

FACTORS IN THE RADIOLOGICAL DIFFERENTIAL DIAGNOSIS OF PYLORIC ULCER

I. THE PYLORIC ORIFICE SIMULATING AN ULCER

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The radiological diagnosis of an active gastric ulcer depends on direct and indirect signs. The indirect signs *per se* are often inconclusive and, in practice, the diagnosis depends on the direct sign, viz., the demonstration of an ulcer cavity. This may present in two ways, as follows:

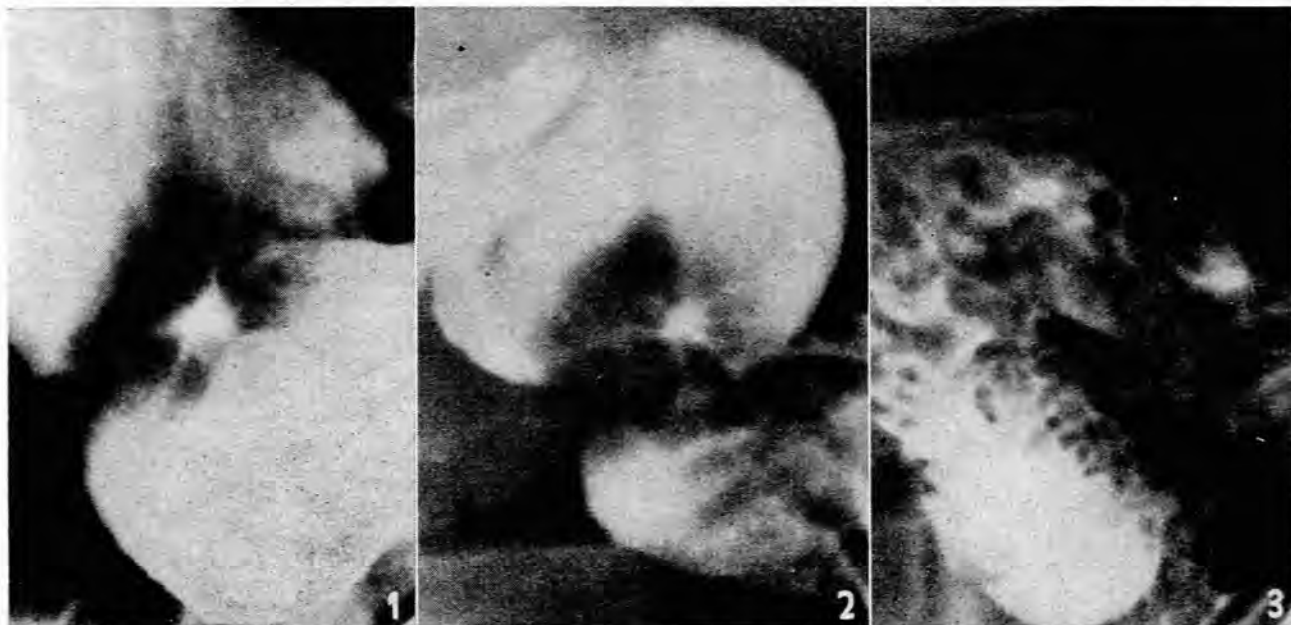
1. It may have the appearance of a barium-containing projection from the lumen. In this case the ulcer is seen in profile, i.e. sideways, on one of the margins of the organ.

2. It may be seen as a persistent dense fleck. Here the barium-containing ulcer cavity is seen *en face*, or end-on. The fleck can usually be demonstrated both in the mucosal views and in the filled stomach with graduated compression. By means of compression, the gastric walls are approximated and the barium in the lumen is pressed away, leaving only the barium in the crater to present as a dense fleck.

