T H E D U M P I N G S Y N D R O M E

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as a complication following elective operation for chronic duodenal ulcer .

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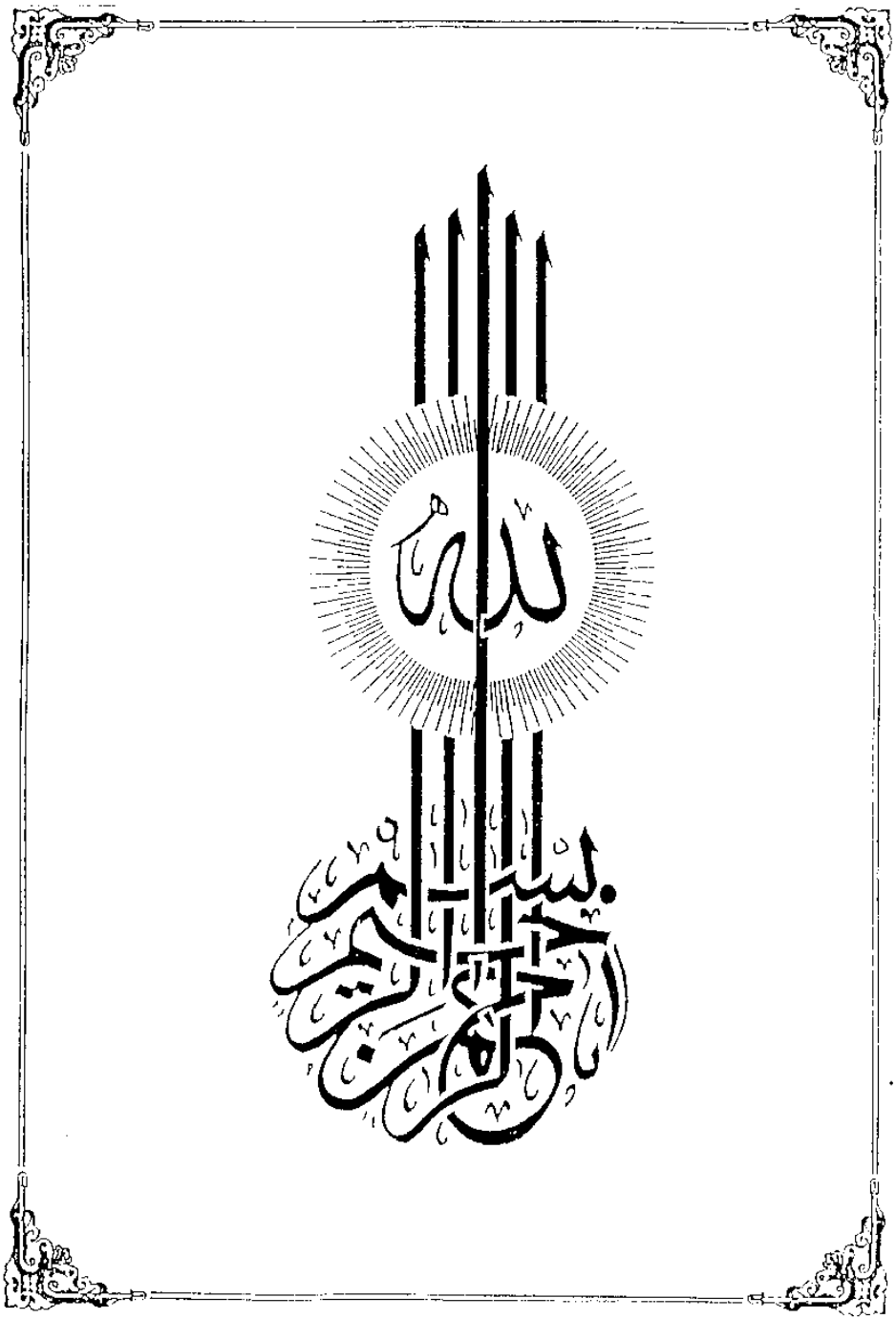

CONTENTS OF THE ESSAY :

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I N T R O D U C T I O N

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The post-prandial symptoms complex referred to as the " dumping syndrome " may occur after any operation tried so far for duodenal ulcer .

There are very few syndromes that have generated so much controversy and confusion as the " dumping syndrome ". Experimentally , the syndrome is hard to study because of difficulty in defining symptoms in animals .

During the time that this syndrome has been recognised many reports have appeared in the literature describing its various aspects and postulating different theories to explain its mechanisms . Some of the reports were based on the data collected from clinical studies , others upon experimental observations (Machella ,1949 ; Roberts , et al ,1954 ; Le Quesne , et al , 1960) .

This study will include a review to shed some light on this difficult problem , the dumping syndrome , as regard the incidence after various operations for chronic duodenal ulcer , its patho-physiology , its clinical aspects and management .

dumping syndrome .

