

High peptic stricture of the oesophagus

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Davidson, J. S. (1976). *Thorax*, 31, 1-14. **High peptic stricture of the oesophagus.** Fifty-seven patients with high peptic stricture and the lower oesophagus lined by columnar epithelium are considered from the clinical point of view. Information from 115 cases of low stricture is introduced for comparison. The average age of adult patients was 62 years with a sex incidence of 36 females to 21 males. There is little difference between the symptoms of high and low strictures. Radiologically, the majority of high strictures are short and smooth but other types are illustrated. Carcinoma and congenital mid-oesophageal web are considered in the differential diagnosis. There was an associated duodenal ulcer in 10% of cases. In six patients, a high stricture developed soon after an abdominal operation or period of recumbency. Two patients are illustrated showing the process of stricture formation. Four patients are described who had gastric-lined oesophagus but no ulceration or stricture. One patient had a Barrett ulcer in addition to a high stricture. A patient is described in whom the mucosa of the lower oesophagus appeared to be replaced by jejunal mucosa following oesophagojejunostomy. One patient is illustrated in whom a stricture was seen to ascend the oesophagus over a period of six years. Thirty-three patients were treated by dilatation and 24 by operation. Hernial repair is an effective form of treatment. Of 19 patients treated in this way, significant dysphagia persisted in two and slight dysphagia in one. The clinical findings are discussed in relation to the origin of columnar epithelium in the oesophagus.

This paper is a clinical account of high peptic stricture in patients with the lower oesophagus lined by columnar epithelium of gastric type. It is based on 57 patients, of whom 18 were studied prospectively during 1973 and 1974. The remainder were collected from previous years since 1950. Information gained from a series of 115 low peptic strictures seen between 1950 and 1970 is introduced, where appropriate, for comparison to be made between the two types of stricture.

Strictures at the upper limit of a gastric-lined oesophagus may be usefully divided into two groups.

Group 1 consists of strictures lying at the level of the aortic arch where it is obvious, radiologically and endoscopically, that they are at a considerable distance above the oesophagogastric junction (Fig. 11a). There were 42 patients in this group. In 24 of them, gastric type mucosa was found in oesophageal biopsy from the stricture. In five patients, a biopsy showed granulation tissue only, suggesting that it had been taken from an ulcerated area. Inflamed squamous mu-

cosa was seen in four, and in nine patients no biopsy was taken. In the 18 patients studied prospectively, no biopsy was obtained in two, inflamed squamous mucosa was found in three, and, in the other 13, there was gastric type mucosa in the biopsy. A benign oesophageal stricture at the level of the aortic arch is most likely to be a high peptic stricture and, although a biopsy containing columnar epithelium was not obtained in every case, there seems no doubt about the diagnosis in any of the patients included in this group.

Group 2 comprises strictures lying not lower than midway between the aortic arch and the hiatus. In the case of such strictures it is sometimes difficult to be sure that there is a segment of gastric-lined oesophagus between the stricture and the oesophagogastric junction, and it is for this reason that they are considered as a special group. Where there is a hernia with a large amount of upward slide, a stricture at the cardia may be at a high level. A biopsy taken through the oesophagoscope and showing gastric epithelium may have been obtained from within the

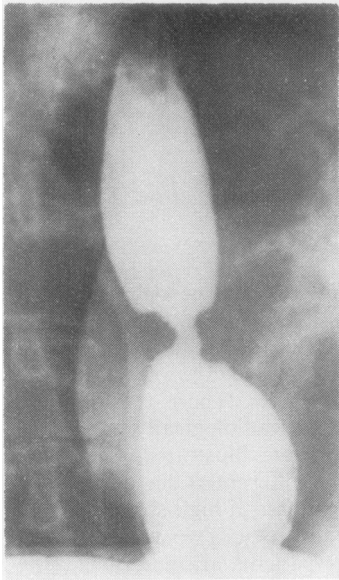


FIG. 1

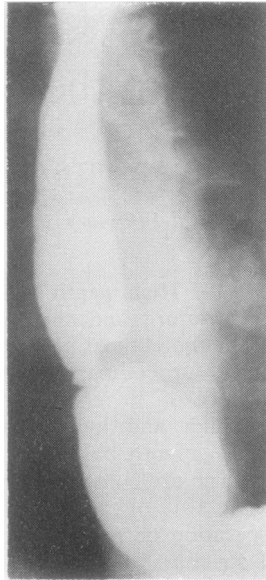


FIG. 2

herniated stomach. The difficulty in distinguishing radiologically between these two types of stricture is illustrated in Figures 1 and 2. In the group of midway strictures with gastric-lined oesophagus there were 15 patients. In five of them, columnar epithelium was found on biopsy, and it was apparent, both on radiography and at thoracotomy, that the stricture lay at a considerable distance above the oesophagogastric junction. In four patients the diagnosis was confirmed on histological examination of the resected specimen. The diagnosis in two patients was made on biopsy and the radiological appearances, and, in the remaining four, on radiographic and endoscopic appearances without histological confirmation. The number of patients in this group is small because of the strict criteria for inclusion. The importance of the existence of gastric-lined oesophagus below the stricture is its bearing on the efficacy of surgical treatment of the stricture by hernial repair. This will be discussed later.

INCIDENCE

Over the years the number of patients referred to our department with dysphagia due to peptic stricture has increased. This applies equally to high and low strictures. Whether or not this reflects a true increase in the incidence is not known. During 1973 and 1974, 56 new patients

with peptic stricture were seen, and 15 of them had high strictures. In a previous study of 146 peptic strictures seen up to 1970, there were 31 high strictures. Our figures suggest that high strictures with the lower oesophagus lined by columnar epithelium account for between one-fifth and one-quarter of all peptic strictures.

AGE Of the 57 patients, four were children and four young adults between the ages of 17 and 28 years. The mean age of the adults with high stricture was 62 with an age span of 43 to 86 years. The average of our patients with low stricture was 63 years. Whereas in many adult patients the stricture lay at the level of the aortic arch, and sometimes level with its upper border, in the children and young adults all the strictures were somewhat lower down.

SEX There were 36 females and 21 males. From our figures it appears that the sex incidence of high strictures is the same as that of low strictures and also of uncomplicated hiatal hernia.

