

The Relationship between Duodenal Ulcer Depth and Gastric Acid Output

A DUODENOSCOPIC STUDY

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SUMMARY

In the course of 750 routine duodenoscopies, 119 patients with duodenal ulcers who also had gastric acid tests, were assessed. A relationship was found between the depth of duodenal ulcers and the height of the gastric acid output. In both Black and Indian patients, maximal acid output was significantly higher in patients with deep duodenal ulcers compared with flat duodenal ulcers. There were more Blacks with deep ulcers, and more Indians with flat ulcers.

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From August 1971 examination of the duodenum has been a routine part of all endoscopies. All patients referred for endoscopy were examined from the pharynx to the second or third parts of the duodenum where possible. The duodenum was entered in 92% of attempts. In addition, all patients with known or suspected duodenal ulceration were subjected to duodenoscopy. A detailed visual study of duodenal ulcers thus became possible. It was noted early in the study that there were at least two types of duodenal ulcer, which we have termed deep and flat. It was decided to attempt to relate these types of ulcers to the height of gastric acid output.

METHODS

A total of 750 duodenoscopies have been performed using the long (120-cm) end-view Olympus GIF endoscope.

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In 27 patients the examination was supplemented by the side-view Olympus JF-B and B2.

One hundred and nineteen patients were selected for this analysis because the report of the ulcer depth was reliable, and because gastric acid studies had been performed. Ulcers were classified as follows: where the mucosa was not only broken, but the ulcer was clearly depressed, the ulcer was called deep (Fig. 1); and where

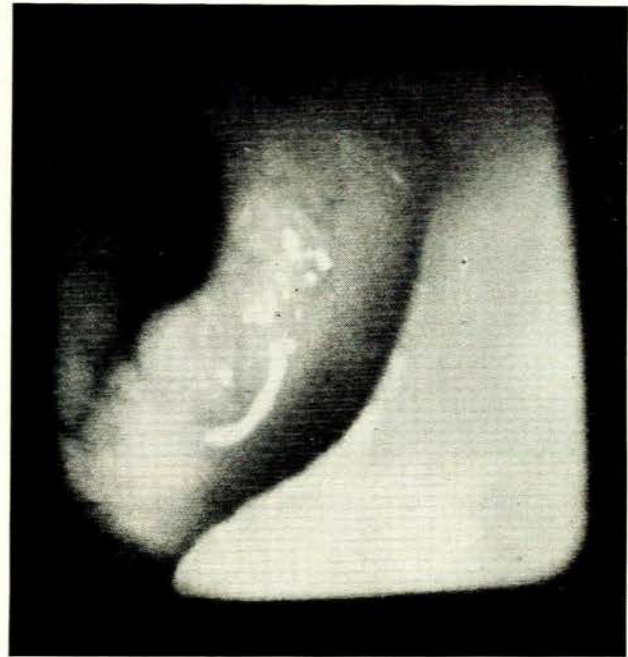


Fig. 1. A deep ulcer.

the ulcer was on a level with the surrounding mucosa it was called flat. Many flat ulcers were of the linear variety (Fig. 2), or 'salt and pepper' ulcers (Fig. 3).¹ Gastric acid output was measured by the method of Kay,² except that 6 μ g/kg intramuscular pentagastrin was used as a stimulus.

RESULTS

Of a total of 119 duodenal ulcers 61 were deep and 58 flat. Table I shows the maximal acid output (MAO),

TABLE I. MAXIMAL ACID OUTPUT (mEq/h) IN PATIENTS WITH DUODENOSCOPICALLY PROVED DUODENAL ULCERS

	Total	Flat ulcers			Deep ulcers			P
		No.	MAO (mEq/h) Mean \pm SD		No.	MAO (mEq/h) Mean \pm SD		
Black								
Males	20	4	29,4	1,9	16	43,5	8,7	<0,0005
Females ...	10	4	17,6	3,1	6	27,4	5,5	<0,01
Indian								
Males	71	40	23,2	6,1	31	32,1	9,3	<0,005
Females ...	18	13	15,7	3,8	5	30,7	13,1	<0,025
Total	119							



Fig. 2. Flat ulcer of the linear variety.