C H A P T E R O N E

I N C I D E N C E O F D U M P I N G

INCIDENCE OF DUMPING

The incidence of the dumping syndrome varies greatly in different reported series in patients who had surgery for peptic ulcer disease (Goligher, 1952; Wellbourn, 1955; Woodward, 1961). This wide variation in the incidence of dumping may reflect the difficulties in the diagnosis of the syndrome. Thus the true incidence of dumping is difficult to evaluate.

Apart from the type of operative procedure that the patient has had, many factors may effect the incidence of dumping:

a) Age of the patient:

It is believed by some authors (Goligher JC & Riley TR, 1952) that younger patients, between the age of 20 to 30 years, and in particular those with a short history of ulcer disease prior to the operation have a higher incidence of dumping. However, other studies (Pulvertaft CN, 1952; Capper & Wellbourn, 1955) suggested that the age of the patient did not play a significant role in the incidence of dumping.

b) Sex of the patient:

Magnuson (1966) suggested that the incidence of dumping is sex-independent, but other studies reported that it was higher in females than in males (Machella, 1949).

c) The duration of ulcer symptoms prior operation:

It has been shown by several authors that the length of the histroy of ulcer symptoms before surgery has no influence

neither on the severity nor the incidence of dumping (Capper & Wellbourn, 1955; Silver D, 1965).

d) The site of the initial ulcer:

This has been found by some authors (Harvey HD, 1961) to play a role in determining the appearance of the dumping syndrome, i.e the more close the ulcer to the pylorus the more are the dumping symptoms experienced by the patient postoperatively, but this observation was disputed (Capper and Butler, 1951; Capper & Wellbourn, 1955).

Operative procedures and incidence of the dumping syndrome

a) Incidence of dumping after partial gastric resection:

It is generally thought that the incidence of dumping symptoms is directly proportional to the extent of gastric resection (Goligher, 1952).

After partial gastric resection the incidence varies between 49% (Nelson, 1968), 21.5% (Goligher et al, 1972) and as low as 15% (Cox et al, 1969). Moore (1969) reviewed 42 series and reported a main incidence of 26.7%.

Butler (1951) reported not a single patient with the dumping syndrome out of 102 who had undergone Billroth 1 gastrectomy whereas Irvine (1948) reported 100% incidence of dumping after Billroth 11 gastrectomy. However, there is considerable evidence to suggest that the incidence of dumping after both operations (Billroth 1 and 11) is not significantly different (Goligher & Riley, 1952; Pulvertaft, 1952).

b) Incidence of dumping after vagotomy:

It has been found that the incidence of dumping following selective vagotomy (27%) was greater than that following truncal vagotomy (11%) in a double blind randomized trial in which each patient had the same type of pyloroplasty (Kennedy T. et al, 1973).

In the prospective Leeds - York controlled trial of elective surgery for duodenal ulcer (Goligher et al, 1968) the incidence of dumping was approximately 13 to 18 % following 'truneal vagotomy and gastro-enterostomy', and approximately 9 % following 'truncal vagotomy and antrectomy with gastro-jejunostomy', and about 22 % following 'subtotal gastrectomy'. The reason of a lower incidence after antrectomy is not clear (Goligher, Pulvertaft, De Dombal, et al, 1968). Following truncal vagotomy and pyloroplasty, these authors found the incidence of dumping to be approximately 12 %.

Several authors (Goligher & Riley, 1952) have suggested that a small gastro-enteric stoma will decrease the incidence of the dumping syndrome by delaying gastric emptying. A stomal size of 2 cm or less has been considered optimal by many authors (Silen w,Eeiseman B, Brow WH Jr, 1948). The normal diameter of the pylorus in man does not exceed 1.9 cm, then it was claimed that when an anastomosis with a diameter of 1.9cm is constructed, the dumping syndrome does not occur (Salessiotis NA, 1975). In contrast, others have concluded that this has little effect upon the rate of gastric emptying and the incidence of the dumping symptoms (Goligher & Riley, 1952).

Proximal gastric vagotomy (PGV), parietal-cell vagotomy or highly selective vagotomy has been widely used for some years in the treatment of duodenal ulcer (Johnston D & Axon ATR, 1979).

The incidence after PGV with no drainage procedure is generally low (Amdrup et al, 1974; Kennedy et al, 1975) and is significantly lower than after other forms of vagotomy where a drainage procedure has been added (Humphrey et al, 1972).

In Jactino De Miguel study (1982), PGV without drainage was performed in 158 patients for duodenal ulcer from 1970 to 1974, 143 patients were followed up for a minimum of 5 years and a maximum of 9 years. The most frequent symptoms were epigastric fullness and intolerance to milk. Early dumping, detected in 6.7% of the patients, was always mild. Diarrhoea, also very slight and often only related to ingestion of milk, was seen in 9.6% of the patients. Thus, as stated by Jactino De Miguel (1982), PGV is clearly effective in reducing the side effects of gastric surgery, while the incidence of recurrent ulceration in the long term is similar to the incidence of recurrence after truncal or selective vagotomy with a drainage procedure.

dumping syndrome .

