The other story is that the tumour may be a teratoma and arise from germinomatous cells which tend to occur in the midline—mediastinum, ovaries, testis, and so on. Many of these tumours have teratomatous elements such as cartilage, muscle, or thyroid—but this one did not. Table II shows a histochemical comparison between cells from a pinealoma, seminoma of the testis, and normal pineal gland. Both tumours contained alkaline phosphatase in the large cells. None was present in cells of the normal pineal gland. This is not a common enzyme and is usually associated with specific cell function. It is probably not a chance finding. So the argument remains unresolved.

DR. DALY: It simply remains for me to thank Dr. Nabarro for his masterly analysis and correct conclusion, and the other participants.

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This conference was recorded and edited by Dr. W. F. Whimster.

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Occasional Survey

Fibreoptic Endoscopy and the Barium Meal—Results and Implications

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Introduction

Although gastroscopy has been practised in a few centres for many years, the recent introduction of fibreoptic instruments has greatly enhanced the range and ease of examinations, and is transforming the clinical practice of gastroenterology. With the correct instruments and training, it is not difficult to examine and take specimens for biopsy from the entire oesophagus, stomach, duodenum (and colon) of conscious relaxed patients, on an outpatient basis. While only three to four years ago these new instruments could be regarded as expensive tools of mainly research interest, their diagnostic yield has led to rapidly increasing application throughout the country. In St. Thomas's Hospital the demand in the past two years for routine examination has increased from five to 25 a week. Our early experience of fibreoptic endoscopy[1] was obtained using instruments which have rapidly been superseded. The instrument field is now more stable.[2] Routine upper gastrointestinal endoscopy must involve examination of the oesophagus, stomach, and duodenum, at least as far as the duodenal bulb. To ensure an adequate survey in all patients, it is necessary to have available both a forward viewing fully flexible panendoscope (ACMI Model 7089P or Olympus Model GIFD) and a lateral viewing duodenoscope (Olympus Model JFB). Although Salmon *et al.*[3] have compared the use of forward and lateral viewing optical systems in the duodenal bulb, no clinical series is available concerning the overall results of properly equipped routine oesophagogastroduodenoscopy.

This paper reviews our recent experience of upper gastrointestinal fibreoptic endoscopy in relation to radiology to try to identify the cases in which endoscopy is of particular diagnostic value. It also discusses the practical problems of providing widespread endoscopy services.

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Patients and Methods

During the year October 1971 to September 1972, 956 patients underwent upper gastrointestinal fibreoptic endoscopy in our unit on a total of 1,020 occasions. Those endoscoped for cannulation of the papilla of Vater are excluded from this total. Patients' ages ranged from 3 months to 86 years. The only contraindication to examination was the possibility of transmitting infection (Australia antigenaemia or active tuberculosis), since endoscopes cannot be sterilized.

With modern forward-viewing instruments endoscopy need not be preceded by a standard barium-meal examination. Nevertheless, this is still the most usual routine sequence, and radiological reports provide the main indications for endoscopy (Table I). Since part of the purpose of the study was to compare radiology with endoscopy only patients who had had a barium-meal examination within one month of endoscopy were included. Results of endoscopy in patients with acute bleeding and in

TABLE I—*Indications for Upper Gastrointestinal Endoscopy (October 1971 to September 1972)*

	No. of Examinations
Barium-negative dyspepsia	200
Abnormal or equivocal radiology	363
Oesophageal stricture	14
Hiatus hernia	39
Gastric ulcer	105
Distorted gastric body	29
Distorted antrum	62
Deformed duodenal bulb	83
Other	31
No recent radiology	127
Operated stomach	122
Acute bleeding	144
Repeat examinations	64
Total	1,020

those with symptoms following ulcer surgery are given elsewhere.[4 5]

Three patients required general anaesthesia for endoscopy. Several others were examined under anaesthesia immediately before an operation or dilatation of an oesophageal stricture. Outpatients (78% of the total) were given atropine (0·6 mg) and diazepam (5-30 mg) intravenously immediately before examination, which was performed on a tipping trolley in the endoscopy room. Inpatients were given atropine and diazepam (5-15 mg) intramuscularly in the ward and examined in their beds in the endoscopy room. More diazepam was given intravenously before examination. Topical pharyngeal anaesthesia induced with a lignocaine spray was practised at first but was later found to be unnecessary.

