was not greater than 0.006 g./hour (the excretion of 0.01 in Period V is probably due to the fact that the patient was given further methionine on this day) and during the second investigation was not less than 0.012 g./hour. Calculating from these figures, we can determine the percentage of methionine sulphur recovered as neutral sulphur after the two infusions. These figures are given in Table III.

TABLE III

	Excretion of Neutral Sulphur in g./hour			Time in Hours	Total Excess Neutral Sulphur	Methionine Sulphur recovered as Neutral Sulphur
	Basal Rate	Total Rate	Difference			
1st admission	0.006	0.0418	0.0358	39½	1.412	66% (minimum)
2nd admission	0.012	0.0277	0.0157	41½	0.620	29% (maximum)

We have no evidence as to the compound or compounds which constituted this excess neutral sulphur on the first occasion. We have given above our reasons for believing that not more than 0.322 g. was present as methionine on either occasion, and that it was probably less after the first infusion. On the second occasion we determined the urinary amino-nitrogen output using the ninhydrin method (van Slyke *et al.*, 1943). These figures, together with the total nitrogen output, are given in Table IV. It will be seen that for the pre-transfusion period and the two final 24-hour periods the

TABLE IV

Urinary Nitrogen Excretion: 2nd Admission

Period	Time in Hours	Urine Volume (ml.)	Total Nitrogen (g.)	Amino-nitrogen -Nitrogen (mg./litre)	Total Amino-nitrogen -Nitrogen (g.)
I	—	—	—	88.5	—
II	4	590	15.6	196.4	0.116
III	13½	1,440	18.4	149.8	0.216
IV	24	2,180	17.1	106.2	0.232
V	24	2,075	14.7	77.9	0.162
VI	24	1,510	—	99.1	0.150

concentration of amino-nitrogen averaged 88 mg./litre urine. If we assume that the basal excretion rate in the post-transfusion period approximated to this figure, we find an excretion of excess amino-nitrogen=0.194 g., which would be sufficient to account for 0.443 g. sulphur in the form of an amino-acid containing equivalent weights of nitrogen and sulphur. If we subtract 0.322 g. sulphur (the maximum amount attributed to the methionine present in the urine) from 0.620 (the total excess neutral sulphur) we find 0.298 g. neutral sulphur not accounted for. It is clear, therefore, that this excess sulphur could be accounted for as an amino-acid. In view of the many uncontrolled factors influencing the excretion of amino-nitrogen, these figures cannot be regarded as more than suggestive.

Summary

A case of acute carbon tetrachloride poisoning reported previously has been reinvestigated six months after the original incident.

The patient showed no signs of impaired liver or kidney function.

The excretion of neutral sulphur after an infusion of methionine was markedly different from that observed after a similar infusion given at the time of the original incident.

The possible significance of this finding has been discussed.

REFERENCES

- Beattie, J., Herbert, P. H., Wechtel, C., and Steele, C. W. (1944). *British Medical Journal*, **1**, 209.
 Folin, O. (1905). *J. biol. Chem.*, **1**, 131.
 Medes, G. (1937). *Biochem. J.*, **31**, 1330.
 Pirie, N. W. (1932). *Ibid.*, **26**, 2041.
 Stewart, A., and O'Brien, J. R. P. (1944). *British Medical Journal*, **1**, 336.
 van Slyke, D. D., MacFadyen, D. A., and Hamilton, P. B. (1943). *J. biol. Chem.*, **150**, 251.

Recently we published a note on the aims of the medical society founded by the L.C.C. medical staff. Nearly 300 of the Council's medical staff applied for foundation membership, including doctors now in the Services. Sir Allen Daley is the president and Mr. G. F. Stebbing has been nominated as chairman. Full membership is open to whole-time L.C.C. medical officers; associate membership is open to medical practitioners attached to the L.C.C. medical service; and honorary membership is open, among others, to the medical members of the Council. The inaugural meeting is to be held at the County Hall on Thursday, Jan. 11, at 4.30 p.m. The acting hon. secretary is Dr. Eli Davis, St. Andrew's Hospital, Bow, E.3.

