THE LARGE GASTRIC ULCER

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THE frequency of chronic gastric ulcers undergoing malignant change is controversial. MacCarty *et al.* believe that many carcinomata supervene on simple gastric ulcers. Stewart, however, stated, after extensive observations on post-mortem and biopsy material, that only about 6 per cent. of chronic ulcers showed malignant changes. Pathologists at the Mayo Clinic have demonstrated that 60 per cent. of apparently simple ulcers showed microscopic evidence of malignancy. Many workers believe, however, that the reparative proliferative changes seen at the edge of chronic ulcers are frequently mistaken for neoplastic growths of the epithelium. These ulcers are, in reality, simple in nature. This opinion is supported by Ogilvie and Schindler. The latter has never seen, by gastroscopy, a simple ulcer which became malignant. Nevertheless, the majority of clinicians regard with suspicion any gastric ulcer larger than 2·5 cm. in diameter. It was decided to review some cases of gastric ulcer in an endeavour to determine the incidence of large ulcers, *i.e.* those greater than 2·5 cm. in diameter, their response to treatment and whether any were, or became, malignant.

CASE MATERIAL

The cases in this series totalled 537. They comprised patients admitted to a general medical ward with symptoms suggestive of peptic ulcer, patients with sudden hæmatemesis and those who were found to have an incidental ulcer during the investigation of some other condition. There were 435 cases of duodenal ulcer (81 per cent.) and 102 cases of gastric ulcer (19 per cent.), a ratio of 4·2 : 1. Of these gastric ulcers 57 (55·8 per cent.) were found to have a diameter greater than 2·5 cm.; 44 of these patients were males and 13 females (3·3 : 1); while of the total cases of gastric ulcer 76 were males and 26 females, a ratio of 2·9 : 1. The average age of this total group was 59 years, being 63 years for men and 47·8 years for women. In the patients with large gastric ulcers the ages were rather less. The average age was 53 years, being 55 years for men and 46·6 years for women. These figures are not, however, statistically significant. They can be seen more clearly in Table I.

SYMPTOMATOLOGY

It is interesting to compare the symptoms of the 45 patients with ulcers less than 2·5 cm. in diameter with the 57 who have ulcers greater than 2·5 cm. In the former group of patients 29 gave a previous

history of stomach trouble, 20 had complained of epigastric pain for an average period of five years and 9 had suffered from indigestion, gastric flatulence and a sensation of epigastric fullness and distension. The average duration of these latter symptoms was ten years. In the patients with large gastric ulcers, 29 had a previous history of typical ulcer pain, the average duration of which was three and a half years; 6 patients gave a history of indigestion for an average period of six

TABLE I

	Number of Cases.		Ratio M. : F.	Average Age in Years.		Average Age. Both Sexes.
	Males.	Females.		Males.	Females.	
Total cases of gastric ulcer	76	26	2·9 : 1	63	47·8	59
Cases of large gastric ulcer	44	13	3·3 : 1	55	46·6	53

years. The immediate presenting symptoms of the cases of small ulcer were:—pain of one month's duration in 30 patients; vomiting, for an average period of one month, in 7, and hæmatemesis for one day in 8 patients. In the group with large gastric ulcers 45 were admitted with a complaint of epigastric pain of one month's duration, 2 with vomiting for a month and 10 with hæmatemesis for a day.

This comparison can be seen more clearly in Table II.

TABLE II

	Previous Symptoms and Average Duration		Presenting Symptoms and Average Duration		
	Pain.	Indigestion.	Pain.	Vomiting.	Hæmatemesis.
Small ulcers 45 cases	20 (44·4 per cent.) average 5 yrs.	9 (20 per cent.) average 10 yrs.	30 (66·6 per cent.) 1 month	7 (15·5 per cent.) 1 month	8 (16·6 per cent.) 1 day
Large ulcers 57 cases	29 (50·8 per cent.) average 3½ yrs.	6 (10·5 per cent.) average 6 yrs.	45 (78·9 per cent.) 1 month	2 (3·5 per cent.) 1 month	10 (17·5 per cent.) 1 day

The complaint of pain, either in the previous history or in the presenting symptoms of the two groups is, however, not statistically significant.

Presence of other Disease

None of the 45 patients with small gastric ulcers had any co-incidental disease. In the 57 cases with large gastric ulcers 2 patients had active pulmonary tuberculosis; 2 were found to have syphilis; one had well-marked mitral stenosis; one suffered from aortic incompetence and another from hypertension. The significance of other disease in these 7 cases of large gastric ulcer is uncertain.

