A COMPARATIVE STUDY OF SELECTIVE PROXIMAL VAGOTOMY AND TRUNCAL VAGOTOMY WITH ANTRECTOMY

THESIS

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By

MOHAMED NAGUIB HASSAN

M. B., B. Ch., M. S.

Supervisors

Prof. M. SAMIR ABOU ZEID
Prof. of Surgery

Prof. AHMED GHAREEB
Prof. of Medicine

Prof. MAHMOUD EL KARIMI
Prof. of Physiology

Assistant Supervisors

Prof. SAWSAN HOSNY
Prof. of Clinical Pathology

Dr. HUSSEIN KHOLEIF
Ass. Prof. of Surgery

Dr LAILA EL-GUINDY
Ass. Prof. of Physiology

Faculty of Medicine
Ain Shams University

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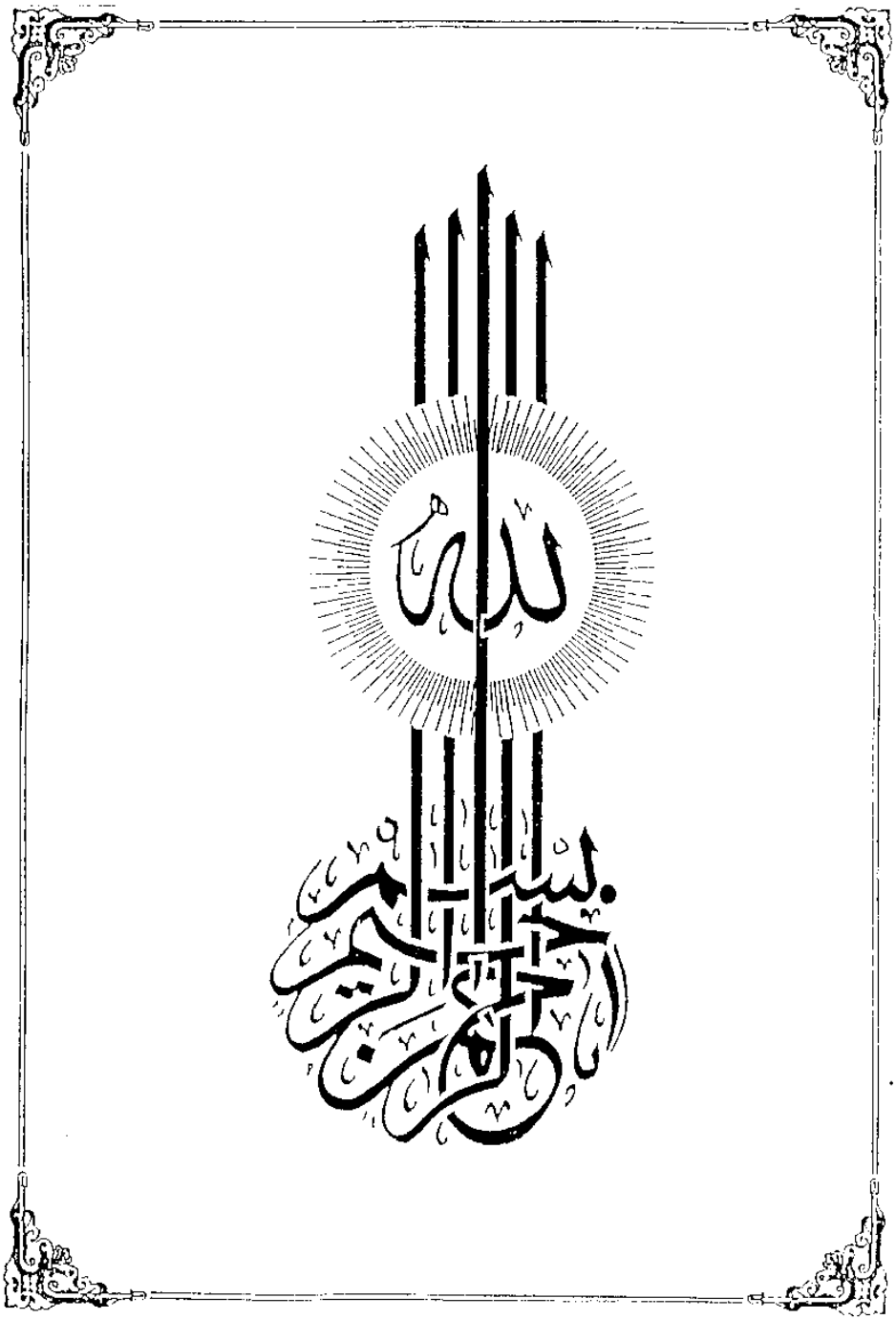