Depending on the situation of the ulcer it may, at times, be visualized in both ways. Generally speaking, an ulcer on one of the curvatures will present as a projection from the lumen. When situated on the anterior or posterior surfaces of the organ it is more likely to present as a constant fleck. If this is in the 'vertical' part of the stomach it is often possible to rotate the patient in such

a way that the crater becomes visible on the 'sky-line', in which case it will also be seen in profile. Where the ulcer is located on the anterior or posterior walls of the 'horizontal' part of the organ such rotation is difficult, and the diagnosis has to depend on the demonstration of a constant fleck. A projection from the lumen may, of course, also be caused by a gastric diverticulum, but this can usually be differentiated from an ulcer by various characteristics such as its situation, rounded shape and narrow neck. Other causes of small projections from the lumen are protrusions between peristaltic waves (which may resemble an ulcer to a remarkable degree on single films) and collections of barium in protruding mucosal furrows.

As to the differential diagnosis of the fleck, it should be pointed out that an inconstant fleck may occur at a convergence of two mucosal furrows. Owing to the mucosal movements in the normal stomach, classically described by Forsell,^{1,2} such a fleck will not be constant. In a series of exposures it should be possible to demonstrate these movements, with the consequent change in appearance or disappearance of the fleck. In cases of spasm of the prepyloric musculature, however, there is diminished movement of the muscularis propria. Owing



Figs. 1, 2 and 3. In each case there is a constant, dense fleck at the pyloroduodenal junction, surrounded by a radiolucent zone and radiating mucosal folds. A greater degree of compression was used in Fig. 3.

to the 'independent but coordinated movements'^{1,2} of the muscularis propria and the mucosal membrane (muscularis mucosae), the movement of the latter will be proportionately diminished. In these cases the pseudo-niche may be more permanent and there may be difficulty in distinguishing it from a true niche. A constant fleck may, of course, also occur on the inner, ulcerated surface of a tumour. In these cases it is generally possible to demonstrate an additional irregular or rounded filling defect.

Apart from the constant fleck, other direct signs of gastric ulcer are a zone devoid of barium around the fleck, caused by mucosal swelling, and radiating mucosal folds, due to the puckering effect of the ulcer. This has been called the rosette appearance.⁶

The purpose of this short communication is to draw attention to 3 cases in which a constant fleck in the pyloric area, resembling an ulcer in various ways, was produced physiologically. It is an appearance that seems to be seldom mentioned in the differential diagnosis of pyloric ulcer. The majority of textbooks do not refer to it, although Schinz *et al.*⁵ mention it, while Templeton⁷ has an illustration of it, and calls it the 'pyloric star'. Meschan⁴ notes that there may be a dimple of mucosa at the base of the bulb when the pylorus closes, in which barium may accumulate, giving rise to the appearance of a fleck.

CASE RECORDS

Case 1

The patient was a woman, aged about 38 years, seen at another hospital.

At the barium-meal examination there was a moderate spasticity of the prepyloric musculature. The pyloroduodenal axis was more horizontal than usual, so that films of this area could not be obtained in the left oblique position. The axis pointed to the right in the usual way, but its sagittal inclination was exaggerated. The result of this was that the caudal part of the prepyloric area was projected over the base of the bulb in the anteroposterior and right oblique positions. We did not succeed in separating these two overlapping shadows. Compression of this area showed a constant dense fleck of barium at the pyloroduodenal junction, surrounded by a zone devoid of barium and showing radiating mucosal folds (Fig. 1). About 4 years before this examination a cholecystectomy had been performed.

At operation a fortnight after the barium meal, dense adhesions were found between the liver, pylorus and duodenum. It was thought that these were due to peptic ulcer, and a partial gastrectomy was performed. The resection specimen showed the changes of gastritis, but no active ulcer.

Case 2

At the barium-meal examination the findings were almost identical to those seen in case 1. It was reported that it was

difficult to distinguish between an ulcer and a physiological condition in which the constant fleck was produced by the pyloric orifice, the round defect by the pyloric valve and the radiating folds by gastric and duodenal mucosal folds converging on the pylorus (Fig. 2). The films also showed a calcified hydatid in the liver. Ten years before admission a hydatid cyst had been removed from the liver.

