A.C.T.H. increased the excretion of total non-ketonic steroids. The increase was most pronounced in the dihydroxy steroid fraction.

Cortisone had little effect on non-ketonic alcohol excretion.

REFERENCES

- Copeman, W. S. C., Savage, O., Bishop, P. M. F., Dodds, E. C., Kellie, A. E., Stewart, J. W., Glyn, J. H. H., Henly, A. A., and Tweed, J. M. (1952). *British Medical Journal*, 1, 397.
- Dingemans, E., Huis in't Veld, L. G., and de Laat, B. M. (1946). *J. clin. Endocr.*, 6, 535.
- Dobriner, K. (1951a). *Bull. rheum. Dis.*, 2, 5.
- (1951b). In *Steroids in Experimental and Clinical Practice*, edited by A. White. Churchill, London.
- Lieberman, S., and Rhoads, C. P. (1948). *J. biol. Chem.*, 172, 241.
- Engel, L. L. (1950). *Recent Progr. Hormone Res.*, 5, 335.
- Hench, P. S., Kendall, E. C., Slocumb, C. H., and Polley, H. F. (1949). *Proc. Mayo Clin.*, 24, 181.
- Kellie, A. E., Smith, E. R., and Wade, A. P. (1953). *Biochem. J.*, 53, 578.
- and Wade, A. P. (1953). *Ibid.*, 53, 582.
- Nathanson, I. T., Engel, L. L., and Kelley, R. M. (1951). *Proc. 2nd Clinical A.C.T.H. Conf.*, vol. 1. Churchill, London.
- Paschkis, K. E. (1951). *Ibid.*, vol. 1.
- Robinson, A. M., and Goulden, F. (1949). *Brit. J. Cancer*, 3, 62.

POST-GASTRECTOMY SYNDROME

DEVIATION OF THE AFFERENT LOOP FROM THE GASTRO-INTESTINAL ANASTOMOSIS

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Much has been written recently about the early post-gastrectomy syndrome. This is not surprising when we consider in what large numbers the Polya type of operation of partial gastrectomy is being undertaken to-day for gastroduodenal ulceration. For the moment a new disease is being created, commonly referred to as the "dumping" or post-gastrectomy syndrome, consisting of symptoms varying in character and severity. The milder cases improve with the passage of time, but the severe ones remain, and it is with these that we are concerned. What is the extent of the dumping syndrome, and what happens to these patients? One so frequently hears that the syndrome occurs in only a small percentage of cases which often right themselves.

Custer, Butt, and Waugh (1946) thought that all but the mildest cases lasted indefinitely, and that the symptoms could be so severe and disabling as to warrant the use of the term "gastric cripple." Capper and Butler (1951), in examining the results of 558 Polya type of gastrectomies, found that 79 cases showed the early syndrome, and that 61 of these had symptoms lasting from two to eleven years. Goligher and Riley (1952) reported that six months after operation dumping occurred in 75% of their patients, which was severe in 12.5%, and that eighteen months after operation 47.5% still had dumping and 10% severe dumping. Others maintain that the percentage is not so high, but we suggest that a personal study of each post-gastrectomy patient will reveal some evidence of the syndrome in a large proportion of cases. The severe cases, by reason of their regular attendance at a follow-up clinic, can be most disconcerting and not at all helpful to other patients. When we consider the scale upon

which the operation for peptic ulcer is being performed, the number of these unfortunate people must be large. Moreover, the operation is undertaken for men usually at the height of their wage-earning capacity and with a family to support. If, as a result of the dumping syndrome, they are unable to return to their pre-operation occupation, then the operation of gastrectomy cannot be regarded as a success.

This paper—a preliminary report—deals with the early post-gastrectomy syndrome following the Polya type of gastrectomy for duodenal ulcer. Our experience has been an average one, and, confronted by the problem of what to do for a small number of severe "dumpers," we decided to follow the procedure of Illingworth (quoted by Muir, 1949), who treated three cases successfully by lateral anastomosis of the efferent and afferent loops of the jejunum. Our patients readily accepted the opportunity of being rid of their miserable condition.