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C O N T E N T S

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INTRODUCTION

Since the clinical application of vagotomy by Dragstedt, there have been gradual developments and refinements. The changing fashions have seen truncal vagotomy superseded by selective vagotomy and later by superselective or selective proximal vagotomy. The change from truncal to selective vagotomy brought about a reduction in the incidence of postvagotomy diarrhoea. The change from selective to selective proximal vagotomy meant that an innervated antrum could be retained and obviated the need for a drainage procedure.

Factors influencing the choice of operation for chronic duodenal ulcer include the safety of the procedure, its ability to control the ulcer diathesis, and the long-term morbidity resulting from a particular operation.

Mortality following truncal vagotomy and antrectomy is greater than that of the lesser procedures such as truncal vagotomy with a drainge procedure or selective proximal vagotomy. Truncal vagotomy with antrectomy shows a marginal advantage, mainly because of the low ulcer recurrence rate. The safety of the operation of selective proximal vagotomy is now well established. Also it would

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seem that the incidence of dumping, diarrhoea and bilious vomiting have been appreciably reduced with this operation.

In this study we compare the functional effects of both selective proximal vagotomy and truncal vagotomy with antrectomy on the stomach, in a prospective randomized trial of elective surgery for chronic duodenal ulcer. Gastric acid output (basal and insulin-stimulated), serum gastrin levels (fasting, insulin and meal-stimulated) and total gastric emptying are all measured pre- and postoperatively in all cases. Also the clinical status of patients following either operation is assessed according to a modified Visick grading system.

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REVIEW OF LITERATURE

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REVIEW OF LITERATURE

Surgeons have attempted for 100 years to cure the duodenal ulcer by reducing the secretion of acid and pepsin, and the history of surgery for duodenal ulcer is a chronicle of their attempts to achieve this aim without producing major disturbance to the functions of the alimentary tract. Partial gastrectomy was effective in curing the ulcer, but by removing two-thirds of the stomach, including the antral mill and the pyloric sphincter, it impaired both the capacity of the stomach and the control of gastric emptying. In addition it permitted free regurgitation of bile into the stomach. The inevitable consequences, for many patients, were inability to eat large meals, loss of weight, dumping, gastritis and bilious vomiting. Dragstedt and Owens placed the use of truncal vagotomy on a firm physiological foundation in 1943, and for a time it seemed that the side effects of truncal vagotomy combined with a drainage procedure would be fairly trivial, and certainly much less troublesome than those of partial gastrectomy.

By the late 1960s, however, Goligher and his colleagues in Leeds and York were able to provide convincing evidence that the after-effects of truncal vagotomy and drainage were by no means trivial, and indeed

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that the overall clinical results of truncal vagotomy and drainage were somewhat inferior to those of vagotomy with antrectomy or partial gastrectomy (Goligher et al., 1968, 1972). These findings were subsequently confirmed by Jordan and Condon (1970), Jordan (1974), and Postlethwait (1973). Truncal vagotomy with a drainage procedure was found to be significantly inferior to both truncal vagotomy with antrectomy and partial gastrectomy in curing the ulcer. The side effects which it produced were almost as severe as those of truncal vagotomy with antrectomy or partial gastrectomy.

Code and his colleagues (Carlson et al., 1966), showed how important the distal antrum is for grinding solid food into chyme. Large particles were trapped by the terminal antral contraction and retropelled forcibly into the body of the stomach, to undergo further grinding and triturition. These functions of the antral mill are dependent on the integrity of its motor nerve supply. Thus, vagal denervation of the antrum, as in truncal vagotomy, produces gastric stasis (Stavney et al., 1963). On the other hand, surgical removal of the antrum and pylorus as in truncal vagotomy with antrectomy and partial gastrectomy causes solid food to leave the stomach with excessive rapidity (Dozois et al., 1971). So, truncal vagotomy by devervating the antrum and making necessary

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the destruction of the pylorus (as in pyloroplasty) or its bypass (as in gastrojejunostomy) interferes seriously with normal functions of the stomach.