SYMPTOMS

DYSPHAGIA All the adult patients complained of dysphagia, which had commonly been present for six months to two years. One woman had had

dysphagia for 25 years and one young man had had a 'narrow swallow' all his life. The dysphagia was usually gradual in onset over a period of some months, persisting thereafter but being variable in its severity. A sudden onset was experienced by two patients whose first symptom was an episode of food impaction. A rapid onset of dysphagia occurred in six patients who had difficulty in swallowing after an abdominal operation or period of enforced recumbency. In the case of certain strictures which were web-like in appearance, the prominent feature was repeated episodes of food impaction rather than constant dysphagia. Bolus obstruction occurred at some time in eight of the 57 patients and was associated with pain and distressing choking sensations. In two patients, although the stricture was as high as the aortic arch, food impaction initiated hiccup, which persisted until the bolus was regurgitated or passed on.

The patients' descriptions of the level at which food was held up were unreliable, and a distinction between high and low strictures could not be made from it. It is of interest, however, that one patient, in whom the stricture ascended the oesophagus, volunteered the information that the obstruction had come to lie higher up in her gullet.

The characteristics of dysphagia due to high and low strictures are essentially the same.

HEARTBURN AND PAIN In only three patients was there no history of heartburn preceding the dysphagia. A history of migraine or 'biliousness' was not uncommon. Some patients experienced severe acid regurgitation and, when this happened at night, it would wake them up choking and gasping for breath. In one patient this had been mistaken for paroxysmal nocturnal dyspnoea. As sometimes happens with low strictures, three patients had relief from their heartburn when they developed dysphagia. Four patients had severe boring pain high up between the shoulder blades. Although it has been said that, in the case of high peptic stricture, the heartburn is felt higher up than with low stricture, we could not confirm this. On the other hand, when a patient had a localized pain in the back, this seemed always to be high up.

HAEMORRHAGE AND ANAEMIA Four adult patients (8%) had a previous history of haematemesis. The source of the haemorrhage was uncertain in two of them, as one had a gastric ulcer and the other a duodenal ulcer and an ulcer within the gastric-lined oesophagus. No large haemorrhage occurred.

In our series of low strictures there was a history of haematemesis in 20% of cases. Three of the four children with high strictures brought up bloodstained fluid soon after birth.

Anaemia or a previous history of anaemia was present in 13.4% of patients. The corresponding figure for patients with low stricture was 18%.

NUTRITION All the children failed to thrive. In adults, on the other hand, loss of weight was not common in spite of dysphagia. Many patients remained overweight, and a few even gained weight. In the case of low strictures we found that, between the ages of 50 and 65, weight loss was not a prominent feature but that nutritional problems arose in infancy, in patients who developed a stricture after an abdominal operation (which was usually for duodenal ulcer), and in some patients over the age of 70. One patient with a high stricture following gastroenterostomy for pyloric stenosis suffered from severe weight loss. It was not possible in the series of high strictures to correlate weight loss with advancing age but it seems probable that there is no significant difference in the nutritional state of patients with the two types of stricture.

RESPIRATORY SYMPTOMS When a patient has dysphagia and recurrent pneumonitis with localized radiological opacities, the pulmonary infection may be attributed with some confidence to aspiration. One patient had repeated pneumonitis in the left upper lobe. It is more difficult, in an industrial community, to relate bronchitis without radiological opacities in the lungs to spill-over, but this was the probable aetiological factor in 10% of adult patients. Four patients suffered from bronchitis and one began to have asthmatic symptoms following the onset of dysphagia when she was 65. All the children had chronic lung infection. In the series of low strictures bronchitis, probably attributable to aspiration, was recorded in 8.1% of patients.

From our figures it appears that the incidence of respiratory symptoms due to aspiration is the same for high and low strictures and that with both types of stricture respiratory complications are much more common in infants and children than in adults.

RADIOLOGY

A majority of high strictures are short and smooth (Fig. 11a). They may, however, show a variety of appearances. Some are irregular and resemble

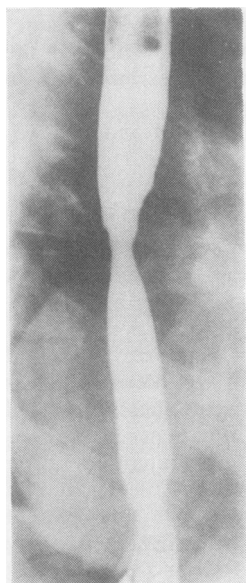


FIG. 3. Stricture having the appearance of a web at oesophagoscopy.

carcinoma (Fig. 13a). Others appear on barium swallow to contain a deep ulcer (Fig. 14a), though this appearance is less common than in the case of low strictures. The stricture may be web-like (Fig. 3) or may consist, at least initially, of a long, rather rigid, tubular-looking narrowing (Fig. 16a).

High strictures may be missed by the radiologist. This happens in three ways. Liquid barium passes rapidly down the oesophagus, and the radiologist, perhaps concentrating on the region of the cardia, fails to notice a stricture higher up (Fig. 4a and b). A web-like stricture, though easy to see endoscopically, may be difficult to demonstrate on films if liquid barium is used (Fig. 3). The type of stricture which begins as a long, mild degree of narrowing may not be commented on by the radiologist though it is obvious at oesophagoscopy (Fig. 16a).

In all the patients, gastro-oesophageal reflux, with or without a hernia, could be demonstrated.

It was not possible from the radiological appearances to determine whether or not a high stricture would respond to the surgical control of gastro-oesophageal reflux but the stricture which begins as a long, rigid-looking stenosis, probably involving a long segment of total mucosal loss, is possibly the least likely to respond.

OESOPHAGOSCOPY

The rigid oesophagoscope was used throughout. In adult patients, the average distance of the

lesion from the upper incisor teeth was, for high strictures, 26 cm and for midway strictures 29 cm.

An attempt was made to assess the nature of the stricture from its appearance and from its feel as bougies were passed. Strictures were roughly divided into the following groups in adult patients—soft and inflamed (22), hard and tight (9), irregular and ulcerated (14), and web-like (7). It was at first assumed that the apparent nature of the stricture would correlate with its response to the control of reflux. While it is true that those described as soft and inflamed did well, as was to be expected (Fig. 11), a considerable number of those which felt hard and tight (Fig. 15) or which appeared to contain an ulcer (Fig. 14) responded well to the control of reflux. Thus, of eight soft inflamed strictures, seven became free from dysphagia and one had only slight residual dysphagia; of seven ulcerated, irregular strictures, only one failed to respond; three hard, tight strictures all did well; one web-like stricture persisted.