A CRITIQUE OF GASTROSCOPY

BY

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Now, just over a decade since the introduction of the flexible gastroscope and safer gastroscopy, it is well worth while that users of the instrument should review their cases and consider how this method compares with other means of examination. Although most reports by experienced users are enthusiastic, different clinics give conflicting views as to the extent of its value; but this is to be expected when one considers how the nature of the gastric disease encountered in an urban municipal hospital varies from that encountered, for example, in a clinic catering for private well-to-do patients or the patients of a military hospital. In the clinic at St. James' Hospital the percentage of dyspeptics who eventually prove to have a chronic gastric ulcer is so high that one feels that the instrument has become indispensable.

It is easy but often unwise to develop a predilection for a particular mode of examination or therapy, and so, in order to discover if my partiality is warranted, I have recently reviewed the gastroscopic examinations carried out personally from the beginning of this war until December, 1943, at this clinic.

In the first 950 cases the Schindler instrument was used, and thereafter the Hermon Taylor model. I do not propose to discuss the relative merits of the instruments beyond confirming the advantages originally claimed by Mr. Hermon Taylor, though I would suggest it requires a little more skill in the passage and is less suitable for mild degrees of kyphosis. It has an advantage I believe not originally claimed—namely, that introduction through deformed or distorted stomachs is often possible under vision. It cannot be said to have entirely abolished the "blind" area, but it has done much to diminish it.

In the period under review the number of gastroscopic examinations was 2,200, and these were made on 1,730 patients. The 470 repeat examinations were mainly to follow the progress of the ulcers while under medical treatment, to confirm healing, to observe relapses, and, less frequently, to confirm doubtful diagnoses, particularly that of carcinoma.

Examination of the 1,730 patients showed, or subsequently showed, the following conditions:

Gastric ulcer alone	589
Gastric and duodenal ulcer	39
Gastric ulcer and diverticulum	3
Post-operative stomach	77
Gastric carcinoma	101
Gastritis	267
Mucosal tumours	7
Submucosal tumours	8
Gastric diverticulum alone	2
Extragastic tumour	3
Multiple telangiectases of stomach	1
Gastric urticaria	1
Volvulus of stomach	1
Duodenal ulcer	296
Duodenal diverticulum	4
Cirrhosis of liver	3
Functional or extragastric dyspepsia with normal stomach	262
Failed or incomplete examination	66

Gastric Ulcer

Although there has been a tendency to regard the gastroscope as an instrument chiefly for the diagnosis of gastritis and rarities, in our own clinic its main usage is in the diagnosis and observation of gastric ulcer. Of the 631 gastric ulcers no fewer than 159 were diagnosed by gastroscopy alone and had apparently normal radiographs—the latter examinations being carried out by a number of expert radiologists. There are several reasons for the difficulty in the diagnosis of many of these gastric ulcers. In the first place, acute ulcers may be too shallow to retain barium, or, particularly after a haemorrhage, the base may be filled with blood-clot, which prevents the entry of barium to the crater. Again, if one waits till the patient is in good general condition after a haemorrhage before subjecting him to investigation, the ulcer may be healed and the scar be missed radiologically. In such cases gastroscopy may show a well-marked cicatrix, rendering the cause of the bleeding evident; though it is on the whole more

satisfactory to make early examinations, as recommended by Avery Jones.

At times large ulcers, particularly in the neighbourhood of the angulus, may be missed by radiology, and this is a part usually well viewed gastroscopically. Multiple ulcers may give rise to puzzling pictures, which are often elucidated by gastroscopy. Two or more concomitant chronic gastric ulcers were seen on 36 occasions in this series.

Gastric endoscopy sheds a good deal of light on the progress of the ulcer during healing, and is undoubtedly the most reliable guide in assessing the efficiency or otherwise of healing. One's first impression is of the strong tendency of most gastric ulcers to heal when treated in hospital, whether the patients are on ulcer diet and alkalization or just taking the normal hospital dietary with no drugs. The early days of treatment usually show the greatest change—the ulcer diminishing in size by contraction of the base so that the edges are brought closer together and radiating folds appear as a result of the smaller circumference. At the same time the ulcer becomes more shallow. The ulcer area also diminishes by new epithelial ingrowth from the edges, but this does not account for so much as the base contraction. The combination of these factors will result in healing in 3 to 6 weeks in the acute and subacute and in some of the moderate-sized chronic ulcers. Many, however, become progressively slower in healing. There appears to be a limit to the contraction of the base—particularly if there is complete penetration—and the epithelial growth is inadequate and too feeble to bridge a wide or deep gap. The ulcer may remain stationary for a long time in this condition, and may be equally resistant to any of the generally accepted methods of medical treatment. Eventually some of these very chronic ulcers will heal, though a few of the patients get discouraged or are worried about finances and discharge themselves. The latter usually reappear within the year with the ulcer in its original state. The importance of this laggardly healing of the centre of the ulcer is that we may observe the unhealed condition several weeks after radiology has shown it apparently healed. On three occasions I found the ulcer reduced to under a quarter of its original size in 3 weeks and yet unhealed in 12 weeks.