Also McKelvey (1970) showed that after vagotomy and drainage the stomach was incontinent of a liquid meal. This finding has been confirmed repeatedly (Cobb et al., 1971; Humphrey and Wilkinson, 1972; Clarke and Alexander-Williams, 1973; Hallenbeck and Gleysteen, 1974). Thus, if an unsuitable meal is eaten after vagotomy with drainage, it dumps rapidly into the small intestine, causing the patient to experience symptoms of dumping, abdominal discomfort and diarrhea.

It appears from this that if the antrum and pylorus could be kept intact, the disordered pattern of gastric emptying which is responsible for many of the side effects of vagotomy with a drainage procedure could probably be eliminated. As vagotomy of the whole stomach, without a drainage procedure, diminished antral motility and produced gastric stasis, it appears that the nerve supply of the antrum would have to be preserved. This led Amdrup and Johnston to perform parietal cell vagotomy or selective proximal vagotomy in 1969 (Amdrup and Jensen, 1970; Johnston and Wilkinson, 1970). Vagotomy was confined to the acid-secreting part of the stomach, the motor nerve supply to the gastric antrum was preserved and the pylorus was left intact.

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Comparison of the effects of selective proximal vagotomy without a drainage procedure and truncal vagotomy with antrectomy on the physiology of the alimentary tract.

1- **Lower Oesophageal Sphincter :**

Neither truncal vagotomy nor selective proximal vagotomy lowers pressure in the resting lower oesophageal sphincter. So surgical manoeuvres at the cardia designed to maintain or increase the competence of lower oesophageal sphincter after vagotomy for duodenal ulcer are probably unnecessary (Johnston, 1980). The futility of routinely adding an anti-reflux manoeuvre to selective proximal vagotomy has been demonstrated by Escat and his colleagues. In a prospective randomised trial in patients coming to elective selective proximal vagotomy for duodenal ulcer uncomplicated by hiatus hernia or by symptomatic gastro-oesophageal reflux, 50 per cent of the patients were treated by selective proximal vagotomy and 50 per cent by selective proximal vagotomy combined with an anti-reflux procedure. The patients who had been treated by selective proximal vagotomy alone suffered no more symptoms of gastroesophageal reflux than did patients in whom the anti-reflux procedure had been added (Johnston, 1980). This was also confirmed by Goligher and his colleagues (1968; 1972). The incidence of heart-burn was 17 per cent after selective proximal vagotomy and 16

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per cent after truncal vagotomy with antrectomy (Goligher et al., 1968, 1972). In most of these patients the symptoms of heart-burn were mild and intermittent and less severe than before operation.

2- Gastric Acid Secretion :

Basal Acid Secretion :

The basal acid secretion is higher in duodenal ulcer patients than in normal subjects (Dragstedt, 1969). The basal gastric acid secretion in man is reduced by all types of vagotomy. This suggests that direct vagal activation of the parietal cells is an important stimulus to this type of acid secretion in man (Olbe, 1974). Antrectomy also much reduces the basal gastric acid secretion in duodenal ulcer patients. The average reduction is about 65 per cent (Capper et al., 1966).

Following selective proximal vagotomy in a series of 22 duodenal ulcer patients, the basal acid output was reduced from a preoperative mean of 5.4 mEq/hour to 0.7 mEq/hour, the percentage of reduction being 87 (Amdrup and Jensen, 1970). In another selective proximal vagotomy series of 63 duodenal ulcer patients, the basal acid output was reduced by a mean of 92 per cent one week postoperatively (Johnston et al., 1973). The BAO then increased significantly and between 6 and 12 months after