From this small series it has not been possible to decide from the oesophagoscopy findings which stricture is not going to respond to the control of reflux but it is apparent that only a few fail to do so.

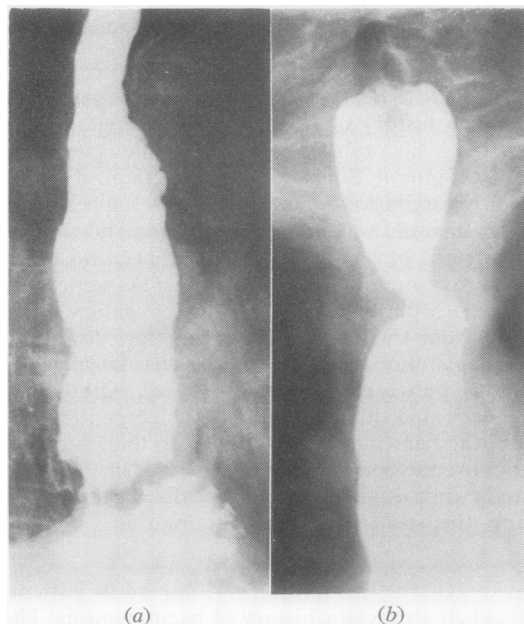


FIG. 4. (a) Barium swallow missing a high stricture. (b) The same patient showing the stricture at the level of the upper border of the aortic arch.

DIFFERENTIAL DIAGNOSIS

The most important differential diagnosis is from carcinoma. A single negative biopsy is insufficient to exclude malignancy, but if gastric-type epithelium is obtained from a high stricture, it is unlikely that the lesion is other than a peptic one.

No peptic stricture was found at a level higher than the upper border of the aortic arch so that the lesion is not likely to be confused with a post-cricoid web. Lower oesophageal webs, because of their situation, do not enter into the differential diagnosis. However, certain web-like high strictures have, apart from their situation, many of the characteristics of lower oesophageal web or Schatzki ring as far as symptoms are concerned.

Congenital webs may occur at the same level as high peptic stricture, as is illustrated by the following patient.

A boy aged 2½ years had had dysphagia since weaning. He had episodes of food impaction. Radiographs showed a stricture at the level of the tracheal bifurcation (Fig. 5). At oesophagoscopy a smooth web was seen, opening and closing with the phases of respiration. A biopsy showed nor-

mal squamous mucosa. The web was excised by submucous dissection. Squamous mucosa was present on both its upper and lower aspects.

A Barrett ulcer may occasionally cause stenosis but this condition may be distinguished from high peptic stricture by the presence of gastric-type epithelium in biopsies taken from above the ulcer.

ASSOCIATED CONDITIONS

The commonest associated condition is hiatal hernia. In only three patients, two of whom were children, was no hernia found either on radiography or at thoracotomy. In two patients the question whether or not there was a hiatal hernia remained undecided at thoracotomy.

A peptic ulcer was found in 10% of patients (duodenal ulcer, 5; gastric ulcer, 1). In the series of low strictures, a peptic ulcer, nearly always duodenal, was found in 16.6% of patients.

One patient (described later) had, in addition to a stricture at the level of the aortic arch, a Barrett ulcer in the gastric-lined oesophagus (Fig. 6). One patient had a pancreatic tumour with

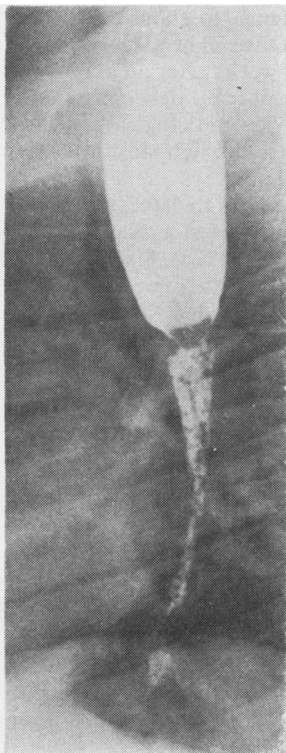


FIG. 5. *Congenital mid-oesophageal web.*

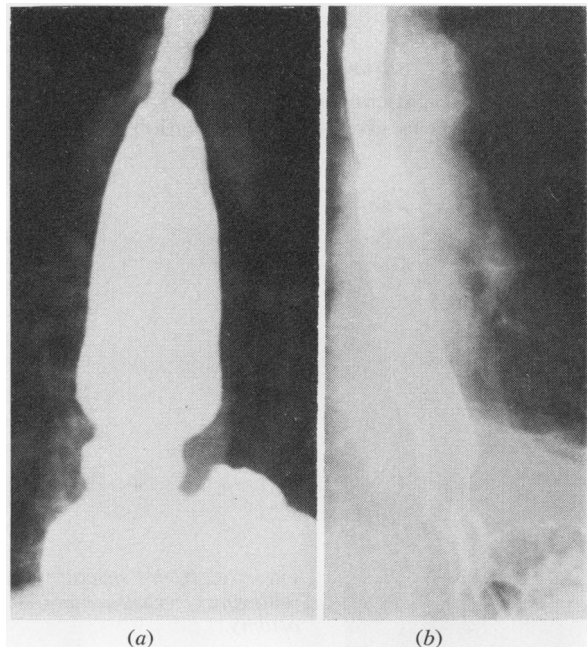


FIG. 6. (a) *Film showing a high stricture and a Barrett ulcer just above the cardia.* (b) *Postoperative film showing disappearance of the stricture but persistence of the Barrett ulcer.*

the Zollinger-Ellison syndrome. A baby had a diaphragm in the second part of the duodenum, and a young adult had a Meckel's diverticulum.

Two patients with high stricture suffered from Parkinsonism, and, in the series of low strictures, there were three cases of Parkinsonism and one girl with repetitive purposeless movements due to phenylketonuria. It has been suggested that incoordinated movements affecting deglutition and associated with aerophagy may cause gastro-oesophageal reflux.

POSTOPERATIVE HIGH PEPTIC STRICTURE

The occurrence of dysphagia due to low peptic stricture following an abdominal operation or period of enforced recumbency is well known. It often begins three to four weeks after the operation. The same sequence of events occurs in the case of some high strictures. In our series, the onset of dysphagia was related to an operation or to recumbency in six patients (operation for duodenal ulcer, 2; operation on the biliary tract, 2; hysterectomy, 1; bed rest because of a broken leg, 1). In two of the patients there had been nasogastric intubation. Figure 7 shows a high stricture following gastroenterostomy for pyloric stenosis.

