The post-operative insulin test was positive, indicating incomplete vagotomy, in three cases. Two of these were patients in whom the electrical stimulation test had indicated the vagotomy to be complete.

During the operation undertaken for incomplete vagotomy a persisting nerve branch was located, and its presence confirmed by the electrical stimulation test. Division of this branch rendered the vagotomy complete as judged by the insulin test.

A single negative response to the insulin test does not necessarily indicate a complete vagotomy, but a positive response with maximum values on the free-acidity curve less than two hours after the beginning of the test is evidence of the persistence of some secretory nerves to the stomach.

Two explanations are offered for the occurrence of incomplete vagotomies where the electrical stimulation test had indicated them to be complete. Either the persisting fibres lie within the ring electrode but fail to respond to stimulation, or they are outside the grasp of the electrode at a distance from the oesophagus. The latter is considered the more likely explanation.

The insulin test is useful in diagnosis and as a measure of the surgeon's skill in performing vagotomy. It is valuable in relapsed patients after vagotomy when further surgery is contemplated.

Employment of the electrical stimulation test in this series did not reduce the incidence of incomplete vagotomy, and its use as a routine measure does not appear to be justified.

I thank Mr. R. L. Holt for his encouragement and advice in this work, and for permission to study the patients, and Mr. H. W. Burge for kindly demonstrating to me the technique of his test. I am also grateful to the various anaesthetists who have helped me with the electrical stimulation tests, and particularly to Dr. J. Greenan and Dr. A. Melvin.

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"The size of the programme of special school building has risen steadily over the years until now work amounting to about £2½m. is authorized each year. In ten years over 21,000 extra special school places have been provided, an increase of more than 50%, and almost any handicapped child, unless he is educationally subnormal or maladjusted, can now be placed in a special school in quite a short time. . . . The big problem now is the persistent shortage of places for educationally subnormal and maladjusted children. Over 10,000 new places for these children are in the pipeline, and our major effort for the next few years must be to provide the rest of the places still needed for them." (Mr. Kenneth Thompson, Parliamentary Secretary to the Ministry of Education.)

INTUBATED JEJUNOSTOMY FOR RECURRENT SMALL-BOWEL OBSTRUCTION DUE TO PERITONITIS

BY

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Post-operative distension in patients recovering from generalized peritonitis is normally due to paralytic ileus. Sometimes it is otherwise caused, and when loud obstructive sounds are heard on auscultation the decision to reoperate is an unpleasant one to have to make, for, as experience shows, the cause of the obstruction is not an isolated band which could easily be found and divided, but a complex and multiple system of interileal adhesions containing loculated pus. To have to deal with these in a patient already depleted by his main illness, from which he had only just begun to recover, is a trial of skill and judgment which no surgeon welcomes; for recurrence is common, and with each episode the gravity of the situation deepens. There is still a high mortality inherent in this difficult situation, for whose correction orthodox measures must be admitted to have failed. If a means could be found of tiding the patient over the final stages of the resolution of his abdominal sepsis—for, as we know, a nearly normal abdomen can be regained within a matter of weeks—the vicious circle of operation→obstruction→operation could very likely be broken and a natural recovery should then ensue.

During the past year we have had three such cases, each subsequent to a perforation of the lower bowel, and we have found that more can be done than to break down the adhesions at the principal point of obstruction.

Technique

The abdomen is reopened through the original incision, and the most distended loop of bowel is opened, packs having been placed about it; a cannulated sucker is held ready to catch the gush of gas and fluid from the small initial hole. The sucker is then advanced up the small bowel, emptying it and threading the collapsed, oedematous, inflamed gut on to the cannula. One or even 2 litres of soupy material collects into the sucker bottle. A second enterostomy may be required if the bulk of the collapsed bowel on the sucker will not allow the operator to advance it up the full length of the small bowel. When this has been done, and the abdomen by this time has become much less tense, a small left subcostal jejunostomy is made comfortably close to the duodeno-jejunal flexure, and into it is passed a Miller-Abbott tube, which is then brought down, as the sucker is withdrawn, so that its tip comes to lie in the low ileum, near the point of obstruction. The enterostomies and jejunostomy are then closed. We normally close the abdomen as for wound rupture, with thick stainless-steel wire.

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Post-operatively, low-pressure suction is applied to the Miller-Abbott tube for several days, even after the need for intravenous feeding has passed. Large quantities of gas are produced, and a variable amount of fluid. When this becomes thicker and more difficult to aspirate, the patient generally passes a loose spontaneous bowel motion, and recovery may be expected. Three cases in which this method was found effective are described.