Lateral Anastomosis

In our series of antecolic Polya gastrectomies with a Hofmeister valve seven cases of persistent severe "dumping" occurred, which was very distressing both to the patients and to ourselves. These patients (five male, two female) were all submitted to an anastomosis between the efferent and afferent loops of the jejunum. Six had a gastrectomy for duodenal ulcer and one for a gastric ulcer. Their symptoms can be grouped conveniently under four headings:

1. *Vomiting Bile.*—All patients complained of this distressing symptom. Vomiting varied from one to three times a day, after food, and in amounts from 5 to 20 oz. (140 to 570 ml.) at a time.
2. *Vasomotor Symptoms.*—Four patients complained of severe sweating and dizziness after food, and had to lie down until the attack had passed off.
3. *Loss of Weight.*—Six cases lost amounts varying from 7 to 35 lb. (2.7 to 15.9 kg.).
4. *Vomiting Food.*—Three cases vomited food by itself or mixed with bile.

The onset of symptoms in all cases occurred within four weeks of discharge from hospital. All seven patients were emphatic that their symptoms were worse after the midday meal—that is, the big meal of the day.

Investigation of Cases.—A barium meal and a fractional test meal were carried out in all cases. The x-ray film showed afferent-loop filling and the fractional test meal a complete achlorhydria. Haematological investigations were all within normal limits.

Interval Between Operations.—The average interval was 15 months, the longest being two years and the shortest five months.

It is now about three years since these cases had their second operation, and their present condition can most conveniently be studied under the same headings as before:

1. *Vomiting Bile.*—This has been completely abolished in five cases. Two cases admit to an occasional vomit of bile every two or three weeks, but are greatly improved.
2. *Vasomotor Symptoms.*—These persisted in three out of the four cases affected, the fourth being completely free from symptoms. One case, in which the symptoms persisted, obtained relief by leaving the table and lying down.
3. *Loss of Weight.*—In five of the cases there was no gain in weight after entero-enterostomy; the other two were back to their pre-gastrectomy level and had gained 14 and 28 lb. (6.4 and 12.7 kg.).
4. *Vomiting Food.*—This was abolished in the three cases affected.

Six of the patients submitted to the operation were very satisfied with the result. One patient has undergone a further operation (see below). It would seem that the post-cibal vomiting was the most distressing symptom, as these patients were very glad to have this abolished and felt very much better in spite of the persisting vasomotor symptoms. Our conclusion from this short series was that,

whilst the lateral anastomosis improved all cases, it did not cure all the symptoms referable to dumping. We noted that, in spite of diverting the flow of bile from the stoma, no case has yet developed any signs of anastomotic ulcer.

Encouraged by these results, and believing that entero-anastomosis had relieved tension in the afferent loop, our interest became centred on this loop. In the recent literature nearly all writers discuss the afferent loop and the possible part it might play in the post-gastrectomy syndrome.

Lake (1948) drew attention to obstruction to the free passage of duodenal contents across the anastomosis which could occur, and might be a possible cause of symptoms. This condition, which has been called "afferent-loop stasis," is probably an accumulation of duodenal contents which eventually overcomes the obstruction at the anastomosis, so filling the gastric remnant. The contents are vomited in varying amounts, sometimes as much as a pint (570 ml.), after which the patient feels quite well and could settle down to another meal. McNealy (1942) estimated that 1.5 l. of secretion may be passed into the afferent loop in 24 hours. Mimpriss and Burt (1948) recognized the condition and added that as the food proceeds down the jejunum unmixed with bile and pancreatic juice there is a tendency to steatorrhea. Tanner (1952) mentioned the need for a short afferent loop, which diminishes the chance of obstruction due to kinking and stasis in the loop. Illingworth, quoted by Muir (1949), faced with this problem, cured three cases with lateral anastomosis of the afferent and efferent loops. Wells and Welbourn (1951) devised the operation of jejuno-plasty and treated three cases with excellent results. F. D. Murphy (1952, personal communication) considered that the afferent loop was responsible for the post-gastrectomy syndrome in some cases which he successfully treated by changing the Polya gastrectomy into the Billroth I type.

Mention should be made of the passage of food down the afferent loop so that it becomes mixed with bile, described as "afferent-loop reflux." The condition has been discussed by Mimpriss and Burt and by Wells and Welbourn. Mimpriss and Burt stated that the symptoms come on shortly after a meal, with distension, lassitude, nausea, vomiting, sweating, etc., but that it has occurred only with anastomosis of the afferent loop to the greater curvature. We have noted these symptoms in some of our cases in which the afferent loop has been anastomosed to the lesser curvature, and with a Hofmeister valve. It has been pointed out by Goligher and Riley (1952) and Butler and Capper (1951) that the clinical and radiological findings in afferent-loop reflux do not always coincide.