Gastric Test Meal

A Ewald test meal was performed on all the patients in this series. The test meal has many fallacies. These include the general state of the patient at the time of the test, the emotional effect of swallowing the tube on the gastric juice, the alteration in the motility and perhaps secretion, due to the Ryles tube acting as a foreign body in the stomach, the distension of this organ by the large quantity of air swallowed during the passage of the tube and perhaps stimulation of secretion, the failure to obtain a true sample of the gastric contents due to improper mixing, the swallowing of a variable amount of saliva and the combined effect of this saliva, gruel and tube on the level of the gastric juice. All these factors, together with the personal error in titration, may modify the results of the gastric analysis. Nevertheless, an attempt was made to carry out gastric analysis in as standard and uniform a manner as possible. Results constantly above 60 Ewald units were regarded as hyperchlorhydric while figures consistently below 30 units were taken to indicate hypochlorhydria. Of the 57 cases of large gastric ulcer, 53 showed evidence of hypochlorhydria (92·9 per cent.); only 4 patients had hyperchlorhydria. In the group of small gastric ulcers 11 were hypochlorhydric while hyperchlorhydria was present in the remaining 32 patients (71·1 per cent.). These figures are seen in Table III and are significant both clinically and statistically.

TABLE III

	Hypochlorhydria.			Hyperchlorhydria.		
	Males.	Females.	Per Cent. of Total.	Males.	Females.	Per Cent. of Total.
Cases of large gastric ulcer	40	13	92·9 per cent.	4	0	7·1 per cent.
Cases of small gastric ulcer	6	5	28·9 ,,	26	8	71·1 ,,

In 102 patients with proved gastric carcinoma the test meals gave very different results from the cases of ulcer. Seventy patients had a histamine-fast achlorhydria; 20 had achlorhydria, in whom a little free acid could be produced after histamine injection, and 12 had hypochlorhydria, but with a very high level of organic acid. Blood was present in every specimen in every patient with gastric carcinoma, while in the group of gastric ulcers only a trace of blood could be detected in one or two specimens in each case. The results of the ulcer group of patients when compared with these latter figures from the cases of gastric carcinoma are again statistically, and perhaps clinically, significant.

Radiological Appearances

Five types of gastric ulcer may be recognised radiologically :— (1) mucosal erosions, (2) so-called callous or penetrating ulcers with deep craters, (3) ulcers perforating into the general peritoneal cavity or other structures, (4) malignant ulcers, (5) ulcerating benign tumours.

The callous or penetrating ulcer, the malignant ulcer and perhaps the benign tumour which has undergone ulceration only need be included in this discussion. Before reaching a definite conclusion as to the nature of a gastric ulcer several factors must be considered.

(a) *Site*.—Simple gastric ulcer has a marked predilection for the lesser curvature. Feldman states that about 80 per cent. of gastric ulcers occur on the lesser curvature, 5 per cent. in the cardia, 10 per cent. in the pylorus and 5 per cent. are scattered. The site of malignant ulcers may be variable. The majority of workers state that these are most commonly found on the lesser curvature near the pylorus, but a few, and these latter are invariably malignant, are present on the greater curvature. In this series all 45 of the small ulcers were found on the lesser curvature. Of the 57 classified as large gastric ulcers, 51 (88·8 per cent.), were present on the lesser curvature ; 3 (5·6 per cent.), on the greater curvature, and 3 (5·6 per cent.) were situated near the pylorus.

(b) *Size*.—Most authors state that the average size of gastric ulcers is about 1 to 1½ cm. in diameter. In this series 45 (44·2 per cent.), were less than 2·5 cm., while 57 (55·8 per cent.) were greater than 2·5 cm. Krisnapoller, in a series of 384 cases of gastric ulcer, found 41 per cent. to be greater than 1·5 cm. and 6·5 per cent. greater than 3 cm. He stressed that the incidence of large gastric ulcers increases with age. This was not seen in the cases in this series, however, and the difference in ages in the two groups was not significant. Although the size of the ulcer should not be the sole criterion for the diagnosis of malignancy, many workers, including Wilson, MacCarty, Carman and Gömöri, believe that the majority of ulcers greater than 2·5 cm. in diameter are likely to be neoplastic.

(c) *Shape*.—The penetrating simple ulcer produces a crater or niche which projects outwards from the gastric curvature. The swollen mucosa at the periphery of the ulcer forms an areolar, halo or ring shadow around the niche. The malignant ulcer may present as a small niche without the surrounding induration of the simple ulcer, or, more commonly, as a large shallow irregular crater on a plateau surface. It seldom projects out from the natural gastric contour. The shadow of this malignant ulcer produces a concave-convex defect which resembles a lens, the convexity directed towards the stomach wall and the concavity inwards. Carman has described this appearance as the " meniscus " sign of malignant ulcers. In this series 45 of the large ulcers had an appearance in keeping with a benign condition. The remaining 12 cases, from their shape, were suggestive of

malignancy. The shape of all the small ulcers indicated their innocent nature.