NATURAL HISTORY

Many of our patients were treated by dilatation so that the series gives some information regard-

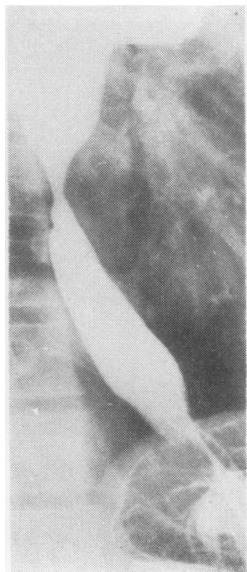


FIG. 7. *High stricture following gastroenterostomy.*

ing the natural history interfered with only by the occasional passage of bougies.

In the great majority of patients, the previous history of heartburn suggested that there had been reflux and superficial oesophagitis for some years. Just as the oesophagus lined by squamous mucosa may be subjected to reflux for years without stricture formation, several of our patients appear to have had columnar-lined oesophagus and reflux for an indeterminate period without complications. The factors precipitating mucosal breakdown and stricture remain obscure.

As in the case of low strictures, high ones tend to retain the same characteristics in any one patient. Thus we found that, with few exceptions, soft, inflamed strictures and hard, tight ones rarely changed their character. Also, a stricture having the appearance of a web when first seen is likely to remain the same. Over a period of years the severity of the dysphagia often varies from time to time. The cause of exacerbations of dysphagia is usually not apparent. It is also a mystery why the intervals between the need for dilatation may vary greatly in the same patient. A stricture does not necessarily get worse with time, and one which initially responds well to dilatation is likely to continue to do so.

We have limited evidence to show the genesis and progression of stricture. The occurrence of high stricture about four weeks after an abdominal operation suggests that it can develop rapidly. The following cases provide radiological evidence of the manner in which some high strictures may behave.

(1) A woman of 48 began to have slight dysphagia in 1968 when films showed a mild stricture, probably with ulceration (Fig. 12a). Six years later the stricture was more marked (Fig. 12b). It was short throughout and remained at the same level.

(2) Figure 16a shows a long, rigid-looking, mild narrowing and is the initial barium swallow in a woman of 46. Seven months later this stricture progressed to become very tight (Fig. 16b).

Patients usually present with dysphagia and an established stricture, and our knowledge of the way in which the stricture developed is limited in most cases by the absence of serial radiographs before the onset of difficulty in swallowing.

CASES OF INTEREST IN RELATION TO LOWER OESOPHAGUS LINED BY COLUMNAR EPITHELIUM

The following case reports refer to patients with gastric-lined oesophagus but without ulceration or stricture.

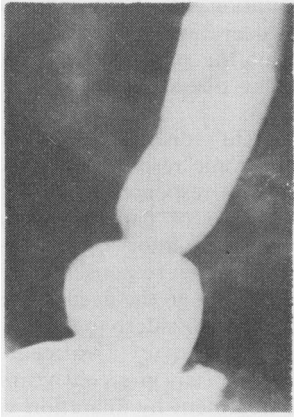


FIG. 8. *Hiatal hernia and gastric-lined oesophagus without stricture.*

(1) A woman of 68 had a long history of dyspepsia, and a perforated duodenal ulcer many years previously. She complained of cramp-like pains in the chest, relieved by alkalis. Films (Fig. 8) showed a small hiatal hernia and free reflux. At oesophagoscopy the squamocolumnar mucosal junction was at 30 cm. There was no evidence of oesophagitis, ulceration, or stenosis. A biopsy from the mucosal junction showed gastric-type epithelium.

(2) A woman of 63 had similar symptoms, a hiatal hernia and reflux but no stricture. In this patient the mucosal junction was shown histologically to be at 20 cm.

(3) A woman of 36 had heartburn and a feeling

of a lump in the throat. The mucosal junction was proved histologically to be at 30 cm. There was a small hernia but no stricture.

(4) A boy aged 4 months suffered from vomiting and failed to thrive. There was free gastro-oesophageal reflux but no hiatal hernia (Fig. 9a). At thoracotomy no hernia was found. An attempt to make the cardia competent failed. On further oesophagoscopy the mucosa looked velvety red, and a biopsy from the level of the aortic arch consisted of gastric-type epithelium. On subsequent radiography a diaphragm was found in the second part of the duodenum (Fig. 9b). Excision of this diaphragm resulted in cure of the symptoms. During a follow-up of five years no complications have developed.

The following case, presenting interesting features in relation to abnormally lined oesophagus, has already been described in detail (Davidson, 1964).

A man of 54 had a total gastrectomy with Roux-en-Y oesophagojejunal anastomosis for recurrent gastric ulceration as part of a Zollinger-Ellison syndrome. The anastomosis was just above the cardia. Six years later he developed dysphagia due to a stricture at the level of the aortic arch. The pancreatic tumour was malignant, and at necropsy the oesophagus up to the stricture was lined by columnar epithelium having the appearance of small intestinal rather than gastric mucosa.

In one patient there was apparent ascent of a stricture up the oesophagus. She was a woman of 73 with a history of heartburn who developed dysphagia due to a stricture at the oesophago-

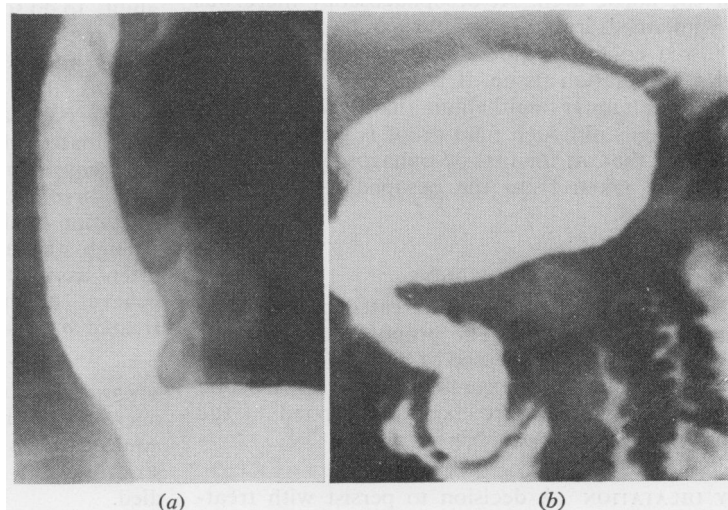


FIG. 9. (a) *Gastric-lined oesophagus in a child without hiatal hernia.* (b) *The same patient showing a duodenal diaphragm.*