There are sources of error in diagnosis of healing even by gastroscopy. A mucous bubble hiding a defect in epithelization may persist in the centre of a slightly depressed cicatrix, and it may be impossible to brush it away (though with the Taylor instrument most such impediments may be rubbed off with its tip). On one occasion I found that scar contractions so approximated the edge of a deeply penetrating ulcer that a rather oblique view gave an appearance of healing. Subsequent operation showed that this was not the case—in fact, there was still complete penetration.

Duodenal Ulceration

Where a duodenal ulcer is seen radiologically, and the diagnosis is consistent with the symptoms complained of, gastroscopy is not indicated. Where radiology is uncertain or the symptoms are suggestive of a gastric lesion, particularly in the fifth decade and upward, gastroscopy may be of help. Thirty-nine of my duodenal ulcer cases also had a gastric ulcer, and even carcinoma was seen on two occasions when duodenal ulcer was suspected radiologically.

No direct evidence of duodenal ulcer can be obtained from gastroscopy. Indirect evidence may be obtained—the typical thick folds and thick mucosa with prominent areae gastricae are almost always present; in long-standing cases a thinning of the mucosa may have taken place, and then the ulcer has usually become quiescent. With the onset of severe pylorospasm and obstruction varying degrees of gastritis—from simple oedema congestion and catarrh with great prominence of the areae gastricae to severe inflammatory changes with superficial ulceration, mucosal scarring, and retained food debris in long-standing cases—may be present. Such cases may give an appearance of polypoidal hypertrophy of the mucosa, though I believe the condition to be usually an oedema of an already thick mucosa.

Carcinoma of the Stomach

It has rightly been pointed out that even direct visualization of an excised ulcer of the stomach may not provide the truth

as to its innocence or malignancy. Nevertheless one is rarely in doubt after gastroscopic visualization, because vitality appears to accentuate the differences, and where such doubt exists a second inspection after ten days' medical treatment usually gives the clue. Certainly it is well worth while to gastroscopically examine every ulcer that is not healing rapidly under medical management. Certain superficial types of carcinoma may be missed radiologically (though tribute must be paid to the great skill with which early mucosal infiltrative carcinomas may be diagnosed by mucosal relief technique (Gutmann, Bertrand, and Péristiany)). In this series were diagnosed 13 subsequently confirmed carcinomas that had been considered innocent or were not diagnosed radiologically.

In the laudable desire of the radiologist not to miss a carcinoma he may diagnose carcinoma tentatively. In 53 cases in this series the area in doubt was clearly seen by gastroscopy, so that carcinoma could be excluded—and thus in the majority a needless laparotomy was avoided. None of these negative diagnoses were later refuted. It is true that repeat radiology might have provided the solution in a certain number of these cases (though many had had such repeats), but gastroscopy may give a clear view of an area radiologically difficult. In this connexion it is well to point out the great danger of making a negative diagnosis without the most careful and clear scrutiny of the suspected area. A carcinoma of the pyloric canal may only differ from a normal pylorus in appearance by stiffness, fixity, or deformity of the folds, or by absence of the normal intragastric prolapse of its mucosa with each contraction. I should have been deceived by two such cases but for the fact that the radiologist had particularly directed my attention to this part.

Although ulcers in the blind areas of the stomach may be missed, carcinomas are less likely to be overlooked, as they tend to project into the gastric lumen, and in the early stages have less extragastric fixation than chronic ulcers.

