The number of *Gastroenterology* (Baltimore) of October 1948 (Vol. XI, No. 4) contains nine articles on varying aspects of vagotomy, most of which were read at the Annual Meeting of the American Gastroenterological Association, in April 1948; they should be studied by all interested in this subject. J. E. Thomas and S. A. Komarov describe the physiological aspects of vagotomy (p. 413 to 418); Pavlov in 1890 showed that section of the vagi in dogs led to stagnation of food in the oesophagus and stomach, and that dogs which survived were unusually susceptible to mild intestinal irritants; sham-feeding in these dogs caused no acid secretion in the stomach. Other results noted by these early workers in animals were hyposecretion of the pancreas and possibly intestine, with disturbance of function sufficient to lead to the animal's death. It seems probable that the completely vagotomized stomach responds with rhythmic contractions to the distending stimulus but is otherwise quiescent. The cephalic phase of gastric secretion is certainly entirely dependant on vagus reflexes, but the chemical phase may also be partly dependant according to some experimental work. Recent work suggests that the output of pancreatic enzymes is reduced by some 50 to 60 per cent by transthoracic vagotomy, and that the tonic activity of the gastrointestinal tract as a whole is much diminished. Thomas and Komarov believe that the wide differences found in men and in experimental animals in their response to vagotomy depend mainly upon the completeness or otherwise of the nerve section after vagotomy, but must be deemed to include all gastric secretory nerves and not only those of the gastric vagi.

Most Physiologists believe that transthoracic or transabdominal vagotomy (as compared with cervical) as usually performed is seldom complete, partly through the action of the oesophageal plexus which of course receives many vagal fibres above the level of the section. Thomas and Komarov regard this incompleteness as fortunate since severance of all vagal fibres in animals gives quite uniformly unfavourable results and might give the same in human subjects.

F. Hollander discusses (p. 419) various tests in use, particularly the Insulin Hypoglycaemia test. The gruel test meal he regards as of little value in testing the vagal phase of gastric secretion, whilst the Histamine test will of course indicate whether the parietal cells are capable of secretory activity, but is again of little help in studying the results of vagotomy. The night secretion test which measures acid output during the period between midnight and breakfast gives an assessment of this (neural) phase of secretion, but is open to technical differences in procedure which make comparisons difficult. The insulin test is designed to determine whether any functionally effective secretory nerves continue to pass to the stomach. The stimulus consists of the hypoglycaemia produced by injection of 20 units of insulin, and must be controlled by blood sugar estimations, a level of 50 mg. per cent being considered adequate for vagal stimulation: specimens of gastric content examined only at 30 minutes after the insulin injection
are insufficient as the full hypoglycaemia develops at varying times up to \(4/2\) hours. A positive response is indicated by a well defined rise in free gastric acidity after the injection, compared to the level of fasting secretion. Before accepting a negative insulin test the patient must be shown by a histamine test to be capable of secreting acid, and the acidity curve must be flat or downward. A positive response indicates persistence of some secretory nerves, which may be either vagal or of spinal origin, and does not therefore necessarily mean that the operation has failed to interrupt the gastric vagi completely. A true negative response indicates a complete neurctomy, especially if repeated and confirmed by the presence of acid on a histamine test. The insulin test [cannot be used as a quantitative guide to the amount of innervation remaining after vagotomy and is only a test for the presence or absence of uncut secretory nerves.

Gastrointestinal Motility following Vagotomy

Machella and Lorber report (p. 426) the effects of vagotomy on gastric motility in 26 patients; of those in whom no other gastrointestinal operation was performed almost all showed gastric retention with decreased tone and greatly diminished or absent peristalsis. Restoration of motility and evacuation could be temporarily restored by oral administration of urecholine. In 16 patients with vagotomy and gastroenterostomy, troublesome gastric retention developed in 3 only. One patient developed temporary dysphagia after vagotomy and two showed email intestine dilatation with symptoms of obstruction. No motor complications were found in the colon in any of the patients. Spontaneous gastric emptying with relief of symptoms of retention returned in all the patients within 2 to 12 months from the time of operation.

Follow-up of Vagotomy in Duodenal Ulcer

116 cases, 99 of duodenal ulcer and 17 of jejunal ulcer, were followed \(\text{by F. D. Moore}\) for from five to forty five months after transthoracic or transabdominal (4 cases) vagus resection (p. 442). Gastroenterostomy was also performed at the same time in 8 cases. In 103 patients followed up no recurrence of symptoms or of a demonstrable ulcer had taken place. Of the remaining 13 eleven have had only transient recurrence and have readily controlled their symptoms by simple dietary measures. The results of vagotomy Moore considers are by no means perfect, but renders the management of patients with duodenal ulcer a simple rather than a complicated problem. The abolition of gastric secretory response to insulin hypoglycaemia is not lasting and in this series secretion reestablished itself two to four years after the operation. Approximately five per cent of patients after vagotomy suffer major inconvenience from side-effects, e. g. diarrhoea.

