

It was found that many histories indicated long periods of gastric upset and agreed with the pathological interpretation that malignancy had supervened on a benign ulcer.

The following points were made:

- (1) Ulcers may project beyond the gastric lumen, and an intra-luminal site is not essential to the diagnosis.
- (2) Mucosal folds may run up to the edge of the crater and are not necessarily interrupted at some distance from the ulcer.
- (3) Long irregular shallow ulcers are often malignant.
- (4) A wide translucent band indicating a very thick edge to the ulcer is very often found in malignant ulcers.
- (5) Angulation at the edge of the ulcer is a frequent sign in malignant ulcer.
- (6) Malignant ulcers occur as frequently above the incisura as in the antrum or pyloric area.
- (7) An ulcer which shows a fluid level within it when the patient is examined in the erect posture is almost invariably benign.

## Headache and Gastric Emptying Time

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HEADACHE, particularly of the migrainous type, is often associated with a delay in gastric evacuation. My reason for presenting the subject is that it does not appear to be well recognized in my own age group. In a search of the current radiological textbooks I could not find a specific statement. The nearest reference was in "Roentgen-Diagnostics" (Schinz *et al.*, 1954) when, after a discussion of gastric emptying, it is said "The emptying of the stomach may be influenced on a purely psychogenic basis. It has been shown that in a patient with an otherwise normal stomach, pylorospasm with retention may occur under circumstances of anxiety and fear". However, Hurst *et al.* (1929) made the following clear-cut statement: "I have saved several patients from undergoing an operation for supposed pyloric obstruction when they were really suffering from migraine. If it is remembered that attacks of vomiting without abdominal pain are rarely due to abdominal disease, and that the association of headache with nausea and vomiting is most frequently due to migraine, such mistakes would never be made. The confusion is sometimes increased by the fact that an X-ray examination has been carried out during an attack of migraine, and as this completely inhibits gastric activity, prolonged stasis may occur. I have seen several reports from experienced radiologists in which pyloric obstruction was diagnosed because of stasis of this kind, a subsequent examination in a period of freedom showing that evacuation took place without delay. There is little excuse for such mistakes, as pyloric obstruction is accompanied by peristalsis of exceptional vigour, whereas during an attack of migraine, peristalsis is more or less in abeyance." This statement was repeated by Arafa (1933) in his textbook of gastro-enterology, and in 1936 there was a report by Kaufman and Levine of a patient who had acute gastric dilatation during a prolonged attack of migraine. A subsequent examination showed a normal stomach with normal emptying.

For my own part I was told of this association by the late Dr. G. R. Mather Cordiner many years ago. At a conservative estimate I would say that 30 examples of major delay have been encountered, that is patients without discoverable pathology in the upper alimentary tract who, two hours after taking the barium, have had large gastric residues with poor transit through the small gut and who have been suffering from severe headache, often migrainous in character, but not always so, throughout. This does not include those patients whose impending faint is heralded by a sudden loss of gastric tone and peristalsis. I might also add an impression which I know is shared by others that delayed contraction of the gall-bladder after a fatty meal is sometimes accompanied by a headache.

The observation regarding this association can be divided in two parts. *First:* During the initial screening there is pyloroduodenal hypertonia, the tone of the stomach is moderately good but peristalsis is poor. Subsequently, the general tone appears to be less good and the stomach becomes relatively atonic. It is not dilated. This state of affairs can be produced by pyloric or duodenal obstruction, antral ulceration and ulceration close to the incisura angularis. The examination may reveal no lesion and, if the patient is then questioned, the fact that he has a headache may be disclosed. Further questioning may point to a relationship between his current abdominal symptoms and migraine. *Second:* All barium meal patients have a routine two-hour film which is examined by the radiologist before the patient is allowed to leave. In the case of a patient whose initial examination was normal but who has a large two-hour residue, it is always worth while asking if he has a headache. Often the fact is self-evident, the patient being thoroughly

unhappy and in obvious distress. Attempts are then made to cut short the attack as it is unjustifiable to keep the patient in this condition merely to see for how long his stomach will retain the barium. Naturally, we know of no certain method of terminating a migraine.

(Five examples of this condition were then demonstrated, together with one case as a reminder that ulceration and migraine can co-exist.)

The physiology of migraine, headache, nausea and vomiting is complex and not fully known. The mass of experimental and observational evidence relating to the control of gastric activities has been summarized by Alvarez (1948). There is a very full summary of all the clinical aspects of migraine in the monograph by Henry Riley (1932), while the physiology of headache in all its forms has been excellently surveyed by Moench (1951).

The problem of delayed gastric evacuation associated with headache has not, so far as I can find, been investigated as a single entity although many researches bear directly on one or other of its aspects. A few selected observations follow:

(a) The migraine stomach most closely resembles the stomach following vagotomy.

(b) The acts of retching and vomiting do not necessarily depend on distension of any portion of the alimentary tract, although they can be induced by such distension or the instillation of noxious substances.

