ulcers, the results of surgical treatment of ulcers in this field are more favourable than in the non-stenosing duodenal ulcers. This is mainly attributable to the fact that in gastric ulcers we find a much lower average acidity than occurs with duodenal ulcers, and consequently there is comparatively little danger of recurrent or anastomotic ulceration. Medical treatment, on the other hand, especially in the larger ulcers, is often followed by relapse after relapse.

Choice of Operation in Gastric Ulcer

It will be agreed by most surgeons that simple gastro-enterostomy is not a satisfactory operation for gastric ulcer. Although it will produce brilliant results in a proportion of cases it is too often followed by recurrence. And any operation that fails to excise the ulcer gives no safeguard against the development of a cancer if the diagnosis should be mistaken. Gastro-enterostomy is not enough. Simple excision of the ulcer also stands condemned because it leaves unaltered the physiological conditions that led to the formation of an ulcer, and is followed in a large proportion of cases, as we might expect, by recurrence. Excision of the ulcer combined with gastro-enterostomy is a much more satisfactory operation, but its results are in no respect better than those of partial gastrectomy, and it is often a much more difficult operation to perform. For this reason I now find myself doing it very rarely.

The operation of choice for any accessible chronic ulcer in the stomach is undoubtedly some form of partial gastrectomy. On this main question there is very general unanimity among surgeons. It is only when we come to discuss the precise method of performing the gastrectomy that differences of opinion appear. This is not the place to discuss the minutiae of surgical technique, but the choice lies between some form of Billroth I operation in which the stump of the stomach remaining is anastomosed with the first part of the duodenum, or some variety of the Polya gastrectomy (including Finsterer's operation) in which the stomach is united to the side of the first jejunal loop. There is perhaps no very fundamental principle involved, and every surgeon will tend to get the best results with the type of operation in which constant practice has steadily improved his technique. My own preference is decidedly in favour of that modification of the Billroth I operation associated with the name of Schoemaker. It has the advantages that it is simple to perform, it is less destructive of gastric function than the Polya operation, and it is therefore less liable to be followed by a severe degree of achlorhydric anaemia. I repeat that each surgeon will be guided chiefly by his practical experience. My own experience is that the Schoemaker gastrectomy is the safer operation. For gastric ulcer I have performed the Polya operation only forty-seven times with three deaths, a mortality of 6.4 per cent., while I have performed the Schoemaker operation 171 times with five deaths, a mortality of 2.9 per cent.

I submit that a method of gastrectomy involving a mortality of less than 3 per cent. is getting near to the ideal that it should be as safe as gastro-enterostomy. The convalescence is always smooth and uneventful, and the late results are good in a very high proportion of cases. I have a record of only one anastomotic ulcer following the Schoemaker operation in my own series. For the large ulcers extending high up on the lesser curvature I find this operation rather more feasible than the Polya, because one is not compelled to use the fibrosed lesser curvature adjacent to the ulcer in making the anastomosis.

Treatment of Gastro-jejunal Ulcer

There is no comparison between the ease of operating on a gastric or duodenal ulcer that is, so to speak, virgin soil for the surgeon and the difficulty of an operation for an anastomotic ulcer. To undo the gastro-enterostomy, excise the ulcer, and restore the stomach and jejunum to their original state is often a long and arduous undertaking, so that a surgeon who has accomplished it is

tempted to be content and to close the abdomen. But if he does the original duodenal ulcer may usually be relied upon to re-form, and if later another gastro-enterostomy should be undertaken for its relief the gastro-jejunal ulcer will almost inevitably recur.

There is only one satisfactory operation for a gastro-jejunal ulcer that resists all medical treatment, as a good many of them do, and that is to undo the gastro-enterostomy and then to proceed to perform a high Polya gastrectomy. Only by abolishing the gastric function and removing the oxyntic cells as completely as possible can the vicious circle be broken. There is no more formidable operation in the surgery of the stomach, particularly where a gastro-colic fistula has to be closed in addition. The mortality is a very considerable one, but for those patients who come safely through the operation the prospects of a permanent cure are extremely good.

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THE VALUE OF PATERNITY EXCLUSIONS MADE BY THE BLOOD-GROUPING TEST

BY

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With the increasing demand for the introduction of legislation in this country to allow of the use of the blood-grouping test in all paternity cases it is desirable to examine the test in greater detail to see exactly what it will do. It is unnecessary to discuss in detail the method of inheritance of the blood groups, as this has recently been done by other authors (Harley and Roche Lynch, 1937, 1937a), but it may conveniently be summarized in four laws, two relating to the ABO system and two to the MN system. The heredity of the ABO system is dependent upon three allelomorphous genes, A, B, and O, of which A and B are dominant over the recessive O. The MN system is inherited by two genes, M and N, each of equal dominance. Thus we have the four main blood groups, A, B, AB, and O, each of which may be further subdivided by the independent MN system into M, N, or MN.

The Laws of Inheritance

The laws of inheritance which have been formulated from the investigation of many thousands of families are:

ABO.—(1) The factors A and B cannot appear in the blood of a child unless they are present in the blood of one or both parents. (2) The combinations AB parent and O child, and vice versa, are incompatible with the laws of heredity of the group factors.

MN.—(1) The factors M and N cannot appear in the blood of a child unless they are present in the blood of one or both of the parents. (2) The combinations M parent and N child, and vice versa, are incompatible with the laws of heredity of the group factors.

The groups A and AB may be further subdivided into A_1 and A_2 and A_1B and A_2B by the use of appropriately absorbed group B or normal animal sera. This observation was first made by von Dungern and Hirsch-