STRENGTHS AND WEAKNESSES OF HIGHLY SELECT WE VAGOTOMY AS TREATMENT OF DUODENAL ULCER

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Duodenal ulcer disease is characterised by periodicity in its symptomatology and therefore, a proper evaluation of any surgical procedure used for its treatment can only be made after a follow up of many years. The operation of highly selective vagotomy (HSV), also known as proximal gastric vagotomy or better still as parietal cell vagotomy, was first performed in 1969 at two different centres, one being at Leeds, and the other at Copenhagen)[1-2]

Since its introduction, HSV has stood the test of time and number of studies have shown it to be an accepted form of operative treatment for duodenal ulcer. Investigators have compared the physiological parameters and the clinical results obtained with other operative procedures, in pros; pective randomised trials. Although the results of one study were not necessarily achieved by another, the general consensus was that the clinical results obtained with HSV were better than with any other operation tested.[3]

Billroth and Polya were the pioneers of gastric surgery for peptic ulcer and they advocated gastrectomy as the standard procedure in the management of peptic. ulcer. It was in 1943 that Dragstedt and Owens described the beneficial effects of vagotomy. Since then, there has been continuous progress and improvement in this field, and a large volume of literature with excellent and careful trials has been generated, allowing the surgeon to make a more confident decision in respect of the type of surgery, though many controversies still remaln to be sorted out[4]. In the mid 1970s, a lot of research was initiated to define both medical and surgical means of healing duodenal ulcers effectively and with minimum side effects. This culminated in the production of H2 receptor antagonists on the medical side, whereas surgical workers developed the operation of highiy selective vagotomy.

The strengths and weaknesses of a surgical procedure for treating duodenal ulcers may be judged by evaluating it with the help of the following criteria:

1. Safety of the procedure.
2. Success rate in curing the disease.
3. Frequency of side effects and compli cations.
4. Overall clinical results.

1. SAFETY:

Any surgical procedure used for treating duodenal ulcer should be safe and result in the least possible morbidity and mortality. A major advantage of vagotomy is its low rate of operative mortality which in combination with a drainage procedure, accounts for an average figure of 0.5% whereas most gastrectomy series have a recorded operative mortality of 1 to 2%[4]. HSV is safer still and Johnstone5in a series of 5539 patients who underwent this operation, has reported an operative mortality of 03% (Table 1).Even though HSV is technically a more difficult operation, the low rates of morbidity and mortality with this procedure may probably be due to opening of the gastrointestinal tract not being required and consequently, no suture line or anastomosis to leak or bleed.

TABLE I. Causes of Death in 5539 HSVs*

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Cause of death	No of cases	%
Necrosis of L. Curve	4	0.09
Necrosis of fundus	1	
Myocardial infarction	4	0.07
Pulmonary embolism	3	0.05
Pneumonia	2	0.04
Haemorrhage	2	0.04
Mesenteric vein occlusion	1	0.02

*Modified from Johnston (1975).

2. SUCCESS:

The success of a surgical procedure in treating duodenal ulcer may be judged by its ability to heal the ulcer initially, and by the incidence of ulcer recurrence later on. Recurrence after surgery for duodenal ulcer is usually due to incomplete vagotomy or inadequate partial gastrectomy, which fails to reduce the acid output sufficiently. In very few patients can other causes such as the presence of a gastrinoma or a retained antrum after Billroth 11, be responsible for ulcer recurrence.

Some surgeons have employed different methods to ensure that sufficient denervation of the acid secreting area has been achieved. These methods are the congored staining of the gastric mucosa via a gastrotomy, or pH mapping by means of an intragastric pH electrode introduced via the nasogastric route. These tests can be used to define the antrum-corpus border in order to determine the extent of denervation required during HSV. Most surgeons however, rely on anatomical landmarks in order to avoid opening the stomach, cutting only the proximal branch of special interest in this field and are more experienced. Careful training by expert vagotomists together with some form of intra operative quality control by tests such as the congo-red or Grassi test, will go a long way in keeping ulcer recurrence rate after HSV to a minimum.