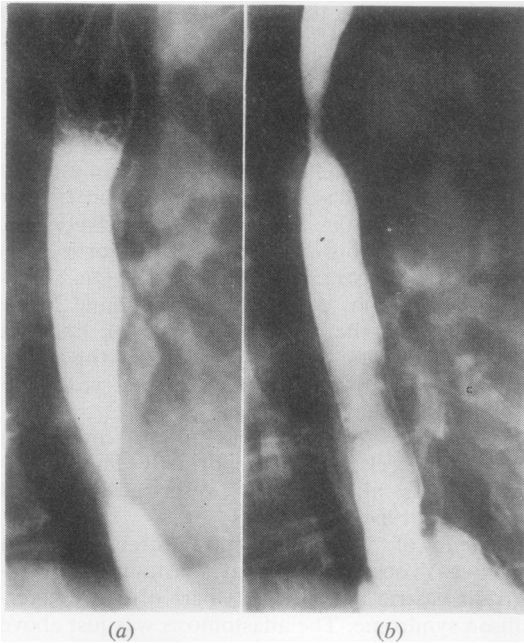


FIG. 10. (a) Barium swallow showing stricture at low level. (b) The same patient five years later showing stricture now at the level of the aortic arch.

gastric junction (Fig. 10a). At oesophagoscopy there was an inflamed stricture at 34 cm with acute oesophagitis above it. The stricture was dilated but some dysphagia persisted. Six years later the dysphagia became worse. The patient said that the food was now sticking much higher up, and a film (Fig. 10b) showed a stricture at the level of the aortic arch. At oesophagoscopy there was an inflamed, irregular stricture at 25 cm. Biopsies showed columnar epithelium of gastric type and also granulation tissue. It is assumed that, in this case, columnar epithelium had ascended the oesophagus although final proof is lacking due to the fact that, at the first oesophagoscopy, a biopsy was not taken from the oesophagus above the stricture.

TREATMENT

Of the 57 patients, 33 were treated by dilatation and 24 by operation. The proportion of patients operated on has increased. This has come about because of increasing confidence that high peptic strictures in adults are likely to respond to the control of gastro-oesophageal reflux.

BY DILATATION A decision to persist with treat-

ment by dilatation has been influenced by the following considerations:

1. the age of the patient. The average age of those treated by dilatation was 65 and, of those operated on, 54;

2. intercurrent disease, especially cardiovascular and chronic respiratory disease;

3. an excellent response to dilatation. In an appreciable number of patients, dilatation is required only at long intervals. It has been our policy to observe the response to initial dilatations before deciding on the need for surgery. This applies particularly to elderly patients. In younger patients early operative treatment has been undertaken more often in recent years.

Successful treatment by dilatation via the oesophagoscope depends to a large extent on the local arrangements. The procedure should always be done by the same surgeon. Delegation of this task to an ever-changing junior staff is unsatisfactory. There must be an arrangement whereby the patient can contact the hospital directly as soon as dysphagia recurs so that dilatation can be done without delay. The method fails if the patient has to attend outpatient clinics and perhaps see a different doctor each time.

Occasionally a stricture is so tight that it is not possible to pass a bougie. In such circumstances, if the patient is fed parenterally for a few days, the passage of a bougie becomes easier. There was no instance of instrumental perforation.

In six patients, self-bougination was used with success. The patient is admitted to hospital to be taught to pass the bougie. It has usually taken a week for him to gain complete confidence in his ability to do so.

A majority of strictures required dilatation at yearly intervals. One third were dilated every six months. The intervals between dilatations vary in any one patient. One patient whose stricture was dilated 11 times between 1951 and 1962 did not require another dilatation for 11 years. In only three patients was heartburn worse following dilatation of the stricture.

High strictures, which tend to be short and less often associated with deep ulceration, can, we believe, be more easily and more effectively treated by dilatation than low strictures.

OPERATIVE TREATMENT The number of children operated on is too small for comment. In two adult patients operated on some years ago, the stricture was resected with jejunal implant; one died.

It is now considered that, in adults, treatment should be directed to the control of gastro-oesophageal reflux. In selecting patients for treatment by hernial repair it is necessary to exclude the following conditions:

1. a stricture which, though lying at a high level, is in fact at or near the cardia and associated with shortening and rigidity of the oesophagus. A high stricture at the level of the aortic arch does not produce shortening of the oesophagus, and the hernia is easy to reduce. Also, the portion of oesophagus brought down through the hiatus is not inflamed or thickened, and competence at the oesophagogastric junction can be achieved;

2. the occasional patient in whom a Barrett ulcer gives rise to stenosis. This lesion does not seem to respond to the control of reflux.

In the absence of shortening and rigidity of the lower part of the oesophagus, it is a matter of personal preference which type of hernial repair is employed. Since 1970 we have preferred the method described by Hill (1967) but have operated through a thoraco-abdominal incision. In addition, a circumferential oesophageal myotomy (Davidson, 1972) is done between the stricture and the cardia. In the case of low strictures, the vagi may form taut cords, hindering satisfactory reduction of the hernia, and, for this reason, they have to be divided. This is not so with high strictures, and the main vagal trunks have been preserved unless there is an associated duodenal ulcer, in which case the vagi are divided and a gastric drainage operation is carried out.

It is an indication of increasing confidence in this procedure that, of 19 patients treated by hernial repair, 11 have been operated on in the past four years.

Results of treatment by hernial repair Of 19 patients in whom the hernia was repaired, eight were operated on before 1970 by an Allison procedure. Five had a good result with cure of the dysphagia. One, operated on in 1966, was shown postoperatively still to have some reflux but has had no further dysphagia. In one patient, who developed a high stricture following gastro-enterostomy, the stricture was converted from an inflamed, irregular to a smooth, web-like one. The patient was taught self-bougination, which he was able to discontinue after two months without subsequent recurrence of dysphagia. One patient with bilateral bronchiectasis and a web-like stricture, who was operated on in 1966, has had to have intermittent dilatations ever since.

