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MALABSORPTION SYNDROME FOLLOWING EXTENSIVE RESECTION OF THE SMALL INTESTINE*

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RECENT REPORTS have indicated that survival is not unusual after resection of all the small intestine distal to the proximal three feet (90 cm.) of jejunum.[1] The case to be reported falls within this group and is considered to be of special interest because of the striking improvement in undernutrition and convulsions after an alteration of the jejuno-colic anastomosis. This alteration eliminated two blind pouches and exposed all remaining small and large bowel to the intestinal contents. A unique finding in this patient just before the change of his anastomosis was the increased serum phosphate concentration in conjunction with marked hypocalcæmia, a combination which suggested the presence of hypoparathyroidism. The recent increase in steatorrhœa following discontinuation of intramuscular cortisone, oral sulfisoxazole and a gluten-free diet was also noteworthy.

The patient, a 19-year-old Dutch male labourer, was thrown from an automobile and sustained severe injuries to the small bowel and abdominal wall on July 8, 1956. Fig. 1 indicates the small bowel resection and anastomosis which was performed at that time. The ileum was removed along with all but the proximal 2½ to 3 feet (75-90 cm.) of jejunum. A jejuno-transverse colic anastomosis was made, leaving a blind jejunal loop of about 8 inches (20 cm.) beyond the anastomosis and diverting the intestinal contents from the proximal half of the colon.

During the next five months the patient developed steatorrhœa and diarrhœa with the passage of eight to nine foul bulky stools per day. He sustained a weight loss of 80 lb. despite a very large caloric intake. He developed signs of tetany followed by convulsions about one month before his admission to the Victoria General Hospital in December 1956. Fig. 2 shows his appearance at the time of admission. The marked undernutrition and the defect in the abdominal wall are obvious. Table I shows pertinent laboratory data obtained at that time. A very slight normocytic anæmia was present. The hypocalcæmia and hyperphosphatæmia were accompanied by an alkaline phosphatase level above the normal upper limit of 8.5 units per 100 ml. Several subsequent values of phosphatase were within normal limits, however. Radiographic bone studies did not show evidence of significant demineralization.

Oral and intramuscular calcium therapy along with large doses of vitamin D resulted in very little improvement in the serum calcium level, and even intravenous injections of calcium failed to control convulsions on some occasions. The serum phosphate level fell to 2.6 mg. per 100 ml. after exhibition of vitamin D, although subsequent values obtained while this agent was continued proved somewhat variable. The patient also received intramuscular injections of parathyroid hormone with slight or no effect on the serum calcium level or muscular irritability.

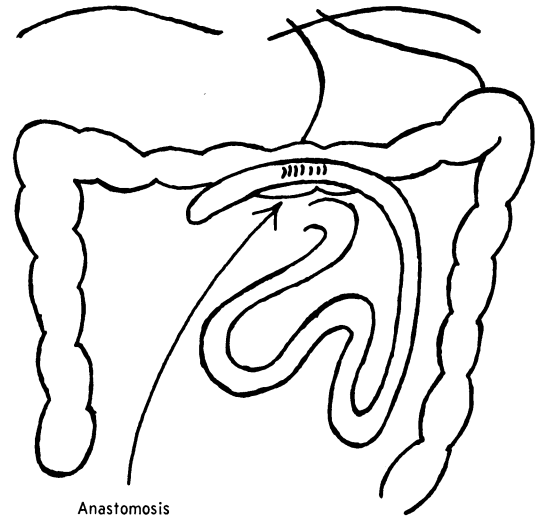

Fig. 1.—Diagram showing initial jejuno-transverse colic anastomosis.