(c) Nausea is a subjective sensation which can be initiated through many pathways, central and peripheral. The problem arises as to whether sensations of nausea, in the average subject, as opposed to the experimental animal, are mediated through a phase of gastric hypotonia. In migraine, nausea with or without vomiting is almost a constant feature. The initiating factor in migraine may not be discoverable and Alvarez regards the condition more as a hereditary mental disease than one produced by organic disorders of the body. Suggestions made to explain the abdominal symptoms of migraine have almost all been directed to explaining the vomiting. Very few suggestions have been made regarding the preceding gastric hypotonia since this does not appear to have been generally recognized.

(d) The work of Stewart Wolf (1943) is apposite to this problem. He carried out a series of experiments on himself and volunteers and subsequently, with H. G. Wolff (1947), on Tom, the man with a gastric fistula who formed the subject of their book "The Human Gastric Function". These experiments were repeated many times and the results were always comparable. On syringing one external auditory meatus with cold water up to the stage of nystagmus, there was an interval during which the subject either had no abnormal sensations or developed nausea. Irrespective of whether or not nausea was experienced, there was a prompt cessation of gastric motility. If nausea was experienced then, in addition, there was a reduction in gastric acidity with an increased production of mucus. If Prostigmin and atropine were given beforehand, so that gastric motility was enhanced, the procedure had no effect on gastric motility and no feeling of nausea developed. He concluded that, in his experiments, nausea could only be induced if there was a pre-existing gastric hypomotility. He was not able to define further the connexion between the stimulus and the subjective sensation.

(e) Delayed gastric evacuation with headache is not always associated with nausea and there do appear to be patients in whom the abdominal symptoms of migraine can occur without headache.

To sum up, it is important for the radiologist to know of this syndrome so that, when faced with the condition outlined earlier, he will be able to offer an explanation and will be deterred from making an error in diagnosis. It must not be forgotten that patients may suffer from both migraine and peptic ulceration.

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#### DISCUSSION

**Mr. Norman C. Tanner:** For about twenty years I have been connected with a gastroscopic clinic, where on one day a week we gastroscop patients from other hospitals most of whom are sent because the radiological evidence is either negative or inconclusive. In this part of our work I think the examination gives particular help in two classes of case: (1) the patient who has bled and has negative radiographic findings, and (2) the patient with a radiological lesion which may or may not be a cancer.

Of the latter type of case there is no doubt that with its aid one can, not infrequently, confidently exclude malignancy and the finding most commonly made is that the filling defect is in reality an encircling fibrosis or less often spasm, associated with a small posterior wall or lesser curve healed or healing ulcer. On the contrary occasionally an hour-glass stomach turns out on gastroscopy to be an infiltrative cancer.

The most anxious and difficult decisions concern doubtful radiological abnormalities of the pyloric antrum.

If an ulcer is present at the angulus a successful gastroscopy should give good views of the ulcer and this together with confirmation of mobility of the antrum might enable a diagnosis of innocence to be made.

We have confirmed the innocence of ulcers on the greater curve side of the distal antrum on occasions, but the lesser curve side of the distal antrum is a much more difficult proposition. With patience one may find the antral peristaltic waves become strong enough to view the ulcer or scar, but the view may be either transitory or tangential. In a significant proportion of ulcers of the distal lesser curve, the extra-gastric adhesions will hold this part up and no view of the lesser curve beyond the angulus may be obtained. Under such circumstances even a deep ulcer cancer may be missed.

On the other hand some helpful evidence may be obtained. In nearly all cases the mobility of the greater curve may be assessed and a smoothly undulating mucosa in this region will at least exclude an encircling carcinoma. Furthermore if there is an encircling carcinoma the appearances of the part in view are striking to the experienced gastroscopist by the local and unusual stillness, asymmetry, colour changes, superficial mucosal irregularities, erosions and so forth.

One of the most important things in gastroscopy is to know what parts of the stomach one has or has not seen. With patience and the avoidance of too much inflation the antrum and pylorus can be seen in most cases. A circular ring of spasm is not the pylorus. I have even seen an antral wave run smoothly to finish at a small final contraction and yet there was a localized carcinoma in the pyloric ring. The pylorus has only been seen when, not only does the wave contract to a small opening, but also the mucosa inside the opening evenly prolapses back into the stomach—demonstrating the laxity of the intrapyloric mucosa.

Gastroscopy is of help in differentiating simple from malignant ulcers. Many ulcers which appear innocent at radiography have obvious malignant appearances on gastroscopy. There is, of course, a small residuum of cancers which look innocent on gastroscopy or even after resection. To eliminate this group I am sure the safest course is to repeat the gastroscopy after two to three weeks' *bed rest* and regular meals. If it does not show definite signs of healing then it should be treated as malign. I have never known an ulcer to be seen to heal gastroscopically and later turn out to be malignant.

