showed diffuse small-bowel abnormality with signs of malabsorption and areas of narrowing. Rectal biopsy specimens showed granulomas but no tubercle bacilli. Guinea-pig inoculations for mycobacteria were negative. Crohn's disease with presumed bacterial overgrowth was diagnosed, and his condition improved with oral tetracycline, prednisolone, and azathioprine. He required small-bowel resection in September 1979 for subacute obstruction and subsequently remained well. The histology of the resected specimen was consistent with the diagnosis of Crohn's disease.

Comment

This patient initially presented with pulmonary and peripheral oedema due to hypoproteinaemia secondary to widespread Crohn's disease. Pulmonary oedema due to hypoproteinaemia is extremely uncommon, though the mechanism of production is probably the same as that causing peripheral oedema from hypoproteinaemia: a reduction of plasma proteins leads to a lowered plasma colloid osmotic pressure, which then disturbs the balance of fluid distribution between the intravascular and extravascular compartments, resulting in increased fluid in the interstitial space. Studies in dogs³ have shown that when plasma protein is removed by plasmapheresis pulmonary oedema may be induced at progressively lower left atrial pressures.

As far as we are aware, this is the only reported case of Crohn's disease presenting as pulmonary oedema, itself an uncommon presentation of hypoproteinaemia.

¹ Van Patter WN, Barger JA, Dockerty MB, Feldman WH, Mayo CW, Waugh JM. Regional enteritis. *Gastroenterology* 1954;**26**:347-447.

² Steinfeld JL, Davidson JD, Gordon RS, Greene FE. The mechanism of hypoproteinaemia in patients with regional ileitis and ulcerative colitis. *Am J Med* 1960;**29**:405-15.

³ Guyton AC, Lindsey AW. Effect of elevated left atrial pressure and decreased plasma protein concentration on the development of pulmonary oedema. *Circ Res* 1959;**7**:649-57.

(Accepted 21 August 1981)

Department of Medicine, Frenchay Hospital, Bristol BS16 1LE

M J BRADSHAW, MRCP, research registrar

R F HARVEY, FRCP, consultant physician

C J BURNS-COX, FRCP, consultant physician

Importance of symptoms after highly selective vagotomy

Highly selective vagotomy has been studied for just over a decade as a surgical treatment for duodenal ulceration. Good results have been widely reported, and controlled trials have shown improvements compared with truncal or selective vagotomy and drainage¹ and truncal vagotomy and antrectomy.² Recurrent ulcer and other persistent abdominal symptoms are, however, still present in 20-25% of patients. Some of these residual symptoms may not be related to duodenal ulceration, and in an attempt to clarify this possibility we compared patients' symptoms after highly selective vagotomy and after inguinal herniorrhaphy.

Patients, methods, and results

Ninety-one patients with chronic duodenal ulceration were treated with highly selective vagotomy by one surgeon (JRS) between November 1973 and March 1980. The operation was that described by Johnston and Wilkinson but modified by the use of tantalum clips instead of ligatures to secure the neurovascular bundles to the lesser curve of the stomach.³ All the patients were requested to attend a special follow-up interview at which a list of questions were asked concerning 11 symptoms—namely, abdominal pain, epigastric fullness, flatulence, nausea, food vomiting, bile vomiting, dysphagia, heartburn, early dumping, late dumping, and diarrhoea—and their frequency (daily, weekly, monthly, or more than monthly). Sixty-five patients who had undergone an operation for inguinal hernia during 1979-80 were also asked to attend the hospital on the same day. The interviewer was unaware of which operation the patient had undergone. All patients were warned that the interviewer would ask questions that might seem

unrelated to their operation but that they should answer as accurately as possible. A standard questionnaire was sent to those who were unable to attend for interview. The ranking of patients was carried out using the modified Visick classification²: (1) no symptoms; (2) mild symptoms; (3) moderate symptoms; and (4) recurrent or bad symptoms; and this was completed before the operation code was broken.

Almost 80% of both groups were followed up and assessed. Four late deaths occurred after highly selective vagotomy, which were not related to ulcer disease. Additional procedures were performed in 28 patients at the time of highly selective vagotomy: dilatation of the pylorus (21 patients), cholecystectomy (four), splenectomy (two), and closure of duodenal perforation (one). Age and sex distributions of the patients in the two groups were comparable. No significant differences were found between the patients who had undergone highly selective vagotomy and those who had undergone herniorrhaphy (table). After highly selective vagotomy three patients (3.3%) subsequently developed recurrent ulcers.

Symptomatic results by Visick classification. Figures are numbers (%) of patients

	Visick classification			
	1	2	3	4
Highly selective vagotomy (n = 66)	38 (57)	15 (23)	7 (11)	6 (9)
Hernia (n = 51)	32 (62)	11 (22)	6 (12)	2 (4)

Comment

Highly selective vagotomy evolved in an attempt to reduce the incidence of symptoms that may follow truncal vagotomy with a drainage procedure. By denervating only the proximal acid-secreting part of the stomach the distal stomach and pylorus retain their normal activity so that gastric emptying is not disturbed. A drainage procedure with its attendant problems of dumping and bile reflux is then not needed. Although many reports have affirmed the effectiveness of the operation, the incidence of recurrence of ulcer, which has been as high as 12% in one series, has been a cause for concern. Surgical technique appears to be all important, however, and surgeons who have had considerable experience with the operation can achieve much lower recurrence rates. None the less, recurrence would appear to be more likely after this operation than after vagotomy and pyloroplasty. The low recurrence rate in our series may be due in part to the fairly short period of follow-up, but such low rates are not particularly unusual.

The importance of symptoms after any operation may depend on the attitudes of the interviewer and the patient. Heartburn and indigestion are common in the general population.⁴ Kennedy *et al*⁵ found no difference in the Visick classification of symptoms between patients after highly selective vagotomy and patients with no known gastrointestinal disease and who had not undergone operation, though none of his controls were classified as grade 3 or 4. Our study has shown that patients are symptomatically no worse after a hernia operation than those after highly selective vagotomy. Thus a success rate of over 80% should not be asked for operations for duodenal ulcer as long as an incidence of recurrence in the region of 10% is acceptable.

¹ Stoddard CJ, Vassilakis JS, Duthie HL. Highly selective vagotomy or truncal vagotomy and pyloroplasty for chronic duodenal ulceration: a randomised, prospective clinical study. *Br J Surg* 1978;**65**:793-6.

² Dorricott NJ, McNeish AR, Alexander-Williams J, *et al*. Prospective randomised multicentre trial of proximal gastric vagotomy or truncal vagotomy and antrectomy for chronic duodenal ulcer: interim results. *Br J Surg* 1978;**65**:152-4.

³ Salaman JR. Highly selective vagotomy using tantalum clips. *Br J Surg* 1978;**65**:155-6.

⁴ Hannay DR. Symptom prevalence in the community. *J R Coll Gen Pract* 1978;**28**:492-9.

⁵ Kennedy T, Johnston GW, Macrae KD, Spencer EFA. Proximal gastric vagotomy: interim results of a randomised controlled trial. *Br Med J* 1975;**iii**:301-3.

(Accepted 25 August 1981)

Welsh National School of Medicine, Heath Park, Cardiff CF4 4XN

J R SALAMAN, MCH, FRCS, reader in surgery

J HARVEY, MPHIL, FRCS, senior registrar

H L DUTHIE, MD, FRCS, provost