Case Reports

Case 1.—A labourer aged 23 was admitted to hospital with a history of 24 hours' abdominal pain and the signs of generalized peritonitis. At operation the abdomen was found to contain thick green offensive pus, and a perforated gangrenous appendix was removed. On the third post-operative day he developed a gross, painful distension with vomiting and increased bowel sounds, and a second operation was performed. An obstructed loop of ileum was freed, and proximal decompression with a sucker was carried out. Ten days later he again presented the picture of acute small-gut obstruction. A swallowed Miller-Abbott tube could not be entered into the jejunum, so a third operation was undertaken, with the method described in mind. The state of the abdomen was far worse than before, with widespread adhesions and many abscesses. The method described was used for the first time and continuous suction was applied. He was able to resume oral feeding on the seventh day. Eight days later the tube was removed. The jejunostomy drained for a few days, but the patient's recovery continued otherwise uneventfully and he was working again as a labourer seven weeks after his discharge from hospital.

Case 2.—A man of 83 was admitted to hospital with a three-day history of left-sided lower abdominal pain, and a clinical diagnosis of acute diverticulitis was made. Next day his pain increased, and abdominal rigidity and tenderness quickly became generalized. At operation the cause for the peritonitis was found to be a large leaking perisigmoid abscess, which centred on a perforation of the apex of the sigmoid loop. A 6-in. (15-cm.) segment of the colon with the perforation at its centre was resected, and the colon was anastomosed. He made an excellent recovery until on the tenth day he developed intestinal obstruction, which did not improve with several hours' gastric aspiration and intravenous fluid replacement. Operation was therefore undertaken, and a loop of small bowel was found adherent to the under side of the incision and to the anastomosis. Many other coils in the vicinity were closely adherent with fibro-fibrinous adhesions. The procedure described was carried out: the balloon of the Miller-Abbott tube in this case could be made to reach the ileo-caecal valve. After nine days' suction the patient had regained his bowel function and the tube was removed. He did experience a short bout of obstructive symptoms five days later, but his recovery quickly resumed and he remained well four months later. The pathological report on the sigmoid colon showed the perforation to have occurred not at the site of an acute diverticulitis but in a small adenocarcinoma.

Case 3.—A man of 67 was found at operation to have a gangrenous appendix, and his post-operative course after its removal was stormy. He developed increasing distension despite gastric aspiration and intravenous fluid replacement, and on the eighth post-operative day his general condition began to deteriorate for the first time. He was by then very distended indeed, so operation was undertaken and many adherent ileal loops were found in the right iliac fossa, these being the cause of the obstruction. They were freed, and an intubated jejunostomy was made as described, the patient doing well. In this case a recurrent bout of obstruction developed 11 days after the first, the Miller-Abbott tube having been removed three days before. However, the jejunostomy had not yet closed, so that the tube could be reinserted without difficulty and soon was carried along to approximately half its length by intestinal peri-

stalsis. Three days later it was removed, and before long the jejunostomy sealed itself off. The patient made a good recovery, and remained well three months after operation.

Discussion

In the U.S.A. intestinal intubation has for many years been routine in the management of recurrent obstruction; but in this country it has never found much favour. The Miller-Abbott tube is generally regarded as too difficult to pass, and its main potential danger is that its use may mask the need for open operation, as, for example, in strangulation obstruction. We thought that these two objections would be overcome if the tube could be passed at operation, and our early experiences seem to justify further trial of the method.

The problem of recurrent intestinal obstruction has not yet been solved. So much is left to chance by the standard operation of freeing the adhesions responsible for the current episode and trusting that they will not re-form in a similar manner. It is not surprising that a policy of conservatism in such cases has been generally adopted. A false sense of security may be engendered by the institution of gastric aspiration (often ineffective) and intravenous fluid replacement (generally governed by day-old blood chemical estimations, rather than consideration of fluid losses: which indeed may be internal and therefore hidden and impossible to assess). Cooke (1958) has emphasized the need for a return to more active management by early operation in acute intestinal obstruction. Logically, this should apply also to recurrent cases, and if something more than temporary correction could be achieved in these patients a difficult problem would be solved.

Noble (1937) suggested that "controlled adhesions" produced by suturing the whole small gut in regular folds might be safer than accepting the risk of the gut returning to its confined and angulated state. Later he wrote that he had never seen a case of intestinal obstruction after this operation (Noble, 1945). Lord (1951) has reported favourably on the Noble "plication operation." In 9 out of 11 patients the result was highly satisfactory. Nevertheless, it seems that the prospect of adding such an operation to the burden of the main intervention has prevented any general adoption of it. A simpler alternative was suggested by White (1956), who used a long intestinal tube, of semi-rigid consistency, as a means of intraluminal splinting of the freed bowel for the purpose of controlling the disposition of the post-operative adhesions, much as Noble did with his plication sutures. White either intubated the bowel before operation through the nose, or at operation, retrogradely, via a caecostomy. Twelve out of 14 patients treated thus did well according to a follow-up survey, between one and six years later.