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SPV the mean reduction was 87 per cent. At 1 to 2 years the mean reduction in BAO was 77 per cent. In a series of 21 duodenal ulcer patients treated by selective proximal vagotomy and followed up to 5 years, the basal acid output was reduced from a preoperative mean of 8.4 mEq/hour to a mean of 1.7 mEq/hour 1 year after SPV, and 1.4 mEq/hour, 5 years after SPV (Greenall et al., 1975). The mean reduction in BAO was 75 per cent at 1 year and 79 per cent at 5 years, compared with the preoperative mean value. In another series of 35 duodenal ulcer patients treated by selective proximal vagotomy, the basal acid output decreased from a preoperative mean of 6.1 mEq/hour to 1.3 mEq/hour at 2 months postoperatively, 2.1 mEq/hour at 6 months, 2.1 mEq/hour at 12 months, 1.8 mEq/hour at 2 years, and 2 mEq/hour at 3 years (Jordan, 1976). The percentage of reduction was 70, 56, 64, 47 and 53 respectively, as compared with the mean preoperative value. In a series of 86 patients with duodenal ulcer, the mean reduction in basal acid output after SPV was 75 per cent (Sawyers and Herrington, 1977). In another series of 40 duodenal ulcer patients, the basal acid output fell significantly from a preoperative mean of 5.9 mEq/hour to about 1 mEq/hour after SPV (Dunn et al., 1980). The percentage of reduction of BAO was 83.8. In a series of 50 duodenal ulcer patients treated by SPV, the mean reduction in BAO was 60 per cent (Koo et al., 1983).

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Truncal vagotomy with antrectomy results in a very marked reduction of basal acid secretion in duodenal ulcer patients. The mean reduction in basal acid output was 99 per cent in 7 duodenal ulcer patients treated by truncal vagctomy with antrectomy (Gillespie et al., 1960). Kay (1962) found that antrectomy with truncal vagotomy resulted in a 95 per cent reduction of basal acid output. Following truncal vagotomy with antrectomy there was 95 per cent reduction of basal gastric secretion (Capper et al., 1966). In a series of 92 duodenal ulcer patients treated by truncal vagotomy with antrectomy, the basal acid output was significantly reduced from a preoperative mean of 10.54 mEq/2 hours to a mean of 0.05 mEq/2 hours at 6 months postoperatively (Jordan and Condon, 1970). The percentage of reduction of BAO was about 99.5. The fasting volumes of gastric juice obtained after truncal vagotomy with antrectomy usually range from 0 to 20 ml/hour, and the basal output of hydrochloric acid is usually less than 0.5 mEq/hour (Herrington, 1971). Achlorhydria is usually found during the fasting state and also after test meal stimulation following truncal vagotomy with antral resection in patients with duodenal ulcer (Herrington and Sawyers, 1980). In another series of 35 duodenal ulcer patients treated by truncal vagotomy with antrectomy, the basal acid output was significantly reduced from a preoperative mean of 6.3 mmol/hour to a mean of

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1.2 mmol/hour, at 6 months postoperatively (Robbs, 1980). The percentage of reduction of BAO was 80.9. In another series of 51 duodenal ulcer patients treated by truncal vagotomy with antrectomy, the postoperative reduction in the basal acid output was 56 per cent (Koo et al., 1983).

Pentagastrin-stimulated Maximal Acid Output :

In a series of 22 duodenal ulcer patients, the pentagastrin maximal acid output was reduced from a preoperative mean of 43.6 mEq/hour to 16.8 mEq/hour, following selective proximal vagotomy (Amdrup and Jensen, 1970). The percentage of reduction was 62. Taking preoperative maximal acid output as 100 per cent, maximal acid output was reduced by a mean of 51 per cent, 1 week after selective proximal vagotomy, and by 68 per cent, 2 to 3 months after SPV (Johnston et al., 1973). Maximal acid output then increased, and the mean reduction in MAO 6 to 12 months postoperatively was only 55 per cent. More than one year after operation, the pentagastrin maximal acid output was the same after selective proximal vagotomy as after truncal vagotomy (Jepson et al., 1973; Johnston et al., 1973). In a series of 21 duodenal ulcer patients, the pentagastrin maximal acid output was 42.7 mEq/hour before operation, 21 mEq/hour at 1 week, 20.2 mEq/hour at 1 year, and 22.6 mEq/hour 5 years after selective proximal vagotomy (Greenall et al., 1975). Pentagastrin MAO

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