Since adopting our present operative technique in 1970, we have operated on 11 patients. A barium swallow has been done two weeks and three months postoperatively. A postoperative endoscopy has been done only if dysphagia persisted.

Symptomatic results Eight of the 11 patients had no further dysphagia or heartburn. The following three patients had less satisfactory results.

1. A woman of 63 developed dysphagia and had a haematemesis in 1972. Films showed a hiatal hernia with reflux, a high stricture, and, in addition, an ulcer just above the oesophagogastric junction (Fig. 6a). The presence of this ulcer was confirmed at thoracotomy. Since hernial repair the patient has had no dysphagia and, radiologically, the stricture has disappeared. After two years the patient complains of epigastric pain, and recent films show some reflux and the appearance of a duodenal ulcer; they suggest that the ulcer in the gastric-lined oesophagus persists (Fig. 6b). This is the only patient in whom there was a Barrett ulcer in addition to a high stricture. The presence of this ulcer may account for the failure to achieve competence at the cardia.

2. A woman of 64, who had a stricture at 25 cm, was operated on in 1973. Slight dysphagia and heartburn persisted. One year later it was possible to show a mild residual stricture, and there was still some reflux. Although the patient's dysphagia was much less after the operation, the end result was not entirely satisfactory, presumably due to the persistence of reflux.

3. A woman of 46 had a long history of sickness. She had at one time been diagnosed as anorexia nervosa and had had bilateral leucotomy. Increasing dysphagia began in 1973. Radiographs (Fig. 16a) showed a long, slightly narrowed segment in the oesophagus. After eight months this had progressed to a tight stricture (Fig. 16b). The patient became emaciated. At oesophagoscopy there was a tight, inflamed stricture at 27 cm with columnar epithelium in the biopsy. Films two weeks after hernial repair (Fig. 16c) showed a persisting stricture which, at endoscopy, seemed to have become softer. The patient has been taught self-bougination, which she does without difficulty.

In summary, of 11 patients treated by our present method, the dysphagia disappeared in nine, persisted in mild form in one, and was still present in one.

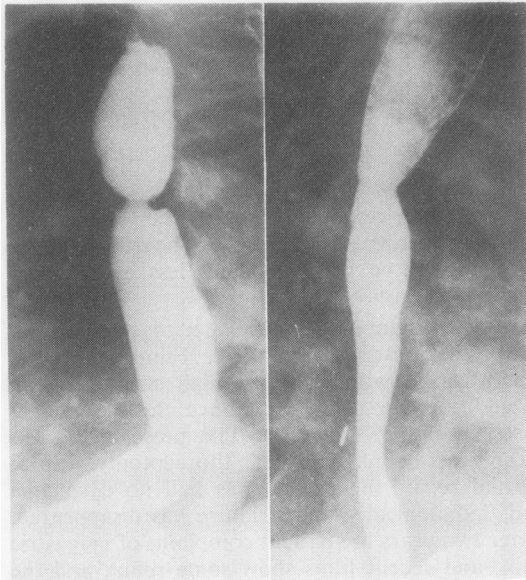


FIG. 11 (a) (b)

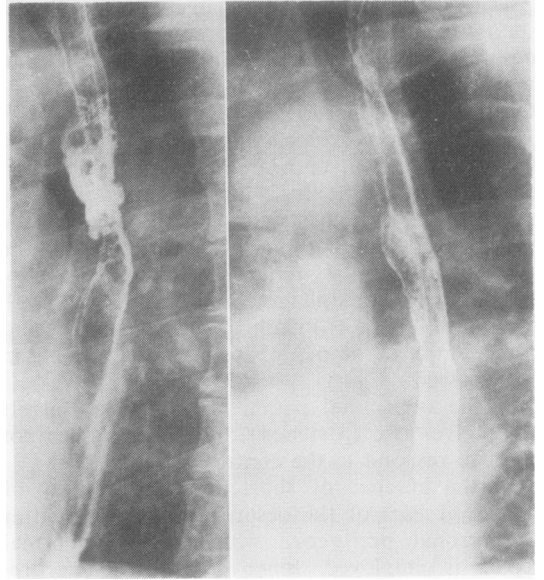


FIG. 13 (a) (b)

FIG. 11. (a) Short, smooth high stricture. (b) Film two weeks after hernial repair. The residual slight indentation indicates the site of the original stricture.

FIG. 13. (a) Irregular, ulcerated stricture. (b) The same patient five months after hernial repair.

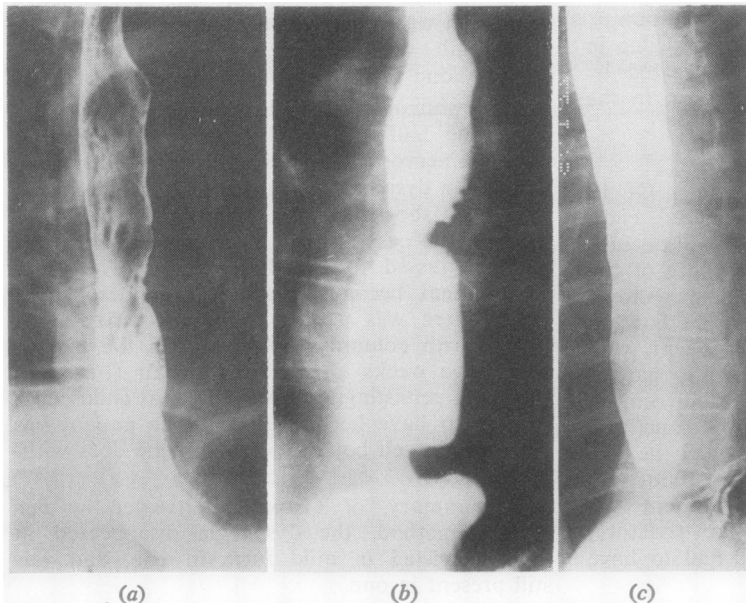


FIG. 12. (a) Film in 1968 showing early stricture and small ulcer. (b) The same patient six years later showing a well-marked stricture. (c) Barium swallow two months after hernial repair showing disappearance of the stricture.

