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How I do it

The technique of intestinal strictureplasty

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Aetiology and classification of strictures

Localised narrowing of the alimentary tract may be due to a number of causes. If the narrowing arises in the muscle due to spasm, hypertrophy or failure of relaxation, it can be treated by dilatation or myotomy, techniques frequently used at the extremes of the alimentary tract for oesophageal, pyloric and anal narrowing. A true stricture usually implies the presence of fibrosis due to mature fibrous tissue. In the alimentary tract this results from the maturation of granulation tissue that has replaced the epithelial lining of the gut destroyed by ulceration. For such a stricture myotomy is inapplicable although forcible dilatation can still be used, as it is in the management of peptic strictures of the lower oesophagus and "post-Whitehead deformity" of the anus.

Benign strictures of the alimentary tract can occur as a result of healing of any form of ulceration of the gut, particularly circumferential ulceration. A stricture often occurs in the healing phase of tuberculosis, after potassium ulceration, caustic ulceration of the oesophagus, peptic ulceration anywhere in the alimentary tract, ischaemic ulceration as the result of embolic or athrosclerotic disease or following trauma in an incarcerated hernia. Ischaemic strictures occasionally occur at intestinal anastomoses, particularly if associated with localised sepsis due to partial disruption. Post-irradiation strictures also cause strictures due to tissue ischaemia. Crohn's disease causes strictures, particularly in the small bowel, anus and rectum.

Strictures due to Crohn's disease

Although the common terminal ileal strictures are usually 10–20 cm long, proximal "skip" lesions, jejunal and duodenal Crohn's disease often take the form of multiple short strictures.

Crohn's disease usually runs an intermittent course of exacerbations and remissions. Obstructive symptoms usually present during acute exacerbations, when the wall of the gut is oedematous. If they occur when small bowel Crohn's disease is in remission they are usually due to fibrous stenoses of the gut. Persistence of intestinal fistulas in Crohn's disease is due most commonly to obstruction distal to the fistula. Chronic external abdominal fistulas may persist long after the primary bowel disease has become quiescent.

Operative treatment

Although surgical intervention in small bowel Crohn's disease usually involves excision of the limited disease segment and end-to-end anastomosis, there are certain conditions in which strictureplasty can be considered as an alternative. These indications are:

1. short strictures in quiescent disease
2. multiple short strictures, particularly "skip" lesions proximal to a major diseased segment that is to be excised
3. if there is already a serious shortage of small intestine from previous reactions, when it is desirable to attempt to preserve as much bowel as possible.

Contraindications to strictureplasty have not yet been defined accurately but in my experience there are few apart from irremediable distal obstruction. Nevertheless, I would not normally use it in primary surgical intervention for which simple excision and anastomosis gives such good results. Strictureplasty can be used in the presence of a fistula and of localised sepsis and can be employed safely even when the bowel disease is in an acute phase. However, I have always preferred to employ it when the disease is quiescent.

Other strictures

I have no experience in the use of strictureplasty for radiation strictures and it might be hazardous in

this condition when local ischaemia might impair healing. The safety of strictureplasty in Crohn's disease may be due largely to the fact that the narrow segment of bowel is usually hyperaemic.

Technique

A short stricture can be treated in the same way as a Heinecke-Mikulicz pyloroplasty is performed for a pyloric or duodenal peptic stricture. The gut is incised longitudinally from normal gut proximally, through the stricture, to normal gut beyond. I prefer to make the initial incision with coagulating diathermy as the gut is hyperaemic and bleeds readily. I make the incision 1 cm long in the immediately proximal part of the distended thin bowel (Fig. 1). The incision is made longitudinally and the edges of the gut are held open with fine tissue forceps or stay sutures. The lumen can then be inspected and the proximal end of the stricture assessed (Fig. 2). The luminal diameter of the stricture is measured with graduated dilators or the balloon catheter technique (see below). Dissecting forceps are then introduced through the stricture and allowed to spring apart to provide gentle sideways distraction (Fig. 3). The cutting diathermy blade is then used to cut through the stricture between the blades of the dissecting forceps which spring apart easily, once pliable normal gut is reached beyond the stricture.

I incise 1 to 2 cm proximally and distally into normal pliable bowel. The mid-point of the stricture is then grasped with the tissue forceps or held with stay sutures and distracted laterally (Fig. 4). A single horizontal mattress suture is placed from the apex of normal bowel proximally to the apex of normal bowel distally. Trial traction on this suture determines whether or not there is sufficient mobility of the tissues to proceed with the transverse suture (Fig. 5). Having tied the central suture to approximate the