Forward-viewing panendoscopes were used for 91% of the examinations, but in 15% of these a lateral-viewing duodenoscope was also used when a complete survey was impracticable or tissue for biopsy was difficult to obtain with the forward-viewing instrument. These difficulties sometimes presented in the upper lesser curvature of the stomach and in the proximal duodenal bulb, and also as a result of surgical or pathological distortion. In the remaining 9% of cases only the lateral-viewing duodenoscope was used to survey the stomach, duodenum, and distal oesophagus. This was sometimes because of temporary technical problems with other instruments, but the thinner duodenoscope was chosen in children down to the age of 2 years and in some frail adults. A fibrebronchoscope was used to examine the stomach and duodenum of two babies.

Examinations lasted from 5 to 30 minutes; bookings were made at 30-minute intervals. Outpatients were subsequently observed for up to an hour before leaving, preferably with a friend or relative.

Failures and Complications

Eighteen patients (2%) could not tolerate intubation, and three pulled out the endoscope before the examination was completed. Most were young, nervous people and some were heavy drinkers, in whom diazepam seemed ineffectual. Eight other patients who were unable to swallow a forward-viewing panendoscope tolerated a duodenoscope, which is narrower and has a rounded tip.

The oesophagus, stomach, and duodenum (at least as far as the apex of the duodenal bulb) were examined at the initial examination in every patient, whatever the clinical or radiological indication or the endoscopic findings en route. Organic stenosis of the oesophagus or pylorus (with or without retention of food) prevented a complete oesophagogastrobulboscopy in some cases. Otherwise it was always possible to pass through the cardia into the stomach, and entry to the duodenal bulb failed in only six out of 864 attempts (0·7%).

Most patients tolerated the procedure well. The amnesic effect of diazepam largely explains why no patient refused re-examination, and many preferred endoscopy to a barium-meal examination. One elderly patient developed an aspiration pneumonia and another had upper oesophageal perforation; both recovered after conservative treatment.

Endoscopic Findings

NEGATIVE RADIOLOGY

Lesions of obvious clinical importance were found in 64 (32%) out of 200 patients in whom a barium-meal examination within the past month had been reported on as normal (Table II). The mucosa of the duodenal bulb was abnormal in a further 23 (11·5%) but there was no ulcer or scar. Unequivocal biopsy evidence of active duodenitis, the significance of which is controversial, was found in some.[6] In the remaining 113 patients (56·5%) no abnormality was seen. One duodenal ulcer was known to have been missed by both endoscopy and radiology. Follow-up of the patients has necessarily been brief, and possibly other lesions were missed. Many of the patients with dyspepsia and negative radiological findings had biopsy evidence of gastritis. This has been excluded from the diagnoses since its relevance to symptoms is highly doubtful.

TABLE II—*Endoscopic Findings in 64 out of 200 Patients with Barium-meal Examination within past Month reported on as Normal*

Site	Findings	No. of Patients
Oesophagus	Oesophagitis	6
	Cancer	4
Stomach	Benign ulcer:	
	Body	7
	Antrum	11
	Ulcer scar	5
	Polyp	4
Duodenal bulb	Ulcer	22
	Ulcer scar	5
Total		64 (32%)

POSITIVE OR EQUIVOCAL RADIOLOGY

Oesophagus

Hiatus hernia is a common radiological finding but may not be the cause of the patient's symptoms. Oesophagitis was seen on endoscopy in only 18 (46%) of 39 such patients, and 11 (28%) had an additional lesion of clinical importance (Table III). One other patient was later found to have a colonic cancer and another a pancreatic cancer. In a further 14 patients with dysphagia the endoscopic findings of benign and malignant strictures agreed with the radiological diagnosis in each case.