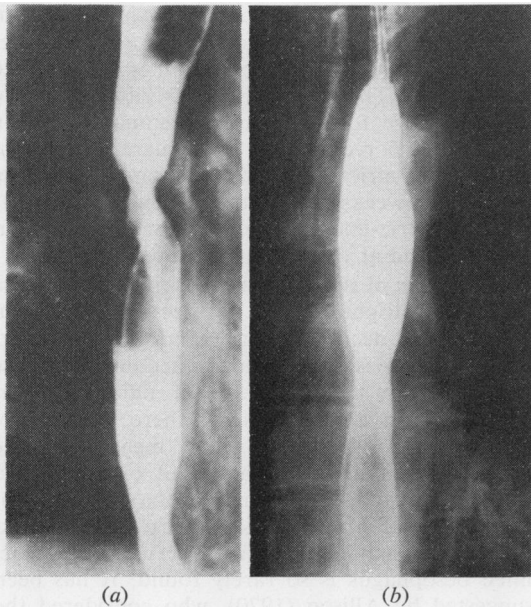


FIG. 14. (a) Stricture containing deep ulcer. (b) Post-operative film.

Radiological results In six of the 11 patients a stricture was no longer demonstrable radiologically. In four of them it can still be detected by the presence of slight indentation on the barium swallow at the site of the original stricture

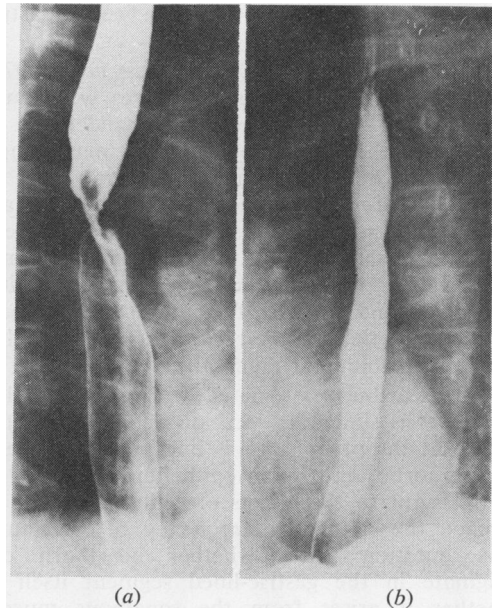


FIG. 15. (a) Hard, tight stricture with food impaction. (b) Film two weeks after hernial repair.

(Fig. 11b). In one patient an obvious stricture persists (Fig. 16c). Gastro-oesophageal reflux can still be demonstrated in two patients.

It has been found that, if a high stricture is going to respond to the control of reflux, it does so quite rapidly. There is evidence of marked improvement on barium swallows done as early as two weeks after operation.

Barium studies of different types of high strictures with their response to hernial repair are shown in Figs 11 to 16.

DISCUSSION

According to Burgess *et al.* (1971), who described a well-documented series of patients with columnar epithelial-lined lower oesophagus, this condition has been encountered with increasing frequency since the original papers by Barrett (1950) and Allison and Johnstone (1953). This has been our experience. d'Abreu (1963) noted the increased number of patients being referred to hospital because of dysphagia due to peptic stricture. It appears that this increase applies equally to high and low strictures. The numerical relationship between high and low strictures has not been established but, as has been mentioned and if our figures are correct and representative, as many as one-fifth to one-quarter of all peptic

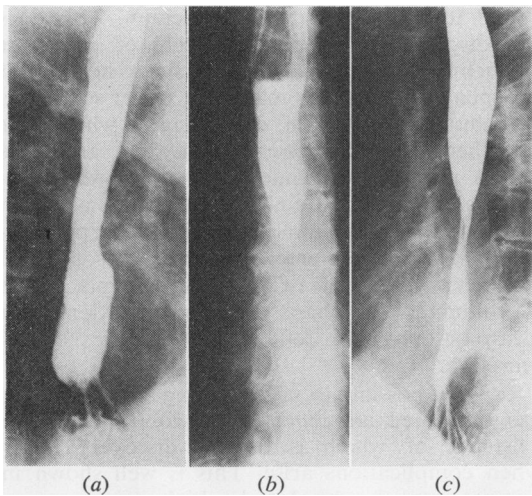


FIG. 16. (a) Film showing long, slightly narrowed segment in the oesophagus. (b) The same patient seven months later. The stricture has progressed to become very tight. (c) Early postoperative film showing persisting stricture.

strictures are high and associated with gastric-lined oesophagus.

In the series described by Burgess *et al* (1971), the sex incidence of high strictures was almost equal. Our figures show a preponderance of females in the same proportion as in uncomplicated hiatal hernia and in low stricture.

We have found the age incidence of high and low strictures to be the same. It appears, therefore, that whatever the origin of the abnormal oesophageal mucosa, acquired or congenital, ulceration and stricture formation tend to occur at the same time of life regardless of the level of the squamocolumnar mucosal junction.

The heartburn associated with high and low strictures is similar in location and severity. The fact that the oesophagus is lined up to the level of the aortic arch by an epithelium presumed to be resistant to the effects of reflux does not influence the nature or frequency of heartburn. The question arises whether heartburn can originate in the gastric-lined segment itself or whether it arises from the squamous mucosa above the stricture. In this series, there are two points of interest in this connection. It is well known that, in the case of low strictures, heartburn may cease after the onset of dysphagia. This has been attributed to the stricture acting as a barrier to reflux on to the squamous mucosa above it. Three of our patients with high stricture showed this sequence of events, suggesting that their heartburn arose from oesophagitis in the squamous mucosa above aortic arch level. On the other hand, the three adult patients who had reflux and gastric-lined oesophagus but no ulceration or stricture and no apparent oesophagitis above the mucosal junction all suffered from severe heartburn. While the heartburn with high and low strictures is the same, when a patient with a high stricture develops localized pain in the back, this pain always seems to be at a higher level than in the case of low strictures.

The incidence of haematemesis was less with high stricture. Although the situation is complicated by the frequent association with duodenal ulcer, this finding may relate to the fact that, radiologically, deep ulceration is less frequently seen in high than in low strictures. The incidence of anaemia was somewhat lower in high strictures (13.4 as against 18%) but, as pointed out by Windsor and Collis (1967), it is difficult to assess the part played by the stricture itself in the causation of anaemia.

Although much has been written regarding the occurrence of low strictures after operation,

usually for duodenal ulcer or pyloric stenosis (Davidson, 1967), the fact that high strictures may develop in similar circumstances has not been emphasized. The six patients described who had high stricture following an abdominal operation or period of recumbency are, therefore, of interest. Such strictures commonly cause dysphagia about four weeks postoperatively, which suggests that a gastric-lined oesophagus was present but unrecognized at the time of the operation.