(d) *Deformity of the Stomach.*—Deformities of the pyloric antrum or, indeed, of any part of the stomach, due to scar tissue or spasm, are commonly seen in cases of gastric ulcer. Moore states that prepyloric narrowing often occurs in association with ulcers. In this condition the lesser curvature becomes shortened and the narrowed antrum is drawn upwards and medially, giving the stomach the appearance of an exaggerated fish hook. The stomach may assume an hour-glass deformity due to spasm. This is the result of localised spastic contraction of the circular muscle fibres in the plane of the ulcer. It forms a deep notch or indentation, usually on the greater curvature and invariably directed towards an ulcer on the lesser curvature. This incisura is pathognomic of gastric ulcer, even if no ulcer crater can be visualised. Pyloro-spasm may be found in relation to ulcers of the lesser curvature, posterior wall or pylorus. The spasm may be intermittent or persistent. In this latter instance the continuous spasm gives the appearance of a filling defect. It can, however, be made to disappear by pressure or massage. In malignant ulceration there may be a concentric narrowing of the pylorus with hypertrophy of the rugæ, indicating an associated gastritis. This latter defect is usually constant. There is usually no evidence of gastric spasm in cases of malignant ulceration, although a carcinoma of the fundus may induce cardio-spasm, and in rare cases pyloro-spasm may occur with prepyloric neoplasms. Twenty-four patients in this series of large ulcers showed evidence of spasmodic deformity of the body of the stomach, while three had spastic deformities of the pylorus. No associated alterations in gastric contour were seen in the remaining 30 cases. All 45 cases of small gastric ulcer showed this spastic deformity.

(e) *Tenderness.*—Tenderness over the area of ulceration is an important radiological sign of benign active ulcer. Morley and Twining stated that this deep tenderness is due to stimulation of the parietal peritoneum by contact with the inflamed area of the active ulcer. Malignant ulcers are not usually tender. Tenderness was not a noticeable feature, on radiological examination of the patients with large ulcers, in this series.

(f) *Peristalsis.*—Hypoperistalsis of the stomach is often seen in association with gastric ulcer. The induration at the site of a chronic ulcer interferes with the gastric motility and the peristaltic waves are absent in the affected area. They are seen to become submerged at the site of the lesion and then reappear on the other side of the ulcerated area. The larger the ulcer, the greater is this area of peristaltic inactivity. In carcinomatous ulceration the peristalsis is again absent. In rare cases, however, the peristalsis may be exaggerated, irregular, or antiperistalsis even may occur. None of the patients in this series was observed by the author when they were screened and no note of peristaltic activity was obtainable.

(g) *Mucosal Pattern.*—The appearance of the mucosal folds is important in differentiating malignant from simple ulceration. In carcinomatous ulcers the mucosa may be atrophied with disappearance of the folds, or the rugæ may be prominent and irregular. This irregularity and nodular appearance is considered by Rendich to be an important sign of malignancy, while Berg has noted striation of the mucosal folds in cases of gastric carcinoma. Whether the rugæ are atrophied or hypertrophied, there is always interference and disruption of their natural pattern in cases of malignant ulcer. In simple ulceration the mucosal folds may be hypertrophied and are seen to converge towards the ulcer crater. In the group of large gastric ulcers 45 (78·9 per cent.) showed a mucosal pattern suggestive of simple ulceration. All 45 cases of small gastric ulcer had the typical converging mucosa.

TABLE IV

	Small Gastric Ulcers.	Large Gastric Ulcers.
Total cases . .	45	57
Site . . .	All lesser curvature	88·8 per cent. lesser curvature 5·6 ,, greater curvature 5·6 ,, pylorus
Size . . .	All less than 2·5 cm.	All greater than 2·5 cm.
Shape . . .	All suggestive of simple ulcer	78·9 per cent. simple ulcer 21·1 ,, malignant ulcer
Deformity . .	All spasm of body	43·1 ,, spasm of body 5·6 ,, spasm of pylorus 51·3 ,, no deformity
Mucosal pattern .	All converging rugæ	78·9 ,, converging rugæ 21·1 ,, abnormal rugæ
Evidence of healing .	All after 14 days	63 per cent. after 14 days