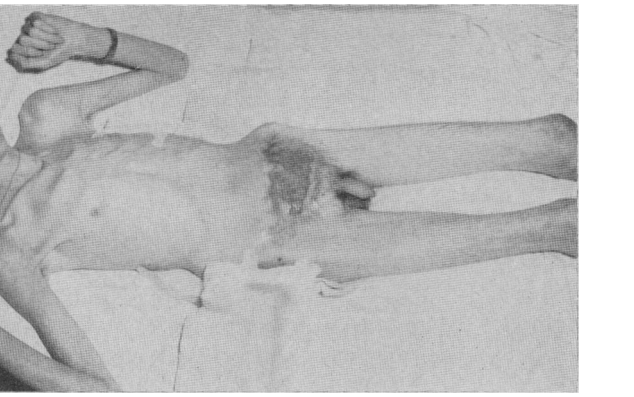

Fig. 2.—Patient's appearance in December 1956.

On January 28 (almost seven months after the injury) Dr. E. P. Nonamaker replaced the jejuno-colic anastomosis with the anastomosis shown in Fig. 3. By joining the most distal point of the jejunum to the cæcum, both blind pouches were eliminated and all the remaining small and large bowel was exposed to the intestinal contents. During this procedure it was noted that the cæcum

TABLE I.—CASE C.V., LABORATORY DATA, DECEMBER 1956

Hæmoglobin value	12.2 g.%
Serum:	
Ca	4.3 mg.%
P	7.1 mg.%
Alk. phosphatase	9.5 Shinowara units %
K	2.9 mEq./l.
protein	6.2 g.%
non-protein nitrogen	35.0 mg.%

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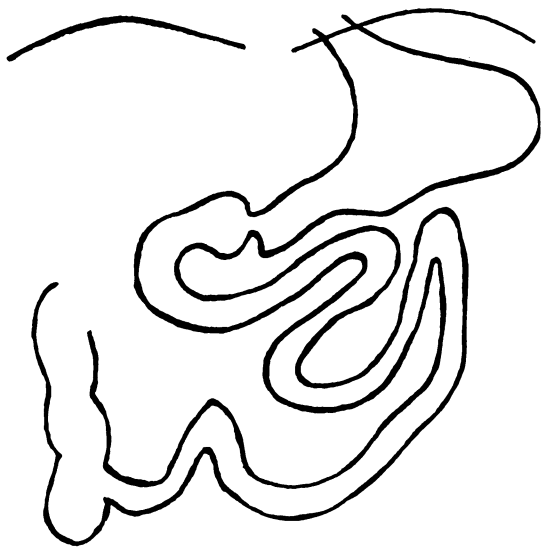

Fig. 3.—Diagram showing alteration of jejuno-colic anastomosis made in January 1957.

contained a greyish white fluid with a very sour odour. Unfortunately no specimen was taken for culture.

During the postoperative period the patient sustained a very gradual but marked improvement. Fig. 4 shows the very satisfactory weight gain which occurred, and his weight has been maintained subsequently at near normal levels. His appetite can only be satisfied by an excessively large food intake and at present he passes an average of two large foul stools per day. He has recently returned to lighter forms of manual labour. The patient received a gluten-free diet and intramuscular cortisone therapy for three weeks before the alteration of his anastomosis and for four months afterwards. There was some evidence that withdrawal of gluten resulted in symptomatic improvement, and during the early postoperative period the deliberate exhibition of gluten was associated with an exacerbation of diarrhœa. The stool fat analyses illustrated were made on three to four day pools which were collected after the patient had been on a 100 g. fat intake for three days. The lowest fat levels in stools were obtained in May and June 1957. It may be significant that the patient had received sulfisoxazole orally for six weeks before these analyses in addition to cortisone and a gluten-free diet. Since June 1957, the patient has, with minor exceptions, been without medication or dietary restriction. The striking increase in fat loss in the stools during this period is noteworthy. The oral glucose tolerance curve has also become completely flattened, whereas in June and November 1957 the peak blood sugar concentrations after glucose loading were about 40 mg. % above the fasting levels.