Follow-up of Vagotomy plus Gastroenterostomy

An analysis of 84 patients (p. 453) subjected to vagotomy plus gastroenterostomy or pyloroplasty for duodenal (80) and jejunal ulcer (4) cases was carried out by E. N. Collins et al. 5 to 18 months after operation. There was one operation death. These patients had all made unsatisfactory progress on medical treatment, and though the time of observation is too short for fair appraisal the results compare very well with the successes of medical management. 58 of the 83 cases reported in a questionnaire as being entirely well whilst 5 had to be
regarded as failures. All these were regarded as having had an incomplete vagus section. 30 of the patients reported some diarrhoea, whilst 67 had gained weight and no objective evidence of a recurrent ulcer was demonstrated in any patient.

Vagotomy combined with subtotal gastrectomy

S. A. Wilkinson and J. C. Sullivan analyse (p. 457) 62 cases subjected to subtotal gastrectomy combined with subdiaphragmatic vagotomy, compared with 60 cases operated upon during the same period of time and approximately the same follow-up period (this is not stated). As far as possible cases were studied by an insulin gastric analysis, an X-ray examination, and a questionnaire. Results of the insulin test were difficult to correlate with the success or failure of the operation. Out of these 62 cases two died one on the fifth post-operation day, the other following reoperation for jejunal ulcer 21 months after a transthoracic vagotomy. 58 per cent of the remainder had no complaints of any kind. Out of the comparable 60 cases of subtotal gastrectomy without vagotomy 72 per cent were entirely well, none died, and there were three known ulcer recurrences.

In summary 93% of the patients without vagotomy declared that they were completely satisfied with their operation as against only 84 per cent of the vagotomized cases, so that the authors conclude that the addition of vagotomy to subtotal gastrectomy increases the risk of postoperative morbidity and disability whilst not increasing the chance of cure of the ulcer.

Follow-up of Gastric Vagotomy alone

Dragstedt and Camp divided their experience (p. 460) of gastric vagotomy into three periods, the first from 1943 to 1946 when a transthoracic supradiaphragmatic vagotomy was done with no additional surgery on the stomach: the second period from January 1946 to June 1946 when abdominal vagotomy was combined with posterior gastroenterostomy, and the third or current period from June 1946 to the present time when approximately 80 per cent of the patients were submitted to transabdominal vagotomy alone, and 20 per cent to this combined with a posterior gastroenterostomy.

These patients were all referred for surgical treatment either on account of perforation, haemorrhage, pyloric stenosis or intractability to ordinary medical treatment. Of the 144 patients with intractable duodenal ulcer 56 (with one death underwent transthoracic vagotomy and 88 (with no deaths) abdominal vagotomy with incision of the diaphragm. These patients were observed for from one to five and a half years; 80 per cent of the first group and 86 per cent of the second group are regarded as giving an excellent result, in that objective evidence of healing with complete absence of pain or distress on an unrestricted diet and with no medication was obtained. Dragstedt considers that incomplete vagotomy is the principal cause of recurrence or failure of the ulcer to heal, and that on the whole routine gastroenterostomy combined with vagotomy will probably provide better results than vagotomy alone. Nevertheless with careful selection Dragstedt reports that 86 per cent of his duodenal ulcer cases submitted to vagotomy alone secured an excellent result.

Ultimate results of vagotomy

Dr. Ruffin summing up his views on vagotomy (p. 466) from his own experience and the big American survey of over 2500 patients concludes that the vast majority of peptic ulcer patients (85–90%) experience remarkable relief, and that the
mortality of the operation is extremely low (1.7% in 2500 patients). Why 10 to 15 per cent show an unsatisfactory result is not fully explained but the constitutionally inadequate individual with many symptoms Ruffin considers likely to do badly. Gastric retention is a serious complication of vagotomy and frequently requires subsequent surgery (gastro-enterostomy) but in cases with haemorrhage and in those with junctional ulcers the operation usually gives brilliant results. The refractory duodenal ulcer patient if carefully selected may Ruffin considers obtain at least as good an end result after vagotomy as after resection, and he feels that careful choice of patient is perhaps the greatest single factor in the success or failure of the operation. Th. H.