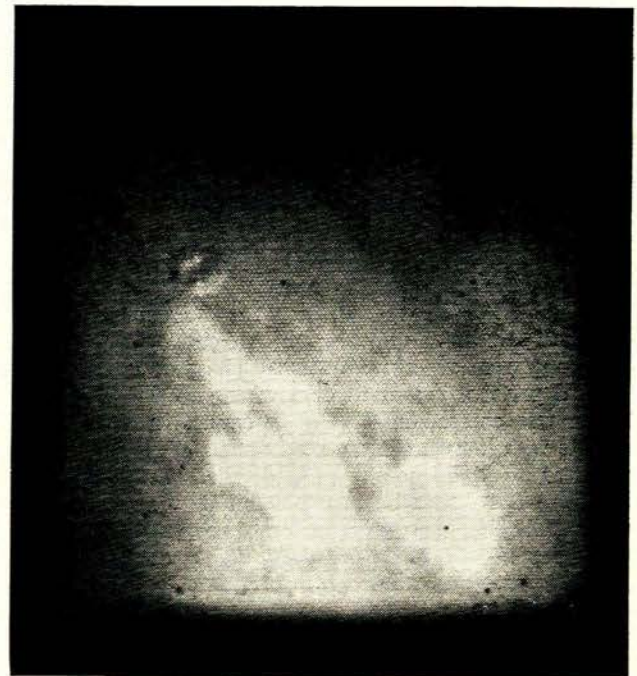


Fig. 3. 'Salt and pepper' ulcer.

expressed as mEq/h, in the 4 groups of patients with duodenoscopically proved duodenal ulcers. There were more Black patients with deep duodenal ulcers than flat ulcers, and the acid output was significantly higher in those with deep ulcers. In Black males, mean MAO \pm SD in 4 patients with flat duodenal ulcers was 29,4 \pm 1,9 mEq/h, and in 16 patients with deep duodenal ulcers it was 43,5 \pm 8,7 mEq/h ($P < 0,0005$). In Black females mean MAO \pm SD in 4 patients with flat duodenal ulcers was 17,6 \pm 3,1 mEq/h, and in 6 patients with deep ulcers it was 27,4 \pm 5,5 mEq/h ($P < 0,01$).

There were more Indians with flat duodenal ulcers than deep ulcers, and acid output was significantly lower in patients with shallow ulcers. In Indian males, mean MAO \pm SD in 40 patients with flat duodenal ulcers was 23,2 \pm 6,1 mEq/h, and in 31 patients with deep duodenal ulcers mean MAO \pm SD was 32,1 \pm 9,3 mEq/h ($P < 0,005$). In Indian females mean MAO \pm SD in 13 patients with

flat duodenal ulcers was 15,7 \pm 3,8 mEq/h, and in 5 patients with high acid output it was 30,7 \pm 13,1 mEq/h ($P < 0,025$).

Table II shows that in all groups, except Indian males with deep duodenal ulcers, there was a clear separation between those with high and low acid outputs and deep and flat duodenal ulcers. A 'low acid' is defined as a maximal acid output in males of below 30 mEq/h, and in females below 20 mEq/h. Thus in patients with flat duodenal ulcers, not more than 2 in each group had high acid outputs. A total of 92% of patients with flat ulcers had 'low acids'. In the patients with deep duodenal ulcers, the only exceptions to the rule were 11 Indian males with MAOs under 30 mEq/h. Yet, in the entire group of patients with deep duodenal ulcers, 81,0% of patients had high acid outputs.

TABLE II. NUMBER OF PATIENTS WITH DUODENOSCOPICALLY PROVED DUODENAL ULCERS

	Flat ulcers			Deep ulcers		
	No.	Acids*		No.	Acids*	
		Low	High		Low	High
Black						
Males	4	3	1	16	0	16
Females	4	3	1	6	0	6
Indian						
Males	40	38	2	31	10	21
Females	13	12	1	5	1	4
Total	—	—	—	—	—	—
	61	56	5	58	11	47
		(92%)				(81%)

* Key: MAO (mEq/h) — low acid: males <30, females <20; high acid: males >30, females >20.

DISCUSSION

It is only since the advent of routine duodenoscopy that a detailed visual examination of duodenal ulcers has become possible. We related the depth of a duodenal ulcer to the gastric acid output.

Flat duodenal ulcers are invariably on the anterior duodenal wall, and deep duodenal ulcers are on the posterior wall. It is possible that deep duodenal ulcers are not seen on the anterior wall because they would perforate in that situation. On the posterior wall duodenal ulcers appear to become deep without perforation. There were no discernible differences in symptomatology between deep and flat duodenal ulcers. In the healing phase deep

duodenal ulcers took 8 weeks to heal to a scar, whereas flat duodenal ulcers disappeared, often without scar, in 2 to 4 weeks. A deep duodenal ulcer may look like a flat ulcer before healing.

A long-term prospective study in the 119 patients with duodenal ulceration is being carried out to assess if there is any difference in the course of the disease.

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