At operation 3 days later, adhesions were found between the liver, stomach and duodenum. These were severed. An annular thickening was felt at the pylorus, and it was decided to do a partial gastrectomy. The gastric resection specimen showed an atrophic mucosa with disappearance of rugae in many areas. The histology was that of a chronic, atrophic gastritis. There was no sign of malignancy and no ulceration. The thickening felt at operation was not commented upon, but it was probably due to a degree of local pyloric hypertrophy.

Case 3

For some months we have been doing routine radiological examinations of the pyloroduodenal junction in cases where the stomach and duodenum had been proved normal at an earlier cholecystectomy. Case 3 was from that series and again showed a constant fleck, surrounded by a radiolucent zone and radiating mucosal folds at the pyloroduodenal junction (Fig. 3).

DISCUSSION

It is clear that in these 3 cases, in which the stomach and duodenum were proved free of ulceration and tumour, the constant dense fleck resembling an ulcer at the pyloroduodenal junction was produced by barium in the pyloric orifice. Because of the peculiar direction of the pyloroduodenal axis and moderate spasticity of the prepyloric area, the caudal end of the latter was projected over the base of the duodenal bulb and could not be separated from it. Consequently the pyloric orifice was seen end-on and presented as a constant fleck. In view of the spasticity of the prepyloric musculature, and probably also because of the adhesions between liver, stomach and duodenum in 2 of the cases, there was diminished rhythmic contraction and relaxation of the prepyloric area, and the fleck remained unchanged throughout the examination.

SUMMARY

Three cases are described in which a constant dense fleck of barium surrounded by a radiolucent zone and radiating mucosal folds, thus resembling an ulcer, was produced physiologically by the pyloric orifice. In these cases a peculiarity in the direction of the pyloroduodenal axis was present, and the prepyloric musculature was spastic. In 2 of the cases there were massive adhesions between the liver, stomach and duodenum.

2. A COMMON NORMAL PREPYLORIC MUCOSAL FURROW SIMULATING AN ULCER

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A small, ulcer-like projection on the lesser curvature of the prepyloric area of the stomach, is seen relatively often during barium-meal studies. The following case is an example:

Case 4

A man, aged 67 years, was admitted with obstructive jaundice of 1 month's duration. During the preliminary investigations the barium meal showed that the pyloric area of the stomach

was relaxed throughout the examination, showing diminished rhythmic contraction. A small niche was seen, situated on the lesser curvature in this area just orally to the pyloric orifice (Fig. 4). It was visible at screening and was more or less constant on a number of films, and compression views showed what appeared to be a small, persistent fleck in this area. Owing to the inclination of the pyloroduodenal axis the area could not be adequately visualized in the left oblique position.