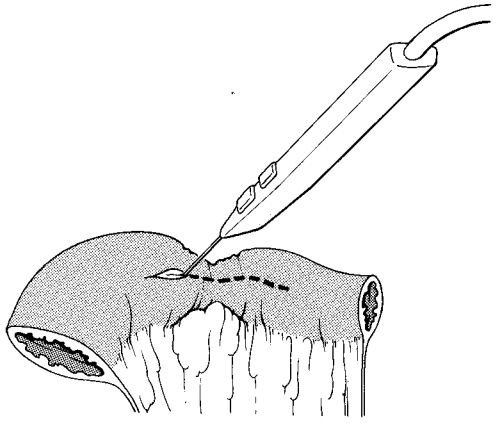

Fig. 1. Longitudinal incision across the stenosis using cutting diathermy

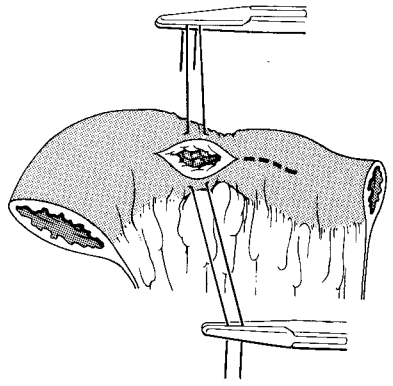

Fig. 2. Begin incision proximal to maximal stenosis entering relatively normal bowel

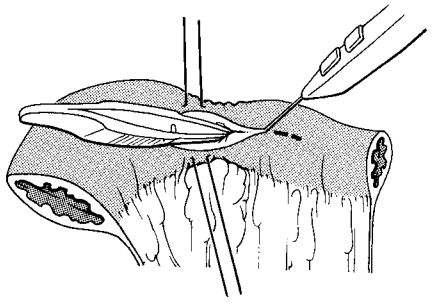

Fig. 3. Place forceps through the stenosis allowing them to spring apart

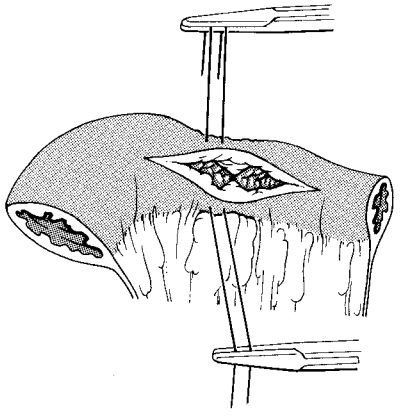

Fig. 4. Incision completed across stenosis from normal proximal to normal distal bowel

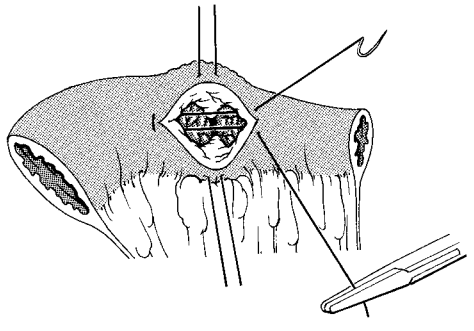

Fig. 5. Stay sutures provide lateral traction. A central mattress suture approximates the two ends of the incision centrally

two apices, the transverse suturing is completed, usually in one continuous layer (Fig. 6). When I first started using the technique I employed an interrupted inner layer and an inverting external sero-muscular continuous layer. However, when I started measuring the luminal diameter at the completion of the strictureplasty I realised that the double suture line technique further narrowed the bowel and appeared to be defeating the object of the operation. I now employ a single continuous layer of Vicryl and this technique has been used in the last 75 strictureplasties. No attempt is made to drain the anastomotic site or to place omentum over the strictureplasty (Fig. 7). As the peritoneal cavity is inevitably contaminated during the procedure I usually wash it out with a broad spectrum antibiotic in 3 l of saline.

The technique of strictureplasty is ideal for short strictures and multiple strictureplasties can be performed, as many as 25 having been performed in one operation. However, there are circumstances in which a long continuous stricture is found where there is already a serious shortage of small bowel because of previous resections. Under these circumstance I employ a Jaboulet type of pyloroplasty as shown in figures 8 to 10. A longitudinal diathermy incision is made along the whole length of the stricture (Fig. 8). Although the bowel is usually oedematous and fibrotic it has always been possible to bend it back on itself and perform this type of strictureplasty (Figs. 9 and 10). One patient who had only 80 cm of small bowel remaining had a 30 cm stricture that was dealt with in this way with satisfactory results.

It could be argued that there is no advantage of the long strictureplasty over a side-to-side enterostomy between either side of the long stricture. I accept this reservation and simply point out that cutting open the whole of a long stricture enables it to be assessed and, if necessary, biopsied. In my experience the Jaboulet type of strictureplasty gives no more complications than the short strictureplasty.