TABLE III—*Endoscopic Findings in 39 Cases of Hiatus Hernia diagnosed radiologically**

		No. of Cases
Oesophagitis		18 (46%)
Additional lesions		11 (28%)
Oesophageal polyp	1	
Gastric ulcer	3	
Cancer	1	
Haemangioma	1	
Duodenal ulcer	4	
Adenoma	1	
No lesions (other than hernia)		8 (21%)

*Two of the additional lesions were present in patients with oesophagitis.

Stomach

The endoscopic findings in 196 patients with a radiological abnormality of the stomach are shown in Table IV. One lesion confidently diagnosed radiologically as cancer was found to be due to gastric varices. In 19 cases in which the radiologist had detected distortion in the gastric body but considered cancer unlikely endoscopy most often showed benign gastric ulceration (previously undiagnosed) or scarring therefrom. One case of gastric cancer and one of benign polyp were found in this group.

None of the 73 cases diagnosed radiologically as benign ulcer of the gastric body were found to be malignant. Nevertheless, in one of these cases there was a malignant antral polyp, which

TABLE IV—*Endoscopic Findings in 196 Patients with radiological Abnormality of Stomach*

Radiological Report	No. of Patients	Endoscopic Findings					
		Cancer	Benign Ulcer	Scar	Extrinsic	Other	Normal
Distortion of gastric body:							
Malignant ..	10	9				1*	
Probably benign	19	1	11	2	1	1†	3
Gastric ulcer:							
Probably malignant ..	32	19‡	5	4	2	1§	1
Benign.. ..	73	1‖	68		1		4¶
Distortion of antrum:							
Probably malignant ..	10	5	1	3	1		
Probably benign	52	5	14	24			9

*Gastric varices. †Benign polyp.
‡Includes one benign ulcer interpreted as malignant.
§Duodenal ulcer.
‖Malignant antral polyp in addition to radiologically detected benign gastric ulcer.
¶Includes one ulcer missed at endoscopy.

had been missed radiologically, and in another a duodenal ulcer. In four cases no ulcer was seen at endoscopy. One of these cases was an endoscopic failure, since an ulcer high on the lesser curvature was found later.

In 32 cases in which the radiological evidence suggested malignancy 13 were benign, as judged by endoscopy, biopsy, and follow-up. In two cases of large ulcers the uneven bases seen on radiology were found on endoscopy to be due to food in the ulcer crater. In one patient an ulcer thought to be malignant on *x*-ray film and on endoscopic examination was found to be benign on endoscopic biopsy and at operation.

Radiological deformity of the antrum may be difficult to interpret. Five out of 10 cases diagnosed as probably malignant were found to be benign at endoscopy (Table IV). In 52 cases thought probably to be benign five were found at endoscopy to be malignant. In nine others there was no lesion, and in the remaining 38 there was either benign ulceration (antral or duodenal) or scarring. But for endoscopy many of these patients would have been subjected to exploratory laparotomy.

Duodenum

We thought it unnecessary to endoscope patients with radiologically unequivocal duodenal ulceration unless there was acute bleeding. But radiologists often report an abnormality of the duodenal bulb (distortion, abnormal folds, or irritability) but no ulcer niche, and 83 such patients were examined. As expected, most (50) had ulcers and nine had ulcer scars. The duodenal bulb mucosa was abnormal, with or without histological evidence of "duodenitis," in nine others. In 13 patients, however, the bulb appeared normal, and four of these had lesions elsewhere (oesophagitis two, gastric ulcer two) which had not been detected by barium-meal examination.