At operation 3 days later a papillary adenocarcinoma was

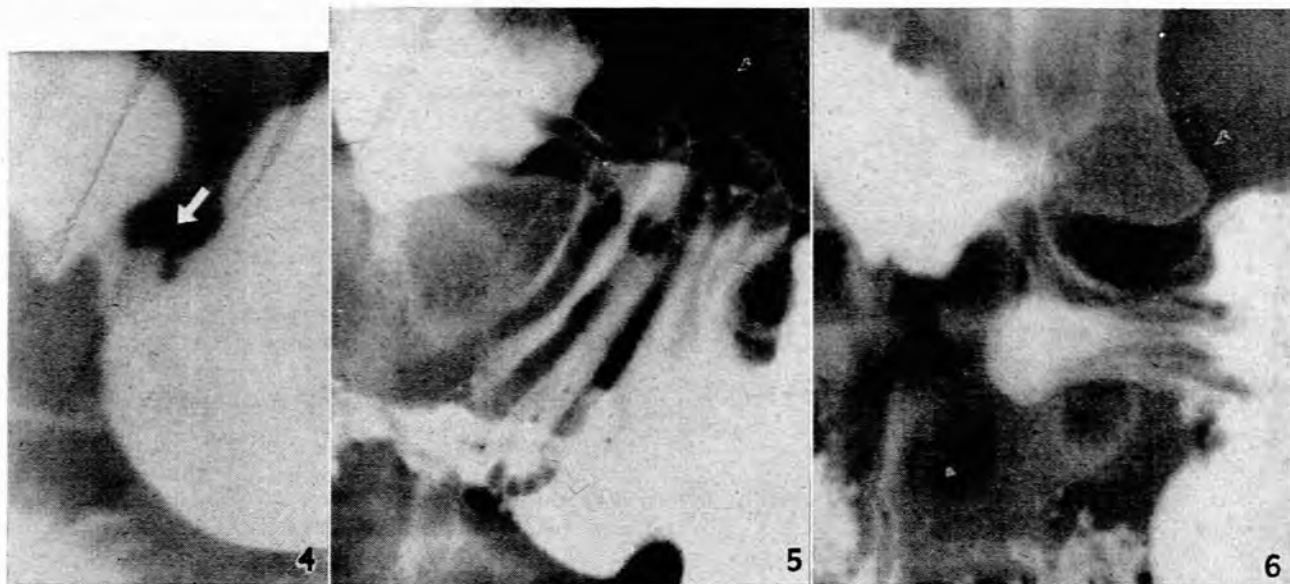


Fig. 4. Case 4. Small projecting niche on lesser curve orally to pyloric orifice.

Fig. 5. Case 5. Prepyloric area relaxed. Mucosal folds in lumen lie obliquely.

Fig. 6. Case 5. Prepyloric area contracted. Mucosal folds now lie longitudinally.

found at the ampulla of Vater, giving rise to obstruction of the common bile-duct. Although the pylorus felt slightly thickened, it was stated after careful inspection and palpation that the stomach was normal. A pancreaticoduodenectomy was performed.

In this case, then, it was shown that the ulcer-like projection was not due to an organic lesion in the stomach. In view of its relatively frequent occurrence, an attempt was made to determine the causal mechanism. Was it a fortuitous occurrence, or did it have an underlying physiological or anatomical basis? In order to find an answer to

these questions, the prepyloric area was systematically examined in a number of normal stomachs.

It was seen that, normally, when the prepyloric area (canalis egestorius of Forsell^{1,2} and Torgersen³) was relaxed or only partially contracted, the mucosal folds in the lumen run transversely or obliquely (Fig. 5, case 5). When the canalis contracts, the folds change in direction and come to lie longitudinally. With maximal contraction of the muscularis propria of the canalis, only longitudinal mucosal folds are seen in the lumen (Fig. 6, case 5).