Pyloric and pre-pyloric ulcers have similarly usually been thought to be similar to duodenal ulcer and treated. However, evidence has accumulated that they do respond differently to HSV and are associated with a higher recurrence rate as compared to duodenal ulcers[3].

the “crow’s foot”, and leaving about 6 to 7 cms. of innervated antrwn. It is also important to clear at least 5 to 6 cms. of the lower oesophagus of all vagal fibres. Ulcer recurrence may be avoided or minimised to a large extent if a proper and careful search for undivided vagal fibres is made, irrespective of the type of vagotomy being performed. A comparison of ulcer recurrence rate after vagotomy and drainage (V&D), vagotomy and antrectomy (V&A) and highly selective vagotomy (HSV), as experienced in various trials, is summarised in Table II.

TABLE - II. Comparison of the Incidence of recurrent Ulceration in Trials of HSV, V&D and V&A.

Author	Year	HSV		V & D		V & A	
		No.	%rec	No.	%rec	No	%rec.
Sawyer et al.	1977	86	3.0	37	3.0	50	0
Dorricot et al.	1978	116	3.0			106	1
Stoddard et al.	1978	64	5.0	62	5.0		
Goligher et al.	1979			228	7.9	101	0
Christiansen	1981	83	16.0	176	12.0		
Muhe et al.	1982	524	13.9				
Koffman et al.	1982	77	20.0	76	7.5		
Kronberg	1982	50	28.0	50	18.0		
de Miguel	1982	143	9.8	131	9.2		
Jordan	1982			103	8.0	91	2
TOTAL		1143	12.3	863	8.8	348	0.8

It is evident from Table II that vagotomy and antrectomy has a much lower ulcer recurrence rate. However due to the greater morbidity and mortality associated with gastric resection, it has not reached the status of a primary operation of choice for the treatment of duodenal ulcer. It can, however, prove to be a valuable technique in patients who require repeat surgery for recurrent ulceration. Although higher ulcer recurrence rates have been reported after HSV, rates from 0 to 5% have been reported by surgeons who have special interest in this field and are more ex-perienced. Careful training by expert vagoto¬mists together with some form of intra operative quality control by tests such as the congo-red or Grassi test, will go a long way in keeping ulcer recurrence rate after HSV to a minimum.

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The recurrence of ulcers in the past following gastric surgery was viewed with much apprehension, as the treatment was difficult and the results often unsatisfactory because of the higher morbidity and mortality following re-operation. Ulcer recurrence after partial gastrectomy had an evil reputation for dangerous complications such as bleeding, perforation or gastro-colic fistula. With the availability of H2 receptor antagonists, the treatment of recurrent ulcers has become safer and simpler, particularly after HSV. In all such cases, a prolonged course of medical therapy should be tried fbst. Re-operation should only be considered if severe symptomatic ulceration recurs. Kennedy[7] found only 1.2% further recuriences after vagotomy and antre'ctomy and has suggested this operation for revisional surgery in cases of ulcer recurrence. This recurrence is no longer as disastrous as considered previously, and recurrent ulceration after HSV should not therefore be taken as a major disadvantage in view of this information.

3. SIDE EFFECTS

Highly selective vagotomy has been generally acclaimed as having lesser undesirable side effects, particularly diarrhoea and dumping, many of which are surmised to be due to the accompanying drainage procedure performed with ordinary vagotomy. In a 5 8 years follow up study after I-ISV for duodenal ulcers, Goligher al[8] have reported a significantly lower incidence of dumping and diarrhoea than after most other operations, and an insignificantly lower incidence of epigastric fullness and bile vomiting even when HSV was compared with all the other operations collectively. Other side-effects

such as nausea, heart burn and vomiting occurred with much the same frequency after HSV as after the other procedures (Table III).

TABLE-III.Incidence of Side Effects 5-8 Years after various Elective Operations for D.U.

SYMPTOM	HSV %	TV & GE %	TV + A %	TV+PY %
Dumping	0.9	17.9	8.6	11.9
Diarrhoea	5.1	26.3	23.2	21.7
Bile vomiting	6.3	14.5	13.8	10.1
Food vomiting	8.6	4.3	9.6	4.4
Heart/burn	13.2	19.8	15.7	12.6
Nausea	15.4	12.8	17.2	17.6
Flatulence	19.2	17.9	22.8	20.1
Epig fullness	30.8	40.2	36.3	37.1

*Modified from Goligher et al (1978).