(h) *Evidence of Healing.*—This is a most important point in the differentiation of benign from malignant ulcers. In simple ulcers, when healing occurs, the niche loses its clear-cut outline, it becomes smaller and perhaps irregular. The surrounding areola of œdematous tissue disappears, the crater becomes shallow and V-shaped and then flattens as the healing becomes complete. The tenderness and spasm disappear and the scar of the healed ulcer may form a star-shaped figure which is seen to replace the ulcer niche. Malignant ulcers always progress and never at any time show these changes of healing. It has been suggested by some workers that the size of the ulcer and the age of the patient may influence the healing process. White, however, did not confirm this in his series of cases, nor was it seen in the present series. Thirty-six patients with large gastric ulcers (63 per cent.) showed definite evidence of healing fourteen days after the commencement of medical treatment. The 45 cases of small

gastric ulcer also presented the changes consistent with healing after a similar length of time. After four weeks of medical treatment the majority of cases in both groups showed radiological signs of the ulcer having healed.

The 45 patients with small gastric ulcers demonstrated most of the radiological signs of simple ulcer. Twelve of the 57 cases of large gastric ulcer (21 per cent.) showed some changes which suggested the possibility of malignancy. These can be compared in Table IV.

Results of Treatment, Mortality and Incidence of Malignancy

All the small ulcers and those large ulcers which were thought to be simple were healed medically with diet, phenobarbitone and various alkalies.

Forty-five, *i.e.* all the patients with small ulcers, became symptom-free in a few days. There were radiological signs of healing in all these cases after fourteen days and of complete healing after a month.

TABLE V

	Small Gastric Ulcers.	Large Gastric Ulcers.
Medical treatment .	45	36
Surgical treatment .	None	14 12 Suspected malignancy. (Histologically simple) 2 Gross size and failure of previous medical treatment (Simple ulcers but eroding body of pancreas)
Died . . .	None	7 1 Perforation and peritonitis 1 Pulmonary embolus 1 Cerebral hæmorrhage 4 Hæmatemesis

In the group of 57 cases with large ulcers, 14 patients (24·5 per cent.) underwent gastric resection; 12 for suspected malignancy of the ulcer and 2 because of failure of previous medical treatment and the gross size of the ulcer. All 14 patients made a good recovery. Thirty-six (63 per cent.) responded well to the prescribed medical regime and 7 patients died, a mortality of 12·5 per cent. The causes of death in these 7 cases were:—perforation and peritonitis with death following operation in one; pulmonary embolus in one; cerebral hæmorrhage in one patient with hypertension and repeated massive hæmatemesis in 4. None of these cases showed any malignant change in the ulcer.

Histological examination of the resected stomachs from the 12 patients who were thought to have malignant ulceration revealed no evidence of carcinoma. The ulcers were simple in every case. In

the two patients who underwent operation because of the gross size of the ulcer and who had not responded to previous medical treatment, both were again found to have simple ulcers which had eroded into the body of the pancreas. These results are seen in Table V.

Conclusions

There were 102 patients with gastric ulcer in a series of 537 cases of peptic ulcer, duodenal ulcer comprising the remainder.

In the gastric ulcer group, 57 patients were found to have large ulcers, *i.e.* greater than 2·5 cm. in diameter. These patients had shorter histories than the cases of small ulcer. This, however, is not significant. Patients with large ulcers may have other chronic diseases such as tuberculosis, syphilis, valvular disease of the heart or hypertension. Although these conditions may possibly have played some role in the ætiology of the ulcer, their presence did not in any way delay healing of the lesion.

Hypochlorhydria was present in 92·9 per cent. of cases of large ulcer. Compared with the gastric analysis of patients with small ulcers this hypochlorhydria is statistically, and should be clinically, significant.

The size, and thus the criterion for small or large gastric ulcers, is usually determined by radiological examination. In addition the site and shape of the ulcer, gastric deformity, local tenderness, peristaltic activity, mucosal pattern and evidence of healing are all important factors in assessing the benign or malignant nature of the ulcer. All the small gastric ulcers showed radiological evidence of their innocent character. Twenty-one per cent. of the large ulcers had signs suggestive of malignancy. It was found at operation, however, that all these ulcers were benign.

In spite of the established teaching that all gastric ulcers greater than 2·5 cm. in diameter are or may become malignant, no instance of carcinomatous ulcer was found in this series.

The size of the ulcer does not generally delay healing, unless the ulcer is eroding the body of the pancreas.

None of the patients with small ulcers died. The mortality rate was 12·5 per cent. in the group with large ulcers. Only 5 of the deaths, however, in these 7 cases could be attributed to the ulcer—perforation in one and massive hæmatemesis in 4 of the patients.

Summary

The incidence, symptomatology, gastric analysis, radiological appearances, results of treatment, incidence of malignancy and mortality of a group of patients with large gastric ulcer are discussed and compared with similar findings in a series with small gastric ulcers.

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