More recently Heydinger *et al.* (1960) reported their experimental findings in a comparative study of plication and intubation in dogs, and a clinical experience of 10 patients with operative intubation for recurrent obstruction. They found that in the dogs either procedure produced a regular and well-functioning disposition of the small bowel, while all of the 10 patients in whom intraluminal splinting was used did well. They emphasize the advantages in time-saving with the tube method.

We have not yet adopted this regime for patients with multiple recurrences and a history of much surgery. Often these patients are socially unreliable, and many are drug addicts. We do intend to try it, however, if

forced to abandon conservatism in such a case; for, as both Noble and White have reported, some patients even of this unfavourable type have been completely relieved. At present, however, we are reasonably convinced that the intubated jejunostomy, perhaps by its decompression function, or perhaps by the merit of providing a more orderly pattern for the intestine, is a most effective means of dealing with recurrent post-operative obstruction where the cause is recent peritonitis.

Summary

Many cases of recurrent small-intestinal obstruction are not at present treated adequately.

Intubation of the whole small bowel at operation, via a jejunostomy, after suction decompression, proved to be successful in the treatment of the three cases described.

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REPAIR OF CARDIAC DEFECT IN PATIENT WITH EHLERS-DANLOS SYNDROME AND DEFICIENCY OF HAGEMAN FACTOR

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Congenital defects of the cardiac septa usually have no known cause, but an incidence of 20–30% in arachnodactyly (Marfan syndrome) and mongolism has been observed (Wood, 1956). Congenital heart disease of all kinds is apparently rare in patients with Ehlers-Danlos syndrome, a hereditary disorder of connective tissue. We have found only one report of such an association, in which the patient had tetralogy of Fallot (Wallach and Burkhart, 1950).

The essential manifestations of the Ehlers-Danlos syndrome are friability of the skin and blood-vessels, undue mobility of the joints, and excessive distensibility and elasticity of the skin. The syndrome is transmitted as a Mendelian dominant character and has often been observed together with other anomalies (Johnson and Falls, 1949; Summer, 1956; Macfarlane, 1959; Zaidi, 1959). McKusick (1959) has stressed how little knowledge we have of the visceral abnormalities which may occur in this condition.

Hageman trait is a rare defect of blood-clotting which does not cause abnormal bleeding, despite a severe coagulation defect which is detectable in laboratory tests (Ratnoff and Margolius, 1957).

The occurrence of partial persistent atrio-ventricular canal in a patient with both Ehlers-Danlos syndrome and deficiency of Hageman factor must therefore be exceedingly rare. Such a combination and relevant observations are reported in the following case.

Case Report

A boy aged 11 years had been regarded as normal until the age of 8 years, when a heart murmur was detected by the school medical officer and he was referred to the cardio-thoracic unit of the Alfred Hospital. He had the clinical features of an atrial septal defect with left axis deviation in the electrocardiogram, suggesting the diagnosis of partial persistent atrio-ventricular canal. Two and a half years later his poor muscular development was noted, and he had developed symptoms of exertional dyspnoea. Cardiac catheterization and femoral-artery puncture performed without incident indicated a left-to-right shunt at both the atrial and ventricular levels, and the pulmonary blood flow to be four times greater than the systemic flow. The original diagnosis was retained, and he was admitted to hospital for repair of the defect three years after the first examination.

The patient, his mother, and at least 15 of her relatives (Fig. 1) had experienced abnormally easy bruising; the size

FIG. 1.—Part of family tree of the patient, who is shown by the arrow. Died indicates died in infancy.

of the ecchymoses was small (up to 4 cm. diameter). All had experienced large lacerations (5 cm. or more in length) requiring suturing of the knees and lower legs after minor traumata. Healing occurred without difficulty but resulted in broad scars of tissue-paper thinness. Excessive bleeding never occurred from these wounds or from accidental incised wounds. The affected relatives and the patient had not suffered from bleeding from mucous membranes, or into the joints and deeper tissues or from the uterus. The skin over the knees and elbows of the patient and his mother was unduly extensible; it could be pulled out to 4–5 cm. and felt elastic. On release the skin immediately resumed its normal contour. Apart from numerous large scars over the knees, the skin felt and appeared normal. Their wrist- and finger-joints were excessively mobile, so that they could be bent dorsally and almost touch the forearm. These features indicated that the patient had the Ehlers-Danlos syndrome of a mild-to-moderate severity.

Pre-operative blood examinations gave the following results: haemoglobin, 14.8 g./100 ml.; white cells, 9,000/c.mm.; platelets, 280,000/c.mm. Skin bleeding-time and capillary resistance tests were normal. Blood-clotting studies are given in Tables I and II.

From the coagulation tests it is seen that the blood-clotting time and the partial thromboplastin time were prolonged. Prothrombin time was normal. From these results it seems that there was a defect in the early stages of blood coagulation. Thromboplastin generation tests