Fig. 5 shows the effect on stool fat excretion of adding gluten to a diet which had previously been gluten-free, at one month and again four

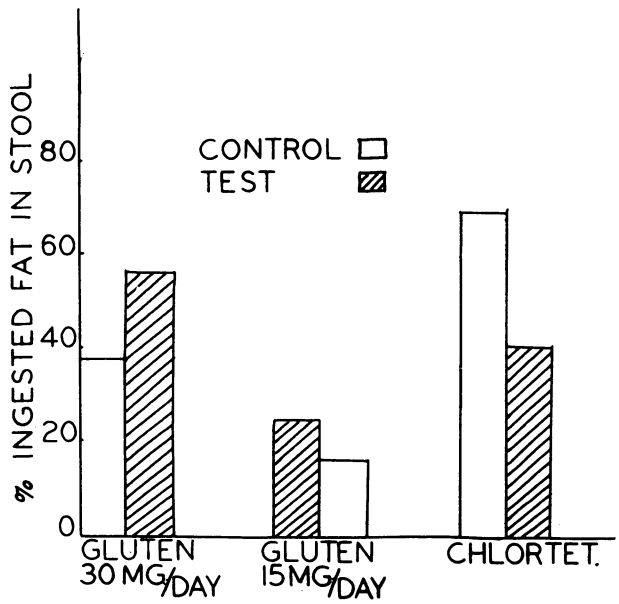

Fig. 5.—Effect of chlortetracycline and gluten on stool fat excretion.

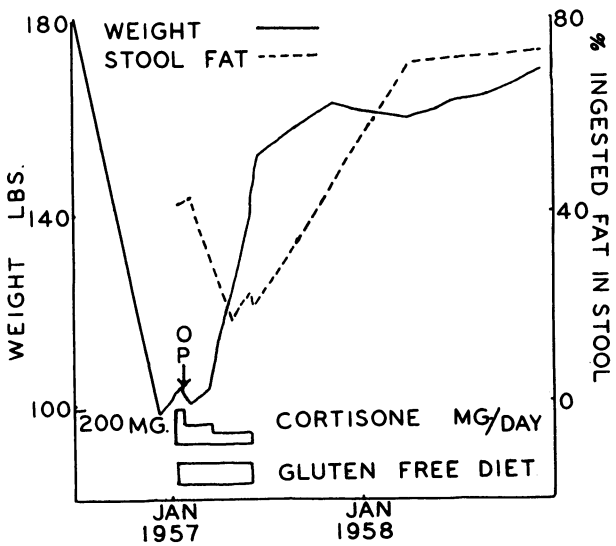

Fig. 4.—Body weight and stool fat excretion during period under observation.

months after alteration of the anastomosis. This diagram also shows the effect of oral chlortetracycline on fat excretion in the stools. The antibiotic was administered for a period of one week, at a time when there was no dietary restriction of gluten. The last-mentioned data suggested that alteration of the intestinal flora affected stool fat excretion. The addition or subtraction of cortisone therapy did not cause an immediate change in fat losses in the stools.

In November 1957 and again in April 1958, vitamin B_{12} absorption was markedly impaired as indicated by studies with cobalt-labelled vitamin B_{12} using the Schilling technique. Neither intrinsic factor nor chlortetracycline improved the patient's vitamin B_{12} absorption. It has been reported that this antibiotic improves B_{12} absorption in the blind loop syndrome, but not in primary steatorrhœa.[1]

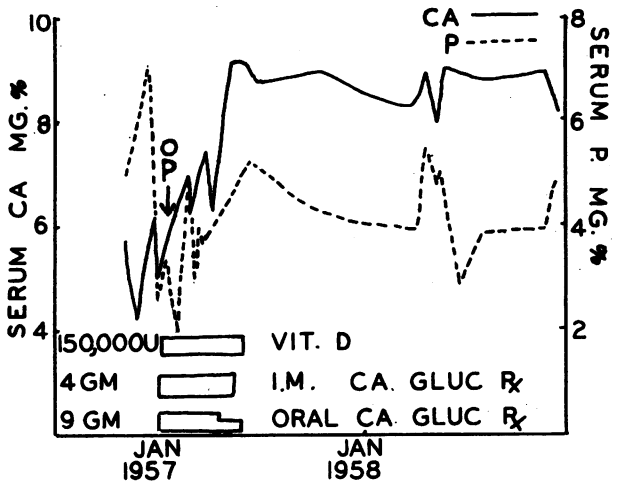

Fig. 6.—Serum calcium and phosphorus concentration during period under observation.