Table V. Visick Grading of 561 Control Subjects and 415 Patients 5 years after HSV.

Visick Grades	CONTROLS		HSV	
	No.	%	No.	%
I	362	64.5	267	64.3
			93.4	92
II	162	28.9	115	27.7
III	36	6.4	18	4.4
IV	1	0.2	15	3.6
TOTAL	561	100	415	100

*Muller (1983).

TABLE-IV.Incidence of Side Effects 5-8 Years after various Elective Operations for D.U.

Jordan[3] treated 200 consecutive patients with duodenal ulcer by randomly subjecting them to either HSV or selective vagotomy and antrectomy (SV&A), found that the frequency of diarrhoea was significantly less after HSV than after SV&A. However, both procedures were superior to truncal vagotomy in prevention of diarrhoea. The onset of diarrhoea in most instances was related to dietary indiscretion, ingestion of milk, and to dumping. Intestinal motility is increased after truncal vagotomy and fast intestinal transit is likely to be an important factor in the causation of diarrhoea.

Dumping is ten times more common after vagotomy and pyloroplasty than after HSV and it is now believed that the important factor is the loss of the pyloric sphincter and its control on gastric emptying. The presence of a large stoma, reduction in gastric reservoir and loss of receptive relaxation after vagotomy, all contribute to aggravating the symptoms of dumping.

Post vagotomy dysphagia occurs in upto 18% of the patients. Usually the symptoms are transient, and the mechanism is probably a temporary and reversible neuromuscular dysfunction of the lower oesophageal sphincter. Oesophageal motility is, however, normal and it seems likely that dysphagia is due to tissue damage at the time of vagotomy, causing a haematoma which organises to form a cuff of resistance. Dilatation may be needed in some cases.

The risk of development of cancer in the gastric remnant especially after gastric resection has been estimated and significant dysplasia was observed in the gastric remnant in some 20% of patients examined 20 years after gastrectomy9. It has been hypothesised that reflux of bile and pancreatic secretions lead to chronic irritation, while hypochlorhydria favours bacterial proliferation with increased generation of carcinogenic nitrosamines from nitrites in the food. If this is true, then the risk of developing gastric cancer after HSV would be minimal because the presence of an intact pylorus would prevent reflux which is postulated as a factor important in causing cancer after gastrectomy. Also, acid secretion may recover partly after selective or highly selective vagotomy over a period of

time[10] Recently, Hoffmann et al[11] in a study of 84 patients available for review 14 18 years after HSV, described two patients who developed gastric cancer. One underwent a gastrectomy 13 years after his original operation, whereas in the second patient a gastric cancer was found at post-mortem examination, six years after HSV.

4. OVERALL EVALUATION OF CLINICAL RESULTS

Visick'[12] proposed a grading system to evaluate the clinical results of gastrectomy in 1948. Since then, Visick's grading of overall clinical results has generally been accepted for assessment of the individual patient and for comparision of different operations and trials in peptic ulcer surgery. Despite the lack of precision in this system, it allows broad comparisions of success or failures, in different series. Visick grade I means excellent results, with the patient having no complaints after his surgery. The grade II patient would have minor complaints which are relieved by care and do not interfere with life and work. In grade III are those patients having major complaints not relieved by care and which would therefore occasionally interfere with life and work. Grade IV patients have severe complaints not relieved by care, and/or they have an ulcer recurrence. The above description, which is really a modification of the original Visick grading, would suggest that patients in Visick I and II have a successfui outcome of their surgery, whereas those in grades III and \ would indicate failures. Despite its apparent limitations, the Visick grading is still the most widely used and practicalway to assess overall clinical results after surgery for peptic ulcer. Collected results of several trials after highly selective vagotomy (HSV), vagotomy and drainage (V&D) and vagotomy and antrectomy (V&A) are set out in Table IV. Around 20% of patients are graded as failures (Grades III and IV) in each of the three operations, but the causes of failure are different. In the case of HSV, recurrent ulcers, which can now be easily treated with H2 receptor antagonists or a second operation, were the common cause in those graded as failures. In contrast, diarrhoea and dumping, which are more difficult to treat, were the main features in vagotomy and drainage or antrectomy.