Attention to the weight of the afferent loop was drawn by Capper and Butler, who thought that the major factor in causing the syndrome was traction of a heavy afferent loop on the gastric remnant, plus the weight of the food. Emptying of the afferent loop greatly reduced the severity of the syndrome. In addition to reconstructing the peritoneal supports of the stomach, Capper and Butler also suture the afferent loop so that it is slung under the liver and the weight so taken off the gastric remnant.

The afferent loop therefore comes in for a good deal of criticism. We then considered whether its deviation from the gastro-intestinal anastomosis might decrease the incidence of the post-gastrectomy syndrome. This could be effected by a return to the Y-shaped anastomosis of Roux. At one time this form of gastro-jejunal anastomosis was in frequent use. It fell into disrepute in gastro-jejunostomy and in low partial gastrectomy because of the high incidence of anastomotic ulcer. Since these two operations failed materially to reduce the secretion of hydrochloric acid, this was not surprising. Warnings have been given against this type of anastomosis by Aird (1949) and Tanner (1952) amongst others. Maingot (1936, 1948) describes it as a most unsatisfactory operation for ulcer, and one which he has ceased to practise. In three cases of gastrectomy for anastomotic ulcer he employed the Y-shaped anastomosis, but all developed a recurrent ulcer. It should be conceded, however, that the Y-shaped anastomosis fell into disfavour

at a time when the radical gastrectomy of to-day had not arrived. Now the operation demands an extensive resection of the acid-bearing area of the stomach, together with complete removal of the pyloric mucosa. In order to obtain an extensive and consistently uniform resection, we followed eventually the plan of the late Hedley Visick (1948) by mobilizing the stomach to the level of the first vas brevis.

We decided that in order to eliminate the afferent loop it was logical to employ the Y-shaped anastomosis in radical gastrectomy. An alternative way of doing this would be to perform a Billroth I operation. We have been impressed by the freedom from the post-gastrectomy syndrome in the latter operation, which we have performed for gastric ulcer. Capper and Butler found that the syndrome did not occur in 102 consecutive cases of Billroth I operation which they investigated. There is much evidence to support this view. However, we think it unwise to perform a Billroth I operation in cases of duodenal ulcer. Some of the duodenal ulcers which we have seen at operation would preclude a successful anastomosis between the duodenum and the gastric remnant. In many cases we feel that, in order to complete an anastomosis without tension, a principle of modern gastrectomy would have to be sacrificed—namely, the removal of enough of the acid-bearing area—and so incur the risk of recurrent ulceration.

Excision of the unhealthy portion of the duodenum, with adequate removal of the acid-bearing area, might result in an anastomosis under tension, with subsequent leakage. This was our unfortunate experience in one case, and on that account we have abandoned the Billroth I operation for duodenal ulcer. Tanner states that most surgeons prefer a gastro-jejunal anastomosis after gastrectomy for duodenal ulcer. Among the disadvantages of the Billroth I operation he mentions are: (1) utilization of a diseased organ for anastomosis; (2) to pass the ulcer a lengthy and hazardous dissection of the duodenum may be necessary; (3) scars may be left behind in the part of the duodenum retained; and (4) tendency to restrict the extent of the gastric resection in order to obtain a tension-free anastomosis.

Technique of Operation with Roux Anastomosis

The operation is proceeded with in the usual way to the stage when the duodenal stump is invaginated and the left gastric artery ligated. We would stress the importance of ligating this artery at its origin, so mobilizing the lesser curvature, and of leaving only one of the vasa brevia, which mobilizes the greater curvature; this allows a measured radical gastrectomy to be performed. Before preparing the jejunum for the Y-shaped anastomosis it should be realized that this will add 20 to 25 minutes to the time of the usual Polya gastrectomy. The jejunum is divided 18 in. (45 cm.) below the duodeno-jejunal flexure. It is unnecessary to ligate the vessels of the mesentery, as access can be gained through a bloodless jejunal window (see Fig. 1). The distal portion of the jejunum is closed,

FIG. 1.—Illustrating the division of the jejunum by access through a jejunal window. The arterial arcade is not divided.

and the proximal portion is anastomosed to the side of the jejunum 12 in. (30 cm.) lower down. We have found that the anastomosis lies comfortably if the proximal jejunum is brought to lie on the left side. The jejunum is then anastomosed to the gastric remnant as in the usual Polya-Hofmeister anastomosis (see Fig. 2). We make a Hofmeister valve for the sole purpose of retaining the food for as long as possible in the stomach. The use of the Y-shaped anastomosis does not seem

FIG. 2.—Illustrating the completed anastomosis.

add to the immediate mortality or morbidity rate of gastrectomy. Our cases have been followed up carefully, and a routine test-meal examination has been made three months after operation.