The patient has recently developed a macrocytic anæmia associated with megaloblastic changes in the bone marrow and these have responded to vitamin B_{12} therapy.

Fig. 6 shows the striking improvement in the serum calcium level after alteration of the anastomosis, and this was associated with disappearance of tetany and convulsions. Slight hypocalcæmia with a mean serum phosphate level of 4.5 mg. per 100 ml. have continued up to the present time. In December 1958, renal phosphate clearance was reduced to 2.25 ml. per minute (with normal creatinine clearance), findings which indicated the presence of hypoparathyroidism. This would not be expected in the hypocalcæmia of osteomalacia with secondary hyperparathyroidism.[2] The phosphaturic response to parathyroid hormone infusion was also impaired, but this was difficult to interpret because of the expected lowering from previous exposure to parathyroid hormone.

It seemed unlikely that osteomalacia was responsible for the slight hypocalcæmia which continued until the most recent examination, for the following additional reasons. The alkaline phosphatase level continued to be normal, and bone mineralization as determined radiologically was still satisfactory in December 1958. Appreciable calcium absorption occurred despite marked steatorrhœa as indicated by recent stool calcium losses of 73 mg. per day while the patient received a 200 mg. calcium intake. Urine calcium excretion was consistently low.

The lack of serum calcium response to parathyroid hormone before the alteration of the anastomosis may indicate that inactivation of parathyroid hormone was occurring or that the preparation used lacked potency. Hormonal inactivation has been demonstrated in a typical case of hypoparathyroidism by Harell-Steinberg.[3] Bensley and Cameron have reported subnormal phosphaturic responses to parathyroid hormone in steatorrhœa.[4] However, several mechanisms might be suggested to explain their findings.

We have not encountered published reports of malabsorption with hypocalcæmia in which the serum phosphorus level was elevated. We have under observation at the Victoria General Hospital three siblings with marked hypocalcæmia, evidence of malabsorption and hyperphosphatæmia. It is possible that malabsorption has given rise to the other abnormalities in these siblings, in view of the findings just reported

Steatorrhœa and hypocalcæmia are often associated with osteomalacia. Impaired calcium absorption has undoubtedly been present in those cases with high serum alkaline phosphatase and radiologically demonstrable bone disease. However, the recent report of Morgan and co-workers[5] of normal serum antirachitic activity in idiopathic steatorrhœa with hypocalcæmia indicated that these patients were not deficient in vitamin D. Furthermore, in those cases of malabsorption and hypocalcæmia with normal serum phosphate and phosphatase values, the possibility of hypoparathyroidism may require consideration as an alternative to first-degree osteomalacia. This suggestion is supported by Krane's report of hypoparathyroidism after thyroid surgery in which the hypocalcæmia was not accompanied by an elevated serum phosphate concentration.[6]

SUMMARY

Observations are presented on a patient with severe malabsorption syndrome after resection of all the small intestine except for the duodenum and 2½ to 3 feet of jejunum.

Severe hypocalcæmia resulted from hypoparathyroidism.

Alteration of a jejuno-colic anastomosis so as to eliminate two blind pouches and expose all remaining small and large bowel to the intestinal contents resulted in disappearance of undernutrition and convulsions, improvement as regards diarrhœa and hypocalcæmia, and the ability to return to light manual labour.

Impairment of absorption of vitamin B_{12} and glucose as well as steatorrhœa has persisted.

The present severe degree of steatorrhœa is for the most part not due to inadequacy of absorptive surface, because fat losses were only slightly abnormal in stools while the patient was on a gluten-free diet, cortisone, and oral sulfisoxazole.