Post-operative Stomach

It is rather difficult to tabulate the results of examining the post-operative stomach: 77 such cases were examined in the series—some for purposes of investigation rather than for suspicion of recurring ulcer. After gastrectomy the whole gastric pouch and stoma are usually well seen. After gastro-jejunostomy a large part or all of the stoma is usually seen, and in fact may be entered with the gastroscopy, but occasionally it is obstinately invisible. In the absence of gastro-jejunal ulcer the stoma usually remains open and clear for inspection, and jejunal peristalsis may be studied. In ulcer of the gastric side of the stoma one can usually see the lesion. With ulcers on the jejunal side, oedema and spasm of the stoma may obscure the lesion or it may be beyond the range of visibility, but occasionally a jejunal ulcer is seen. As this field is notably difficult for radiology, gastroscopy is always advisable if anastomotic ulceration is suspected.

Gastritis

The diagnosis of gastritis remains difficult, and it is hard to say where the normal ends and the abnormal begins. Among the abnormalities it is usually not easy to decide whether a certain lesion is likely to be the cause of certain symptoms, because one so often sees a symptomless gastritis or a gastritis in which another adequate cause for the symptoms is found.

Broadly speaking, the gastric mucosa may be divided into three categories: thick, when the areae gastricae are clearly seen, and usually in the absence of gastritis associated with high secretion (H. Rodgers); medium; and thin, when the areae gastricae cannot be recognized or the mucosa may be so thin that the submucosal vessels may be seen through it—and this is usually associated with low acidity. On top of these types inflammatory, ulcerative, or neoplastic lesions may be set. The inflammatory lesions are most readily observed in the thick mucosa, where a vigorous reaction of oedema congestion and catarrhal exudate with excess of mucus is clearly seen, often after mild stimuli and often apparently symptomless, in association with lesions which are subsequently found to be unassociated with the stomach. To my mind minor degrees of such changes may be no more worthy to be called to account for the symptoms, and may have no more significance, than a

coated tongue. With these inflamed lesions the *areae gastricae* might become even more pronounced, and a close-up oblique view may give a distorted appearance of hypertrophy—the “hypertrophic gastritis” as commonly diagnosed, but which I prefer to call “gastritis in a thick mucosa.” Irregularity of the *areae gastricae* or of the mucosa may denote superficial scarring and suggest chronicity. True multiple inflammatory polypoidal changes in a thick mucosa I believe to be rare, and I saw only two unequivocal cases in the series. Gastritis in a thick mucosa was seen in 49 cases, 22 of them severe.

With medium thick mucosa, 155 cases showed inflammatory changes, only four of them severe enough to be a likely cause of symptoms.

In thin mucosa—particularly if associated with anaemia, as they often are—inflammatory changes are less easy to observe, though the atrophy may be patchy and the patches of incomplete atrophy show the inflammatory lesion most clearly. The atrophy seen in pernicious anaemia appears in some cases to be reversible, and with thickening of the mucosa inflammation becomes more evident. In this series there were 63 cases of gastritis on a thin or atrophic mucosa, 39 of them severe. In the neighbourhood of scars of chronic ulcers the mucosa may be stretched and thinned, and may simulate a patch of atrophy. In 27 cases of gastritis there were associated erosions, many of them being seen after gastro-duodenal haemorrhage.

Simple Tumours

Two cases with mucosal polypi were seen in association with a thick mucosa. Polypi in a thin mucosa were more common and well seen on five occasions, and appeared to be degenerative neoplastic change. In one case the lesion was associated with a carcinoma. Only one was operated on, and histology showed multiple myoadenomata. Submucosal tumours were seen on eight occasions (usually in association with a thick mucosa—six thick, two thin) and may be distinguished from mucosal tumours by the “bridging fold” sign of Schindler. Only one of these was operated on—in association with a duodenal ulcer—and it proved to be ectopic pancreatic tissue.

Extragastric swellings or tumours are occasionally seen, but require much experience of the normal to notice them, and accurate diagnosis is usually impossible.

Rarities

Gastric diverticula were observed on five occasions; sometimes the whole mucous lining of the diverticulum could be seen, and in one of them a pool of mucus was present inside. In three of these cases a chronic gastric ulcer was also present, and seemed to account for the symptoms. Multiple telangiectases were seen in a patient who suffered from repeated haematemesis and who had similar lesions in the tongue and mouth. I was impressed by the resemblance of these lesions to superficial traumatic ecchymoses, and felt that such lesions could be easily misdiagnosed. An unusual gastric appearance in a case of papular urticaria and a (?) gumma scar completed the abnormalities. No tuberculous lesion was recognized.