Discussion

Fibreoptic oesophagogastroduodenoscopy is now technically possible, well tolerated, and reasonably safe.[3 7-9] Complications are rare. Oesophageal and gastric perforation and cardiovascular collapse are the most feared, but aspiration pneumonia is probably under-reported.[10 11] Bearing in mind the frailty of many of the patients and the relative inexperience of many endoscopists, 77 complications from 23,568 endoscopies performed in 62 British centres,[12] an overall incidence of 1 : 300 with six deaths (1 : 4,000), is remarkably few—no greater than in commonly used diagnostic techniques such as intravenous cholangiography[13] and much less than that for percutaneous liver biopsy.[14]

DIAGNOSTIC ACCURACY

Is oesophagogastroduodenoscopy to be an occasional specialist procedure of some research interest or to become routine in all general hospitals, perhaps even superseding the barium-meal? The answer depends largely on the diagnostic accuracy of fibreoptic endoscopy compared with current routine techniques. This is difficult to determine, since in most cases definite immediate proof of the diagnostic accuracy of endoscopy is lacking—as it is also of the diagnostic accuracy of the barium meal, despite millions of examinations.[15]

Modern fibrescopes give views of astonishing clarity, but clinicians may wonder what reliance to place on a negative endoscopy report, especially when radiography suggests a local lesion. Though modern instruments potentially have no blind areas (unless there is gross operative or pathological distortion) places such as the high lesser curvature of the stomach, the lesser curvature of the antrum, and the area immediately beyond the pylorus may be more difficult to view. Experience in endoscopy is not so much in recognizing lesions as in knowing whether the whole mucosal surface has been viewed and when, for example, it is necessary to pass a second instrument to ensure a complete survey.

We are aware of missing only two lesions (one high gastric ulcer and one duodenal ulcer) in the series reported here. But this must be an underestimate since the period of follow-up was less than a year and some patients still had undiagnosed symptoms. Nevertheless, the data provide some indication of what can be achieved by endoscopy. A 32% yield of clinically significant lesions, mainly duodenal and antral ulcers, in cases of dyspepsia with negative radiological findings is impressive. In a previous study of similar patients[1] the endoscopic yield of significant lesions was 18%. The duodenum was not examined in many of these patients, however, and some were shown later to have duodenal ulcers. Known radiologically negative lesions in that series totalled 28%. The Erlangen group[16] has found lesions at endoscopy in 23% of patients with dyspepsia and negative *x*-ray findings.

Various follow-up studies of patients with dyspepsia and negative *x*-ray findings have found peptic ulceration in 12% after 6 years,[17] 30% after 10 years,[18] and 40% after 27 years.[19] Gregory *et al.*[20] found that 24% of patients in general practice continued to have dyspepsia six years after a negative barium-meal. In 11-14% of patients with proved benign gastric ulcer and in 4-12% of patients with gastric cancer *x*-ray findings have been found to be negative.[21-23] In an extensive review of published work, Cooley[15] stated that a duodenal ulcer niche was detected radiologically in only 13-75% of patients with duodenal ulceration but that some abnormality (deformity, with or without a niche) was found in 83-94%. These figures refer mainly to repeated studies in patients with symptoms severe enough to warrant operation. Endoscopic series suggest that 20-55% of duodenal ulcers escape radiological detection.[3 24-27]

INDICATIONS FOR ENDOSCOPY

Should, therefore, all patients with a negative barium meal be endoscoped? The numbers would be enormous. Barium-meal examinations are performed on about one person in every 100 in Britain yearly and about half show no lesion. In St. Thomas's Hospital about 2,000 patients have negative barium meals each year and we have endoscoped only 200 (table I). Since this is a selected group, our results cannot be extrapolated to all patients with negative *x*-rays. Probably endoscopy would show small ulcers in many other patients, mainly antral and duodenal, but who would benefit? Paradoxically such findings might alarm some patients (and doctors), to whom an ulcer is a serious matter and for whom a negative barium meal may have therapeutic value.[28] Endoscopy is likely gradually to alter some concepts of the prognosis of benign ulcer disease as well as clarify the significance of related conditions such as gastritis and duodenitis.[6] So long as only a small proportion of patients with

negative x-ray findings can be offered endoscopy those most likely to have lesions must be selected—for example, those with persistent symptoms or iron deficiency. However this policy will not lead to the detection of gastric cancer at an early, curable stage when symptoms are minor or non-existent.[29]

The present study supports the orthodox belief that most patients with x-ray findings of a distorted or irritable duodenal bulb but no ulcer crater have a duodenal ulcer and can be treated as such. Nevertheless, the presence of ulceration should be confirmed or denied (as in 16% of this series) by endoscopy before surgery. Otherwise apart from important research into ulcer healing[30] there seems to be little value in endoscoping patients with radiologically unequivocal duodenal ulcers.