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RÉSUMÉ

Un malade chez qui on avait réséqué tout le grêle sauf le duodenum et environ un mètre du jéjunum devint victime d'un syndrome de carences multiples. L'hypoparathyroïdie donna lieu à de l'hypocalcémie grave. Une modification de l'anastomose jéjunocolique élimina deux culs-de-sac et permit au chyme d'entrer en contact avec tout ce qui restait de la muqueuse. Les résultats furent encourageants. On observa la disparition de la dénutrition et des convulsions, ainsi qu'une diminution de la diarrhée et de l'hypocalcémie. L'amélioration de son état général permit au malade de retourner à un travail manuel léger. L'absorption de B_{12} et de glucose demeura inchangée. La stéatorrhée a persisté. Cette steatorrhée ne dépend pas du manque de surface d'absorption puisque la quantité de graisse dans les selles devint presque normale lorsque le malade fut mis à un régime sans gluten et reçut de la cortisone et du sulfisoxazole.

A SURVEY OF DUODENAL ULCER*
(724 Cases)

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THIS SURVEY of duodenal ulcer patients treated at the Winnipeg Clinic was undertaken to study our experience with this disease, especially in relation to such characteristics as the nature, frequency and severity of symptoms, the incidence of ulcer complications, the response to medical treatment, and the need for ulcer surgery. Since many of our patients proved to have duodenal ulcer failed to describe the usual "typical ulcer distress", a detailed study of symptomatology in this series was undertaken. It seemed of interest as well to see whether our medical treatment apparently altered the eventual course of this disease. The series has been divided into three groups of cases, the author's, those of other internists, and those of general surgeons, in order to allow a comparison of the results of treatment and the incidence of surgery under different doctors. Since the decision to advise operation in a case of duodenal ulcer is determined not only by the severity of the disease, but also by the attitude to surgery of both the doctor and the patient, an effort is made to analyze the relative importance of these factors in our patients subjected to operation.

MATERIAL AND METHODS

This report is based on a study of the records of 724 consecutive cases of duodenal ulcer seen at the Winnipeg Clinic in the three-year period 1952-1954. Cases were included in the survey if positive radiological or pathological evidence of duodenal ulcer was available. The radiological criteria consisted in the demonstration of the actual duodenal ulcer niche or the persistent duodenal deformity produced by it (see Table I). Since such clinical features of duodenal ulcer as typical pain, the incidence of complications, and the need for duodenal ulcer surgery were comparable in the group of 272 cases with persistent duodenal ulcer deformity but no crater on x-ray examination,

TABLE I.—THE DIAGNOSIS OF DUODENAL ULCER
(724 CASES)

Radiological criteria	
(Examination at Winnipeg Clinic)	
(a) Duodenal ulcer deformity with definite niche	336 cases
(b) Duodenal ulcer deformity with suggestive niche	54 "
(c) Duodenal ulcer deformity with no ulcer niche	272 "
(d) Duodenal ulcer niche (no other deformity)	31 "
(Examination elsewhere)	
"Duodenal ulcer"	5 "
	698 cases
Pathological criteria	
(No x-ray examination at clinic)	
(a) Emergency laparotomy for perforated duodenal ulcer	8 cases
(b) Elective remedial surgery for duodenal ulcer	15 "
(c) Unexpected finding at gastrectomy for gastric ulcer	2 "
(d) Diagnosis at necropsy	1 case
	26 cases
Total	724 cases

and the group of 336 cases with both deformity and crater, all were accepted as having duodenal ulcer disease.[1] Of the remaining cases, five were included on the basis of an acceptable x-ray examination done elsewhere, and in 25 the diagnosis was confirmed at laparotomy and in one case at necropsy.

For this survey the duration of the patient's dyspepsia was used to estimate the duration of his ulcer disease before our diagnosis, even though this might not always have coincided with the onset of peptic ulceration. This estimate, shown in Table II, totals more than 5000 ulcer patient years.

TABLE II.—DURATION OF DYSPEPSIA BEFORE DIAGNOSIS OF DUODENAL ULCER AT THE WINNIPEG CLINIC
(5365 PATIENT YEARS)

Less than 1 month	54 cases
1 month to 1 year	62 "
1 to 5 years	215 "
5 to 10 years	169 "
10 to 20 years	128 "
More than 20 years	65 "
Insufficient information	31 "
Total	724 cases

The follow-up period represents the time from our diagnosis until the patient's last visit before this survey, or until he underwent surgical treatment for his duodenal ulcer (except simple closure of a

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