At this stage two points incidental to the operation are worth mentioning. First, we find it particularly convenient to use a Y-shaped anastomosis when performing gastrectomy for gastro-jejunal ulcer. After division of the afferent and efferent loops of the jejunum, the fashion-

ing of the Y anastomosis is a simple matter. Secondly, by deviation of the afferent loop, the duodenal contents pass uninterruptedly into the jejunum so that tension in the duodenum is relieved, with less likelihood of "blowing" of the duodenal stump. Two of our cases developed mild duodenal leaks with little inconvenience to the patients. We feel that, but for the Y-shaped anastomosis, duodenal tension might have been sufficient to produce an acute leakage, with possibly fatal results.

Discussion of Results

Accepting the principles of modern gastrectomy, we feel that the operation described above is based on sound logical premises. No doubt there will be much opposition to the reintroduction of this form of anastomosis from those surgeons who suffered a bitter experience in its use in the days of gastro-enterostomy and low gastrectomy. The lateral anastomosis, however, has already been used by Illingworth (Muir, 1949) to overcome the syndrome; and Wells and Welbourn (1951) have carried this operation a stage further in the same endeavour by introducing the operation of jejuno-plasty. In surveying the results of this operation we ask ourselves two questions: Does this type of gastro-intestinal anastomosis increase the risk of anastomotic ulcer? and, What is the effect on the post-gastrectomy syndrome?

1. Recurrent Ulceration

Among 90 cases of duodenal ulcer treated by gastrectomy, with a Y-shaped anastomosis, 1 case of anastomotic ulcer has occurred. This was that of a man who before gastrectomy had suffered two perforations of a duodenal ulcer. His recurrent ulcer was a perforated anastomotic ulcer appearing three months after gastrectomy. Unfortunately, this patient developed a subphrenic abscess and died a few weeks later. This was one of our earlier cases, and it was after this setback that we paid very careful attention to the size of the gastric remnant and adhered rigidly to the measured radical gastrectomy. Whilst there is no accepted time-limit for recurrent ulcer, those surgeons who have had experience of gastro-enteric anastomosis in the days of gastro-enterostomy and low gastrectomy will recall that recurrent ulceration could occur in quite a short time. Most cases probably recurred within three years. Maingot (1952, per-

sonal communication) states that in his three cases, mentioned above, recurrent ulceration occurred within two years; one case recurred within three months. One of us (J. E. S.) has observed anastomotic ulcer following gastro-enterostomy and Devine's gastric occlusion operation in a number of cases within six months, and in one case a perforated anastomotic ulcer within 10 weeks. Since our cases are entering their third post-operative year it would seem fair to argue that by now we might have expected a number of recurrent ulcers among our 90 cases. Usually there is no mistaking the recurrent ulcer, the pain of which is severe and may show itself as an acute perforation or haematemesis.

Apart from the one case already mentioned, there is no hint of recurrent ulceration in any of our cases. This we regard as a matter of some importance, in that it goes a little way to substantiate the theory that the Y-shaped anastomosis does not increase the risk of recurrent ulcer after radical gastrectomy for duodenal ulcer. Recently, we encountered a duodenal ulcer so firmly fixed to the common bile duct that we performed gastrectomy with pre-pyloric section. Y-shaped anastomosis was not used. Six weeks later, when we performed a second operation for removal of the antrum, we found a large anastomotic ulcer perforated on to the diaphragm. A similar case is described by Tanner (1952). Such cases emphasize the speed at which an anastomotic ulcer can develop if the two important principles of gastric resection are not followed. Bathing of the anastomosis with the alkaline juices of the duodenum did not prevent recurrent ulcer in these cases.

Fractional test meals taken three months after gastrectomy show in nearly every case a complete absence of free hydrochloric acid. We are aware that the test meal is not altogether reliable, but, in the main, we are able to contrast the steeply rising curve of free hydrochloric acid in the pre-operative test with the constant straight line showing the absence of free hydrochloric acid in the post-operative test. Moreover, the usual fractional test meal performed after gastrectomy is sometimes complicated by the regurgitation of alkaline juices into the stomach and, therefore, is not a true index of the free hydrochloric acid. In our series regurgitation of bile cannot take place, and so we feel that the results are on that account more reliable.