C H A P T E R T W O

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P A T H O - P H Y S I O L O G Y O F

T H E " D U M P I N G - S Y N D R O M E "

PATHOPHYSIOLOGY OF THE DUMPING SYNDROME

The dumping syndrome remains clinically an important complication of operations for duodenal ulcer. A significant incidence of dumping has been noted even with the more conservative procedure of highly selective or parietal-cell vagotomy.

The pathophysiology of the dumping syndrome had been extensively studied, however, the mechanisms involved are still incompletely understood. In view of many studies, it seems most likely that the mechanism is multifactorial and there is no such single factor that can explain all the symptoms attributable to the dumping syndrome.

In this chapter a review of the published work and research studies about the pathophysiological aspects of the dumping syndrome will be given which will include the following points :-

1. Gastric emptying and the dumping syndrome.

2. The role of hypertonic solutions in the dumping syndrome.

3. Plasma volume depletion theory.

4. Cardio-vascular changes and dumping.

5. Potassium depletion theory.

6. Dumping and carbohydrate metabolism.

7. Intestinal motility and blood flow.

8. Hormonal aspect of dumping syndrome.

1. Gastric emptying and the dumping syndrome

The first clue to the pathophysiology of the postprandial dumping symptoms was the early observation by Hertz (1913) who was the first to call attention to the dumping syndrome although he did not use the term dumping. He described postprandial fullness and diarrhoea in some of the patients who had undergone gastro-enterostomy.

Hertz (1913) and later Mix (1922) observed that in those with the postprandial symptoms an ingested radio-opaque meal emptied rapidly in the small intestine.

Machella (1950) made some interesting clinical observations on patients with dumping syndrome. He found that nearly all patients with the syndrome reported the symptoms toward the end of the meal or almost immediately after its completion and in particular that symptoms tended to follow meals containing an excessive amount of sugar. Seventeen out of twenty patients, studied had X-ray evidence of the rapid passage of a water-barium meal to the jejunum as compared with control observations made on twenty-nine patients without dumping symptoms. He noticed that ingestion of hypertonic solutions including glucose reproduce the dumping symptoms in those patients with the

dumping syndrome. To explain the mechanism he proposed that the rapid passage of the hyperosmolar solution into the jejunum was followed by an outpouring of fluid from the jejunal wall into the lumen in an attempt to make the hypertonic contents isotonic. This produced distension of the jejunum which was postulated to be the cause of the abdominal symptoms. In support of this theory was the observation that balloon distension or instillation of 50% glucose into the jejunum in normal human volunteers produced obdominal symptoms resembling those postprandial symptoms (Machella, 1950). These observations have been confirmed by other workers (Muir, 1949; Glazebrook and Welbourn, 1952).

The association of rapid gastric emptying with the dumping syndrome has been demonestrated by several workers who studied the gastric emptying after different operations for duodenal ulcer (McKelvey, 1970; Clark and Alexander Williams, 1973; Thomson, 1974). However, Custer et al (1946) and Duthie and McKellar (1960) were not able to find any significant differences between the rate of gastric emptying in patients with and without the dumping syndrome.

Similarly, Silver D, Anlyan WG, et al (1965) have noted that there was no correlation between the symptoms of dumping induced by standard challange solution (150 ml. of 50% glucose) and the rate of gastric emptying determined radiologically. Rapid transit through the proximal gastro-intestinal tract might account for some of the symptoms associated with dumping

(Owren, 1952), but Brussgaard (1946) noted that the total time required for the passage of food through the entire intestinal tract following subtotal gastric resection was about the same as that seen in healthy persons who had had no prior operation. Furthermore, Welbourn and associates (1953) found that in normal patients the transit time through the gastro-intestinal tract was 12.1 hrs, whereas following Billroth I resection the transit time was 12.7 hrs, and after Billroth II resection the transit time was 12.2 hrs, Thus, the total transit time seem to be not greatly influenced by gastric resection even there may be some slowing of the distal small intestine which compensates for the more rapid passage through the proximal gastro-intestinal tract after gastric resection.

2. The role of hypertonic solutions in the dumping syndrome.

Machella (1949, 1950), postulated that in order to induce dumping, a meal should have two characteristics:

a) The ingradients must have an osmolality greater than 300 milli-osmol , and b) an adequate amount of fluid must accompany the ingested material in order to disolve the ingradients.

Since Machella (1950) was able to reproduce some of the symptoms of dumping by distending the proximal jejunum with a balloon, he concluded that in response to its hypertonic content, the outpouring of fluid into the jejunal lumen caused distension.

Machella (1950) also pointed out that assumption of the horizontal position allows the jejunal contents to flow back into the gastric remnant, which partially dissipates the disturbing force in the jejunum, thereby affording relief of symptoms. Glazebrook and Welbourn (1952) made similar observations.