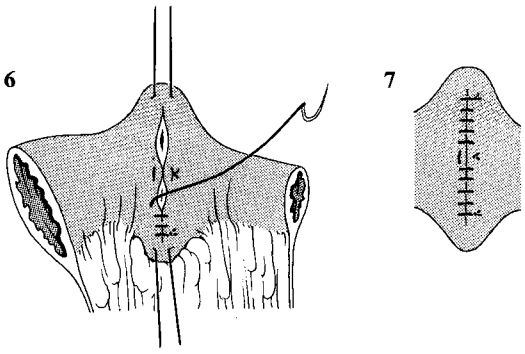

Fig. 6. A running suture completes the closure including all layers. If haemostasis is secured with diathermy the continuous suture may exclude the mucosa

Fig. 7. The completed suture line

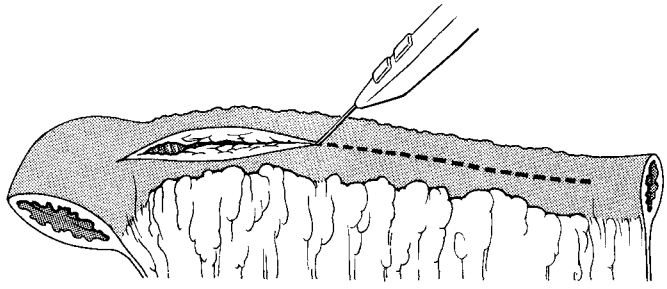

Fig. 8. Longitudinal incision along a long narrow segment

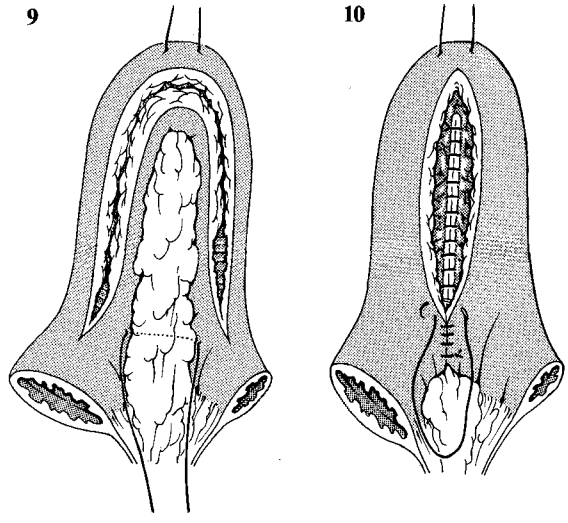

Fig. 9. The narrow segment is then folded into a loop

Fig. 10. The back layer is closed with a running suture which then continues to close the anterior layer similar to the formation of a J pouch

Assessment of luminal diameter

We now adopt the policy of checking the luminal diameter of the whole of the small bowel whenever we have to perform an enterotomy in patients with Crohn's disease. Through the enterotomy it is possible to pass a standard urinary balloon catheter throughout the whole length of the small bowel with the aid of a catheter introducer. Once the catheter is through the entire lumen with the gut concertinaed onto the catheter, the balloon is inflated with 8 ml of water to give a luminal diameter of 25 mm (Fig. 11). The balloon is then pulled back through the bowel until it becomes occluded by a stricture of smaller diameter. The balloon is then serially deflated to contain 6 and then 4 ml of water giving a luminal diameter of 20 and 15 mm. This allows accurate sizing of the diameter of the stricture. Once the stricture is passed the balloon is reinflated and the whole

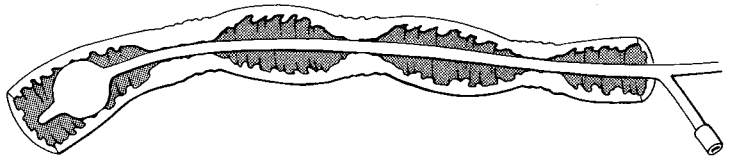

Fig. 11. A balloon catheter is introduced through a series of strictures and the balloon inflated to give a diameter of 25 mm

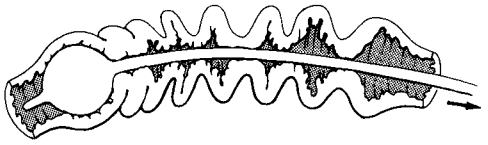

Fig. 12. The balloon is then pulled back through the bowel until it becomes occluded by a stricture. The size of the stricture can be determined by varying size of the balloon

gut is examined with a resulting map of the stricture pattern throughout the small bowel (Fig. 12). On a, so far, empirical basis we have decided that a luminal diameter of 20 mm or greater is unlikely to be producing any symptoms or sequelae.

Results

We have now performed 146 strictureplasties on 57 patients without a death. There have been four anastomotic leakages that have led to persistent fistulae, one of these due to a distal stricture. One healed spontaneously on total parenteral nutrition and the other led to a permanent proximal stoma. Seven other incidents of pain and minor pyrexia suggested the possibility of a small leak but the condition resolved spontaneously without discharge of pus or bowel content.

Eight patients have needed reoperation 6 months to 3 years later, six of these because of strictures elsewhere in the bowel and two because of restenosis at the site of the previous strictureplasty. One patient has developed a jejunal carcinoma at the site of a stricture in the small bowel 2.5 years after her original strictureplasty. This occurrence has led us to take biopsies from all suspicious strictures. However, incidence of small bowel carcinoma in Crohn's disease is still sufficiently low that I would not advocate always taking out small bowel Crohn's disease because it might later develop carcinoma. Such a policy would lead to unnecessary sacrifice of gut.

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