Muller et al'[14] compared the Visick grading pattern of 415 duodenal ulcer patients 5 years after HSV, with that obtained in 561 healthy blood donors. No significant difference between the control group and the patients was seen for all Visick gradings except for. Grade IV, which was mdre frequent after HSV and was almost entirely due to the incidence of recurrent ulcers (Table V).

Table IV. Visick grades after various Operations for Duodenal Ulcer*.

Visick Grades	HSV %	V&D %	V&A %
I	50	43	52
	78	71	82
II	28	28	30
III	8	15	11
	22	29	18
IV	14	14	7

*Modified from Wastell (1982).

This result indicates that there are no specific sequelae after HSV except for ulcer recurrence, and that symptoms such as epigastric fullness, burning pain and dull upper abdominal discomfort are as likely to occur in healthy controls, and appear to be linked to the individual personality and behaviour rather than to the vagotomy procedure alone.

In a somewhat similar study, Salaman [15] compared the symptoms of 91 patiuts after HSV compared the symptoms of 91 patients after HSV. with 51 patients who had undergone an operation for inguinal hernia. Both groups of patients were interviewed with the help of standard proforma. No significant differences were found between the patients who had undergone HSV and those who had undergone herniorrhaphy. The study showed that patients were symptomatically no worse after a hernia operation than after HSV.

When the operation of HSV was first described some 18 years ago, a lot of interest was generated because of its explicit use of applied anatomy and physiology. The procedure enabled the surgeon to selectively denervate the acid secreting parietal cell mass without the need for removing any part of the stomach or disrupting the nerve supply to the whole of the stomach and other intra abdominal organs. Thus a very ideal situation was created in which acid secretion was reduced without causing any loss of the gastric reservoir or the antral "mifi" function and at the same time preserving the integrity of the pyloric sphincter. Obviation of a drainage procedure minimised the chances of the much dreaded symptoms of diarrhoea and dumping.

Reduction of post vagotomy symptoms have been strong plus points for the operation of HSV, making it a popular choice for the treatment of duodenal ulcers over the last two decades. However, its popularity has been tainted by a high ulcer recurrence rate which increases with time. The high rates of long term symptomatic recurrences reported in some series are as bad as and possibly worse than those on which gastroenterostomy alone was discredited[16]. The most obvious competitor in the surgical

treatment of duodenal ulcer is vagotomy and antrectomy. The recurrence rate after this operation ranges between 0 to 5% only in follow up studies over a period of between 4 to 16 years[11] ‘ . However, its operative mortality ranges between 0 to 2% and it has a much higher incidence of post vagotomy symptoms. Thus, when choosing between the two operations, one is faced with the dilemma of having either post vagotomy symptoms or increased risk of ulcer recurrence especially in the long term. An ideal solution out of this dilemma could be to tailor the operation to suit each individual. In other words, there should be some criteria which could help one choose a vagotomy and antrectomy for those patients with a high risk of developing, recurrent ulceration, and HSV for those with a low risk. It has been claimed that patients in the high risk group are young patients, males, those with a long ulcer history, patients with pyloric or pre-pyloric ulcers, high acid secretors, smokers, alcoholics and those with a history of previous bleeding or perforation. However, these claims have been refuted by others. Another suggestion has been to modify HSV by adding a pyloroplasty or ligating the gastro-epiploic vessels at the antral-corpus junction. Emas[17] has compared HSV. with and without pyloroplasty, in a controlled trial, and reported a lower recurrence, 8% compared with 20% in the pyloroplasty group. A more aggressive surgical approach can only be justified if the incidence of dumping and diarrhoea could be kept low.

In future, we may look forward to newer techniques and variations to HSV in an effort to strike a balance between ulcer recurrence and post vagotomy symptoms. Perhaps techniques, which either combine HSV with mucosal antrectomy or provide complefe gastric mucosal denervation with preservation of the muscular innervation, may be the answer to .these problems.

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