Value of the Gastroscope to the Surgeon

Enough has been said to indicate the aid the method gives to radiologist and physician. As a pre-operative investigation it is most useful. The combination of gastroscopic visualization with external examination of the ulcer at laparotomy usually leaves little doubt as to diagnosis, and thereby unnecessarily extensive and radical gastrectomies may be avoided in simple cases. In cases of carcinoma no evidence of extra-mucosal spread can usually be obtained, but one gets help from observation of the type and situation—particularly the nearness of the growth to the cardia.

Some lesions may be difficult to diagnose at laparotomy: in 2 cases of gastric diverticulum (one not in these series), 2 cases of mucosal polypi, and 1 case of gastric carcinoma the lesion was missed by the surgeon at laparotomy, despite the fact that in each case he had directed his attention particularly to the stomach. Gastroscopy showed each of these lesions easily.

In view of the usually direct relationship between thickness of the gastric mucosa and its acid-pepsin-secretion potentialities, some help may be gained when considering whether radical

surgery—gastrectomy or palliative gastro-jejunostomy—will be more advisable. Patients with a thick mucosa are usually more prone to recurrent ulceration.

Gastroscopic Fallacies

The pressure of the hot lamp on the mucosa for a few moments causes a patch of blotchy congestion and outpouring of mucus over a small area. Rubbing the mucosa with the instrument produces a superficial ecchymosis and may cause bleeding. The gastric suction employed to empty the stomach before the examination may cause a superficial erosion or a superficial bruise coloured with altered blood: the so-called pigment spot may result from the suction employed in fractional test-meal examination some days beforehand.

One does not know to what extent certain changes such as congestion, increased motility, spasm, or increased secretion may result from the presence of the foreign body—the gastro-scope—in the stomach.

I have shown already, in connexion with the different lesions, how gastroscopy is subject to all the diagnostic difficulties encountered in trying to diagnose a lesion by surface visualization (which oftentimes is oblique or incomplete), and how these may be partly overcome by repeat examination to observe progress or retrogression.

Failed Examination

In 66 instances the examination was unsuccessful by reason of failure to enter the stomach, or was incomplete in so far as it failed to show the area which it was desired to examine. In 13 of these, carcinoma of the oesophagus or fundus of the stomach was subsequently found to be present. An enlarged malignant or cirrhotic liver may impede entry to the stomach. An apparent lengthening of the oesophagus in the kyphotic may result in kinking of its lower end and prevent entry. The gastroscope has no prograde vision, and any impediment to its smooth progress must be treated gently; one should have no hesitation in abandoning the examination pending oesophagography or radiological examination of the oesophagus or cardiac end of the stomach.

Conclusion

These observations are not intended to make comparisons between gastroscopy and radiology: the methods are, of course, complementary. They are intended more to show the place that gastroscopy is making for itself in medicine. As a single means of examination radiology is undoubtedly superior, and it preceded gastroscopy in nearly every case in this series.

My own conviction that gastroscopy is soundly established as a routine investigation is based on the following facts:

1. It increases the percentage of correct diagnosis of gastric lesions.
2. It ensures that the results of medical treatment of gastric ulceration are accurately gauged.
3. It is increasing our knowledge of the physiological variations of the stomach, though there is still much observation required to demarcate the boundaries between physiological change and disease.
4. It aids the surgeon not only by increasing the accuracy of pre-operative diagnosis but by giving some indication whether radical or conservative surgery is more advisable.
5. It reduces the number of exploratory or unnecessary laparotomies.
6. It has shed light on general diseases in which the gastric mucosa is involved, particularly certain of the anaemias, and may eventually shed light on their aetiology.

PHARMACISTS AND PATENT MEDICINES

The Pharmaceutical Society of Great Britain has decided to ask the Minister of Health to supervise the advertising of certain proprietary medicines and medical and surgical appliances “so that the public can be protected against this type of misrepresentation.” The fears of the public are exploited, the Society states, and its credulity traded upon to the extent of £20,000,000 a year. Supervision is already exercised in New Zealand and the United States, where the American Medical Association registers approved products after examining them chemically, pharmacologically, and, if necessary, clinically, at a cost of £10,000 a year. A department of the Ministry of Health, the Society urges, is necessary so that no advertising shall be put before the public inconsistent with the spirit of the White Paper under which it is proposed to spend millions of pounds a year with the idea of keeping the people fit.