2. Effect of Operation on Post-gastrectomy Syndrome

While we make no claim that the Y-shaped anastomosis is safe from recurrent ulceration, since time must elapse before this can be proved, nevertheless we are in a position to report on the effect of deviation of the afferent loop on the dumping syndrome. The food leaving the gastric remnant can take only one route, and the duodenal contents pass uninterrupted on their way into the jejunum. Therefore both afferent-loop regurgitation and reflux are prevented from taking place. Coincident with the prevention of the afferent-loop regurgitation it is interesting to note that we have not encountered a single case of intestinal "hurry." Furthermore, the post-operative loss of weight has, in most cases, been speedily regained. We feel this is due to the fact that the bile and the pancreatic juices are mixed with the food in its passage along the jejunum, and are not held up in the afferent loop, thus allowing normal absorption to take place.

What is the overall picture? It is a very striking one. All our patients have been interviewed carefully, and leading questions have been put to them in order to ascertain the slightest symptom. Attention has been given to vomiting, intestinal "hurry," failure to gain weight, vasomotor disturbances, and indeed the whole gamut of the dumping syndrome has been discussed with each individual. Apart from the discomfort experienced during the early post-operative period, it was difficult to persuade any patient to admit to any of the symptoms which have come to be included in the term "dumping." The only symptom to which anyone would admit was that after a heavy meal there might be a degree of epigastric discomfort. From this symptom after a heavy meal those of us still fortunate to retain our stomachs are not exempt. Finally, we have noted the cheerfulness of our patients, which we ascribe

to their freedom from symptoms, to their rapid convalescence, and to their return to their pre-operative occupation.

Since we found that the Y anastomosis was producing such uniformly good functional results we decided to convert the Polya gastrectomies in patients who complained of severe dumping symptoms to a Y anastomosis, rather than carry out a lateral anastomosis for them. This conversion is a simple technical procedure. We have so far subjected three cases to operation, and, although the time is very short since their operations, the results are worth consideration.

Case 1.—A man aged 29 had a partial gastrectomy for duodenal ulcer (Polya-Hofmeister antecolic procedure) in February, 1951. He remained well for eight months, but failed to regain his pre-operative weight. In November he began vomiting bile in quantities of up to one pint (570 ml.) twice a week either in the early morning or after his midday meal, the biggest meal of the day. His weight was 7 lb. (3.2 kg.) below his pre-operative weight. A test meal showed a complete achlorhydria, the blood picture was normal, and a barium meal showed filling of the afferent loop. In April, 1952, the anastomosis was altered to a Roux-en-Y. At operation a long afferent loop was found which was not dilated. Since operation he has gained 7 lb. (3.2 kg.) in weight, has eaten well, and there has been no vomiting or feeling of nausea.

Case 2.—A man aged 41 had a perforated duodenal ulcer in 1937 and 1943 which was treated by simple suture. In November, 1950, partial gastrectomy (Polya antecolic anastomosis with a Hofmeister valve) was performed. For sixteen months after operation he remained well, then began to vomit bile in large quantities. His weight was stationary and below his pre-gastrectomy level. He felt a dull ache in the epigastrium and complained of sweating and lassitude before vomiting. A test meal showed a complete achlorhydria, the blood picture was normal, and a barium meal showed afferent-loop filling. In June, 1952, his anastomosis was altered to a Roux-en-Y. Since this he has gained over 7 lb. (3.2 kg.) in weight, vomiting and vasomotor symptoms have completely disappeared, and his appetite has been excellent.

Case 3.—A married woman aged 47 had a partial gastrectomy (Polya antecolic anastomosis with a Hofmeister valve) in 1950 for duodenal ulcer. Six months later she complained of vomiting bile, dizziness, sweating, and loss of weight. In July, 1951, a lateral anastomosis between the afferent and efferent loops was performed. Following this she was well for three months and then her vasomotor symptoms alone recurred. She found that she could abolish these by eating in a recumbent position. Her weight was 21 lb. (9.5 kg.) below her pre-gastrectomy level. In July, 1952, a test meal showed a complete achlorhydria, the blood picture was normal, and the anastomosis was converted to a Roux-en-Y. When last seen, her appetite was improving, she had no attacks of dizziness or sweating after meals, and her weight was stationary.

These three cases are extremely interesting, as they help to confirm our view that the afferent loop is responsible for the symptoms of early dumping. Case 3 is one in which the symptoms were not satisfactorily cured by entero-anastomosis. The time since operation, we realize, is extremely short, but as we have encountered no early dumping symptoms in our series of Roux-en-Y anastomoses we anticipate that the complete relief which they have obtained will be permanent.