The origin of the abnormal oesophageal mucosa remains in dispute. It has not been possible from our series to decide, on clinical grounds, whether the condition is congenital or acquired. All the findings seem to be capable of different interpretations. In all the patients there was gastro-oesophageal reflux. This may mean that the abnormal epithelium is the result of reflux. On the other hand, it is strange that, during investigation of the commonest cause of reflux, namely uncomplicated hiatal hernia, a gastric-lined oesophagus is so rarely found. It has been suggested by Allison (1970), who considered the anomaly to be a congenital one, that there might be an inherent muscular deficiency resulting in incompetence at the cardia. However, in nearly all patients, it is possible to achieve competence at the cardia by surgical means.

Two of our patients with low stricture and a penetrating ulcer were operated on and reflux was prevented. Both ulcers healed with a residual fibrous stenosis requiring resection. Healing was found to be by squamous epithelium. This does not disprove the theory of ascent of columnar epithelium in the oesophagus since healing of oesophageal ulceration may be by either squamous or columnar epithelium, depending on whether or not there is reflux. Bremner, Lynch, and Ellis (1970) removed the mucosa of the lower oesophagus in dogs and found that re-epithelialization by squamous epithelium predominated in preparations with a competent inferior oesophageal sphincter while total or nearly total replacement by columnar cells characterized preparations with gastro-oesophageal reflux and gastric hypersecretion.

It is not possible to say how long an oesophagus has contained an abnormal mucosal lining, the existence of which is usually discovered only when complications arise. This is well shown in our patients who developed a high stricture soon after an abdominal operation. In some patients it is the occurrence of a Barrett ulcer or a carcinoma with gastric-type mucosa above it which draws attention to a pre-existing gastric-lined

oesophagus. Occasionally, the condition is found accidentally, as in our patients who had gastric-lined oesophagus without stricture. The baby aged 4 months with a duodenal diaphragm is of interest in that a gastric-lined oesophagus without stricture was found at such an early age. There are two possible interpretations; either the duodenal diaphragm and the gastric-lined oesophagus were associated congenital anomalies or the duodenal diaphragm, by causing reflux, resulted in the mucosal change in the oesophagus. If the latter view is correct, it must be accepted that complete replacement of the lower oesophageal mucosa can be a very rapid process.

In nearly all instances, once a stricture has developed it remains at the same level, as illustrated in Figure 12. In two patients, however, there seemed to be evidence of the ascent of heterotopic mucosa—in the patient whose oesophagus became lined with mucosa of small intestinal type following oesophagojejunostomy, and in the patient illustrated in Fig. 10 who had an ascending stricture. Such findings correspond with those of Goldman and Beckman (1960), who observed a stricture ascend over a seven-year period, and Mossberg (1966) who described the ascent of glandular epithelium during a period of 30 months.

If the abnormal mucosa is a congenital anomaly, one might expect it to be occasionally associated with other congenital defects. Apart from the baby with a duodenal diaphragm and one patient with a Meckel's diverticulum, the only possible association in our series was with mental defect, which was present in three patients aged 8, 17, and 28 years. It is of interest that, in the early paper by Brown Kelly (1936) on progressive narrowing and shortening of the oesophagus with hiatal hernia, one of the two children described was a mentally defective girl of 2½ years. An association between hiatal hernia, inborn metabolic error, and mental defect was suggested by Moncrieff and Wilkinson (1954). We have seen two patients with low peptic stricture, one of whom had phenylketonuria and the other was a deaf mute. Abrahams and Burkitt (1970) reported an abnormal barium swallow in 29 of 77 children suffering from cerebral palsy. They attributed the hiatal hernia and reflux not to congenital defect but to extensor spasm, inco-ordination of deglutition accompanied by air swallowing, and to recumbency. The mechanism in such patients may be similar to that operating in those of our patients who suffered from Parkinsonism. Shine and Allison (1966) reported

a family with tylosis, which is an expression of a single autosomal gene in heterozygous state. The father and son both had a gastric-lined oesophagus. Further evidence may accrue from the examination of stillbirths. Postlethwait and Musser (1974) found one out of 200 stillbirths to have the lower oesophagus completely lined by columnar epithelium.

Allison (1970) stated that 'personal experience in the use of a technique of hernia reduction that offers competence in the common variety of sliding hernia has been totally disappointing' in the treatment of high stricture. On the other hand, Hill, Gelfand, and Bauermeister (1970) described excellent results from hernial repair for strictures at all levels. This has certainly been our experience as far as high strictures are concerned. The improved results may be due to the use of Hill's method of repair with posterior gastropexy. Whether or not the addition of circumferential myotomy is important is difficult to prove. It must be admitted that, although most high strictures can be treated successfully in this way, it has not been possible to anticipate either radiologically or endoscopically which strictures are going to persist in spite of reflux control. We now consider that high strictures should not be resected. On the rare occasions when the stricture persists after effective hernial repair, it is usually no longer inflamed or ulcerated and can be more easily dealt with by either self-bougination or the occasional passage of bougies via the oesophago-scope.

According to Hill *et al.* (1970), acquired shortening of the oesophagus is never sufficient to render it impossible to bring the gastro-oesophageal junction down below the diaphragm. In the case of some strictures at or near the cardia, this view is hard to accept. When there is a high stricture with a considerable length of gastric-lined oesophagus, shortening is not a problem, and, to state something of a paradox, it may be said that the higher the stricture, the easier it is to achieve control of reflux by hernial repair. A striking feature is the rapidity of symptomatic and radiological improvement after this operation.

The relationship of high stricture to duodenal ulcer is important. According to our series, high and low strictures have the same association with duodenal ulcer. Casten (1967) states that, singly or in combination, the pathological entities peptic oesophagitis, hiatal hernia, and duodenal ulcer are manifestations of acid secretion disease with a common pathological mechanism. He therefore

bases his surgical treatment on vagotomy and is of the opinion that 'actual repair of the hiatus is of considerably less significance'. Burge (1964) occasionally omits hernial repair from his operative procedure. Our view is that if no pathology is found in the region of the pylorus and duodenum, hernial repair alone is the best treatment for high stricture, but that if such pathology is present, vagotomy should be added.

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