**Dr. G. Steiner:** The interesting cases referred to by Dr. Pattinson are mostly examples of a definite radiological entity, described as "ligneous gastritis", "chronic infiltrative gastritis" or "stenosing gastritis". In the majority, but not invariably, they are secondary to a peptic prepyloric ulcer and are characterized on section by infiltration with leucocytes and lymphocytes often of the whole thickness of the gastric wall, with or without hypertrophy of the muscle layer.

Dr. Pattinson's slides showed the appearances with the lumen filled to capacity. We have, for over thirty years, studied the mucosal pattern using a thin coating with barium in attempts to assess how deeply lesions have extended within the thickness of the wall and to further the differential diagnosis of early carcinoma. Study of the mucosal relief similar in manner to that classically described by Berg (1931) permitted us to define lesions confined to the mucosa, others involving at least the sub-mucosa and infiltrations into the muscular layer. Also lesions arising in the muscularis and such confined to the peritoneal coat. These relief studies depict the pathological anatomy as revealed after operation often very closely and histology has in many instances confirmed not only the differentiation from malignancy, but also the radiological assessment of the strata involved.

The following slides were demonstrated: (1) Predominantly submucosal extension with radial conversion of rugæ. (2) Widespread "ligneous" infiltration including the muscularis propria around an irregular prepyloric peptic ulcer (Fig. 1). (3) Extensive rigid infiltration with concentric stenosis which the surgeon at operation considered to be neoplastic. Histology proved radiology to



FIG. 1.—Widespread ligneous infiltration including the muscular layer, around an irregular prepyloric peptic ulcer.

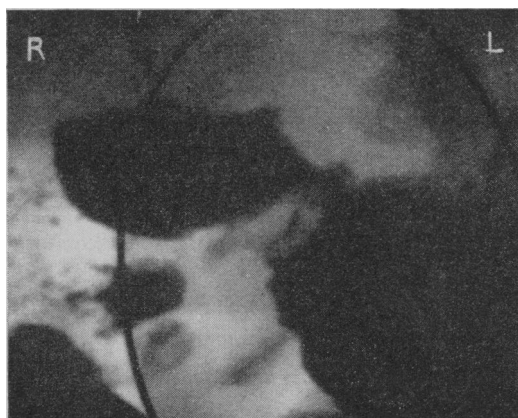


FIG. 2.—Very small circumscribed fibrosis of greater curve, secondary to healing juxtapyloric ulcer. Normal evacuation. Similar to but still smaller than case of Fig. 3 in Steiner (1949).

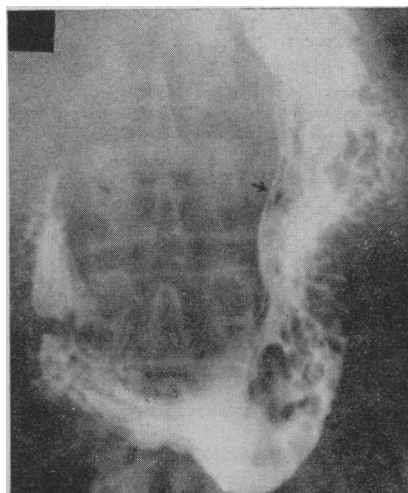


FIG. 3.—Widespread polyposis, normal calibre and sharp definition of intervening mucosal folds.

be correct. (4) A late result, consisting of a sharply outlined small area of thickening near a healing peptic ulcer. Histology: "Chronic circumscribed fibrous induration secondary to peptic ulcer" (Fig. 2). (5) The warty type of idiopathic gastritis is contrasted with multiple polyposis (Fig. 3) and a disseminated polypoid type of carcinoma. (6) One of several instances of correctly diagnosed perivisceritic stenosis without intrinsic lesion, at operation shown to be due to a band of adhesion. After this was cut the prepyloric portion unfolded completely, the pylorus was patent and no thickening of the gastric wall was felt.

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## Some Radiological Aspects of Biliary Tract Disease [Abridged]

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#### Radiological Methods

SINCE the original work on excretion cholecystography by Graham and Cole (1924), several important developments in the radiological examination of the biliary tract have taken place.

Pheniodol was introduced in 1940 as an improved oral contrast medium, largely because of its less unpleasant side-effects than those of the earlier media and because of its greater freedom from confusing shadows due to bowel residue. In 1951, iopanoic acid (or Telepaque), a medium containing much more iodine than pheniodol, began to be widely adopted for routine use. In recent years, Biligrafin, an intravenous excretion medium, first introduced by Frommhold (1953), has been employed with increasing frequency. This medium not only allows demonstration of the gall-bladder but also of the major bile ducts in most cases. Its particular advantage is that the major bile ducts can usually be outlined even in a patient whose gall-bladder has been removed.

Among easily accessible articles on the use of these media are those by Kemp (1943), Stevenson (1952), Gordon (1953), Sutton and Tillett (1954), Aldridge (1955) and Don and Campbell (1956).