Many theories have been advanced to explain the early dumping syndrome, and it is interesting to compare these with our results. The suggestions that distension of the efferent loop is responsible, or that the higher the level of the transection of the stomach the greater the incidence of dumping, are not substantiated. Moreover, as all our anastomoses were anterior to the colon, we cannot agree with Ogilvie (1952), who suggests anterior colic anastomosis as a possible cause of "dumping."

The evidence we offer confirms the view that afferent-loop stasis and reflux play a part in the "dumping" syndrome, and lends support to the view of Capper and Butler (1951), who regard the weight of the afferent loop as contributory.

Some surgeons claim that the incidence of dumping can be reduced to a minimum by operations requiring special technique, aimed at directing the flow of food into the efferent loop. Is it that these operations, having one in-

herent fault—namely, an afferent loop—are unable to guarantee immunity from the post-gastrectomy syndrome?

Other surgeons, in an attempt to obtain a better functional result, have devised operations of a much more complicated character—for example, colonic replacement (Moroney, 1951) and jejunal replacement (Henley and Hudson, 1952). These operations, though not intentionally designed to avoid an afferent loop, nevertheless may owe their success to the very fact that they have done so, rather than to the premises on which they were based. As a remedial operation for the post-gastrectomy syndrome, Henley and Hudson seem to achieve, by means of a very complicated operation, the same beneficial results as are obtained from the simple Y-shaped anastomosis.

In conclusion, let it be restated that we make no claim for this operation. We feel, however, even at this stage, that the results on the dumping syndrome are worth recording. If time proves that this form of anastomosis renders the patient more liable to recurrent ulceration, then, however beneficial may be the effects on the dumping syndrome, the operation would have no place in surgery. We feel that the arguments in favour of this operation are based on sound logical premises and that the immediate results are sufficiently encouraging to warrant its continuation. We are optimistic enough to hope that, at a later date, we shall produce ample evidence in its support which has stood the test of time.

Summary

The view is expressed that a new disease is being created on a considerable scale called "dumping," following the frequent performance of the Polya type of gastrectomy for peptic ulcer.

Results of lateral anastomosis of afferent and efferent loops as a treatment in seven cases of dumping are recorded.

References in the recent literature to afferent-loop stasis, reflux, and weight of the afferent loop are quoted.

Reasons are advanced for the reintroduction of the Y-shaped anastomosis in the Polya type of gastrectomy.

Technical details of the operation are described.

Results of the operation in 90 cases are described in relation to recurrent ulceration and effect on post-gastrectomy syndrome.

No claim is yet made that the operation is as safe from recurrent ulceration as is the Polya anastomosis.

It is claimed that in none of our cases treated by the Y anastomosis has the post-gastrectomy syndrome occurred.

The effect of conversion of the Polya anastomosis to the Roux type in three cases of post-gastrectomy syndrome is described.

The results in our series are compared with the theories advanced on the aetiology of dumping.

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BIBLIOGRAPHY

- Aird, I. (1949). *Companion in Surgical Studies*, p. 635. Livingstone, Edinburgh.
- Butler, T. J., and Capper, W. M. (1951). *British Medical Journal*, 1, 1177.
- Capper, W. M., and Butler, T. J. (1951). *Ibid.*, 2, 265.
- Custer, M. D., Butt, H. R., and Waugh, J. M. (1946). *Ann. Surg.*, 123, 410.
- Goligher, J. C., and Riley, T. R. (1952). *Lancet*, 1, 630.
- Henley, F. A., and Hudson, R. V. (1952). *Brit. J. Surg.*, 40, 118.
- Lake, N. C. (1948). *British Medical Journal*, 1, 285.
- McNealy, R. W. (1942). *Surgery*, 12, 207.
- Maingot, R. (1936). *Post-Graduate Surgery*, 1, 387. Medical Publications, London.
- (1948). *Abdominal Operations*, p. 421. Lewis, London.
- Mimpriss, T. W., and Burt, St. J. M. C. (1948). *British Medical Journal*, 2, 1095.
- Moroney, J. (1951). *Lancet*, 1, 993.
- Muir, A. (1949). *Brit. J. Surg.*, 37, 165.
- Ogilvie, Sir H. (1952). *British Medical Journal*, 2, 299.
- Tanner, N. C. (1952). *Modern Trends in Gastroenterology*, edited by F. Avery Jones, p. 399. Butterworth, London.
- Visick, A. Hedley (1948). *Lancet*, 1, 505.
- Wells, C., and Wellbourn, R. (1951). *British Medical Journal*, 1, 546.