The situation with gastric ulcers is different, because of the fear of malignancy.[18-20] In various series, gastric ulcers diagnosed as benign on radiology have subsequently been found to be malignant in 3-14% of cases. Gear *et al.*[31] detected three cancers on endoscopy in 70 patients diagnosed radiologically to have benign ulcers, and missed three other cancers. In our previous series[1] two out of 99 radiologically benign gastric ulcers were found to be malignant at endoscopy and one other was missed. In the present series none of 73 such ulcers were found to be malignant on endoscopy and biopsy (table IV) but an additional, unsuspected antral cancer was found in one patient.

These figures, if confirmed by longer follow-up are a tribute to the radiologists and question the need for endoscopy in such circumstances. Malignant ulcers, however, can heal,[32] and the prognosis in gastric cancer is much better when it is diagnosed "unexpectedly."[33] Radiologists questioned malignancy in 32 other cases of gastric ulcer in the present series and this was disproved at endoscopy in 40%, thus saving an unnecessary operation.

Endoscopy is invaluable in distinguishing benign from malignant causes of distortion of the antrum, where so often the radiological report is equivocal (Table IV). Small and multiple benign antral ulcers often produce confusing radiological changes (phantom antrum syndrome), and seem to be particularly common in West Indian patients.

The present series and a previous one[1] show that radiologists are rarely mistaken when confidently diagnosing gastric cancer, but ideally cancer should be confirmed by endoscopy and biopsy before surgery, particularly in elderly or frail patients. Biopsy was negative in 5% of cases of gastric cancer in the present series, but in none of these was the diagnosis in doubt on endoscopic view.

The results in the present series of diagnostic radiology of the oesophagus in patients with dysphagia emphasize its accuracy in these cases and also how often a hiatus hernia is irrelevant. It follows that oesophagogastroduodenoscopy should be performed before symptoms (particularly anaemia) are attributed to hiatus hernia, and certainly before a hernial repair is undertaken through the chest. Patients with symptoms after surgery for peptic ulcer often pose diagnostic problems, and surgical distortion may produce confusing folds and niches on barium radiographs. As a result up to 50% of anastomotic ulcers escape detection and there are many false positive reports.[6 34 35] Endoscopy is now mandatory in such patients.

Diagnosis of the cause of acute gastrointestinal bleeding is notoriously difficult,[36] and clinical pointers are often misleading.[37] Radiology cannot detect acute ulcers or erosions, and a lesion, when shown, may not be the bleeding source. More than one potential source may be present in as many as 33% of patients.[38] There can be no substitute for viewing the bleeding point. In our study of early oesophagogastroduodenoscopy in 208 bleeding patients[4] endoscopy provided an unequivocal diagnosis in over 80%, and 15% had more than one lesion. Excess blood prevented adequate examinations in only 4% of patients. Endoscopy found a bleeding point in 26 out of 34 patients with negative x-ray findings. In 47 patients with positive x-ray findings endoscopy showed a different source of bleeding in 15. Radiology is indicated, it seems, only if endoscopy is unavailable or fails to provide a diagnosis.

Conclusion

The present study shows that oesophagogastrobulboscopy is often indicated whether the barium-meal findings are positive, negative, or equivocal. But this does not make the barium meal obsolete. It is a safe, relatively quick procedure which may detect about 80% of all lesions with few false positives.[15] But from sheer volume of work radiologists have had little time to evaluate their results or experiment with new techniques. Hopefully, as in Japan, endoscopy will be a stimulus to improve the accuracy of barium-meal radiology and the evaluation of new double-contrast techniques. [39 40] If, however, as seems likely, direct endoscopic viewing and biopsy remains diagnostically superior to even the most sophisticated indirect radiological technique the future relationship between endoscopy and radiology will be determined by practising clinicians, who ask for what is useful.