Forsell and Torgersen showed that the movements of

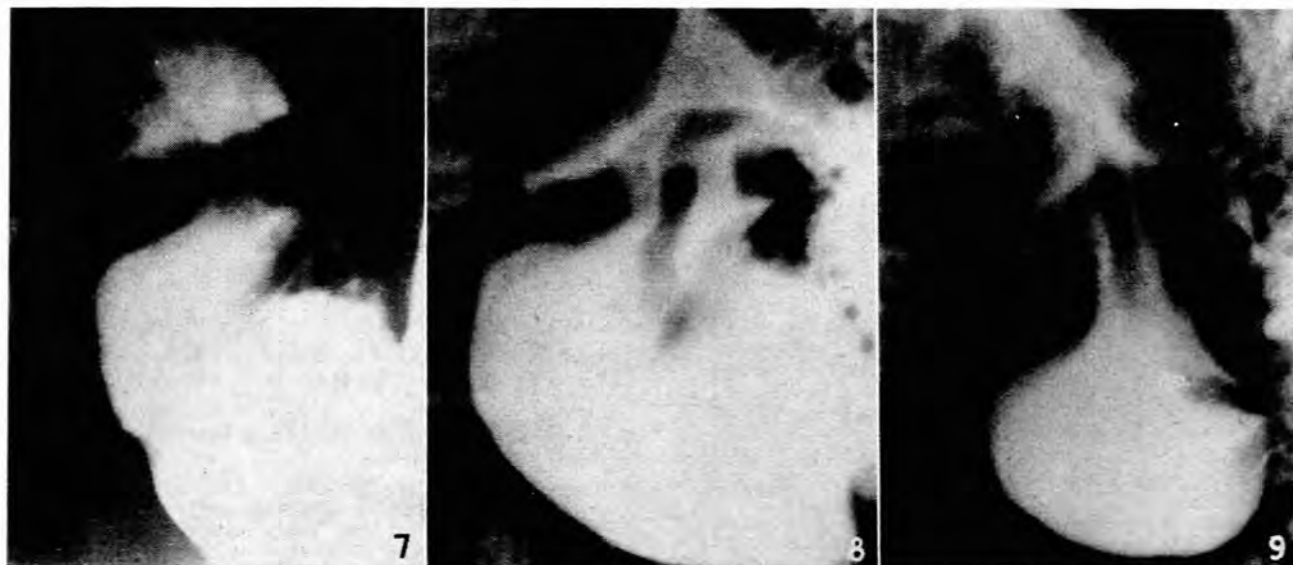


Fig. 7. Case 6. Prepyloric area relaxed. Prominent oblique fold with barium collection on its caudal side.

Fig. 8. Case 7. The barium projection resembles an ulcer niche. Prepyloric area relaxed.

Fig. 9. Case 7. Prepyloric area contracting. Folds change in direction and 'niche' disappears.



Fig. 10. Case 8. Ulcer niche projecting from lesser curve of pyloric orifice.

the intestinal muscularis propria and the mucosal membrane are independent but coordinated in the entire alimentary canal. One of the best examples of these independent but coordinated movements, then, is seen in the prepyloric area of the stomach where the folds run transversely or obliquely when this area is relaxed, and longitudinally when it is contracted.³ It is a regular feature seen in all normal stomachs.³

Between the folds are barium-containing mucosal furrows. One of the oblique mucosal folds may be relatively prominent with relaxation of the canalis, causing a slight projection consisting of a collection of barium to lie in the furrow on its caudal side, between the fold and the pyloric orifice (Fig. 7, case 6). When the collection of barium in the furrow is a little more prominent, it may resemble an ulcer niche (Fig. 8, case 7). Note in Fig. 8 that the prepyloric area is relaxed and that an oblique fold can be seen orally to the pseudo-ulcer niche. When the muscularis propria contracts, the mucosal folds

and furrows change in direction, come to lie longitudinally, and the 'niche' disappears (Fig. 9, case 7). In other words, the presence or absence of the mucosal niche is directly related to the stage of relaxation or contraction of the muscularis propria in this area.

That this 'niche' may resemble an ulcer niche in the pyloric orifice to a remarkable degree is seen in a case of pyloric ulcer (Fig. 10, case 8). In case 8 the niche was permanent, irrespective of the degree of contraction of the muscularis propria in the prepyloric area.

The films were all taken in the right oblique position. In the left oblique position the fold and furrow on the lesser curve are situated posteriorly and, generally speaking, are less prominent.

The fleeting character of the pseudo-niche, and the fact that it is present with relaxation of the canalis and disappears when the latter contracts, differentiates it from a true ulcer niche. The differentiation becomes difficult when the prepyloric area remains relaxed or in a state of partial contraction. In these cases the mucosal folds remain transversely or obliquely, and a pseudo-niche due to a mucosal furrow will tend to be permanent. This appears to be the state of affairs in case 4.

SUMMARY

An oblique prepyloric mucosal fold, with an accompanying mucosal furrow on its caudal side, is commonly seen in the normal stomach when the canalis egestorius is relaxed or partially contracted. The barium-containing mucosal furrow may present as a niche on the lesser-curve side. When the canalis contracts maximally the fold and furrow change in direction and come to lie longitudinally, and the 'niche' disappears. It has to be differentiated from pyloric ulcer.

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