The problems of providing endoscopic services in a hospital are considerable, and the sequence of events is predictable. A physician or surgeon obtains an endoscope, often with non-exchequer funds, and begins by examining a few of his own patients. With increasing confidence and experience he accepts requests from colleagues and becomes embarrassed by the demand. He needs more instruments, space, and assistants and is forced to compete with colleagues for slices of a financial cake which he could swallow whole without difficulty. To adapt and equip a suitable room costs at least £15,000, and an endoscopy service for a typical district hospital requires a yearly budget of at least £8,000.[2] This pales into insignificance beside the cost of x-ray equipment and services. An accurate and prompt diagnosis made by outpatient endoscopy may save weeks of unnecessary occupation of an expensive hospital bed. Endoscopy services are cost-effective, and money must be allocated for them at district level.

The main remaining question is: Who is to do endoscopies? Most doctors in the field think endoscopy should be practised by clinicians and not by full-time endoscopists. The demand at district level, however, would probably be greater than a local physician or surgeon with an interest in gastroenterology could meet, and an endoscopic service could not be maintained by a series of registrars theoretically in training. Indeed, teaching endoscopy is a heavy additional burden on the relatively few who are currently trained. While some radiologists or clinical assistants may wish to take part in an endoscopy service, clearly most of the work and organization must fall on clinical consultant staff. The logical development is to appoint more district hospital consultants with special expertise in gastroenterology and a commitment to endoscopy sessions—somewhat analogous to urologists and cystoscopy sessions. Facilities for developing, teaching, and practising more specialized endoscopic techniques such as colonoscopy[41] and retrograde cholangiopancreatography[42] will also be needed.

The British Society for Digestive Endoscopy reached a medical membership of over 250 within a year of its foundation, and is trying to co-ordinate ideas for organization and training, during this current period of rapid expansion. There is as yet no settled nomenclature. Gastrointestinal and digestive (fibre) endoscopy are acceptable generic terms. Fibresigmoidoscopy, colonoscopy (or coloscopy), and enteroscopy are self-explanatory, and E.R.C.P. (endoscopic retrograde cholangiopancreatography) is becoming an accepted abbreviation. There is, however, no snappy word for routine upper gastrointestinal fibre endoscopy. Gastroscopy is incorrect and oesophagogastroduodenoscopy too cumbersome. It may be necessary to use the terms O.G.D. (or O.G.B.).

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Hospital Topics

Outbreak in Bristol of Conjunctivitis Caused by Adenovirus Type 8, and its Epidemiology and Control

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Summary

In an investigation of an outbreak of adenovirus type 8 infection involving over 40 people it was found that the infection spread initially within the eye hospital, but subsequently involved several family contacts and two local hospitals for mentally subnormal patients. Presumptive diagnosis should be possible before subepithelial opacities have developed provided an adequate history is taken, and had that been done in this outbreak it is reasonable to suppose that many cases could have been prevented.

Introduction

In Western countries epidemic keratoconjunctivitis caused by adenovirus type 8 is usually spread by medical personnel. Such outbreaks are preventable but continue to occur.[1-5] In 1971 three outbreaks occurred in the United Kingdom, the first starting in the Clyde valley in May and involving over 100 people, the second in the Bristol area starting in July and involving over 40 people, and the third in London involving fewer people.[6]

Adenovirus type 8 infection often causes a painful and distressing keratitis with severe photophobia, and corneal opacities may impair vision for over two years. Patients will often be unable to work during the early stages of the infection. Unfortunately, the effects of an outbreak are not limited to infected patients but also have direct and serious consequences on other patients because tonometry is usually drastically curtailed (since tonometers, which are known to spread the infection, are notoriously difficult to disinfect adequately) and because elective surgery is often stopped during outbreaks.

In this report the virology and epidemiology of the Bristol outbreak is presented, and methods of prevention and control are discussed.

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Patients and Methods

From August, when the outbreak was recognized, until September, when the hospital epidemic stopped, all patients seen in the hospital with a recent onset of follicular conjunctivitis were referred to a special clinic to isolate them from other patients and to follow them clinically, epidemiologically, and