PAPERS

Combined barium meal and cholecystogram—an analysis of 1,444 patients

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Summary

Since many dyspeptic patients are still investigated initially by radiology, a policy was initiated whereby all such patients were directly referred for combined simultaneous double-contrast barium meal and cholecystogram. This policy was aimed at reducing patient visits to hospital and increasing diagnostic yield.

The results of 1,444 combined procedures are presented. Of these, 310 (25.5%) had a positive finding on barium meal only; 275 (19%) were positive for cholecystogram only; 117 (8.1%) were positive for both examinations; 742 (51.4%) were negative for both examinations. Of all the patients (427) who had a positive finding on barium meal, 27.4% (117) also had a positive finding on cholecystogram. Of all the patients (392) with a positive cholecystogram, 29.8% (117) also had a positive barium meal. Diagnostic yield rose considerably with patient age. It was found that simultaneous barium meal and cholecystogram presented no serious technical difficulties.

It was concluded that in patients over 40 years old, this policy improved diagnostic yield as many patients had both gall bladder and upper gastrointestinal pathology. In all other patients this policy markedly reduced the number of hospital visits. Combined simultaneous double-contrast barium meal and cholecystogram is therefore recommended for hospitals which used radiology for the first line investigation of dyspepsia. Also, the general principle of examination of both gall bladder and upper gastrointestinal tract is pertinent where other first line investigations are used.

KEY WORDS: hiatus hernia, peptic ulcer, gall stones.

Introduction

Dyspeptic patients are among the commonest out-patient diagnostic problems. Frequently these patients undergo multiple hospital visits for consultation and investigation with subsequent delay in diagnosis and treatment. It is also appreciated that a proportion of these patients have both upper gastrointestinal and gall bladder disease (Block and Allen, 1971). In fact it has been suggested that all patients undergoing cholecystectomy should also undergo thorough upper gastrointestinal radiology before surgery (Zollinger and Williams, 1964). In an attempt to reduce the incidence of missed double pathology, a policy was introduced by one of us (DGCW) in 1972 whereby all dyspeptic patients underwent both double-contrast barium meal and cholecystogram.

To minimize hospital attendance patients were referred directly by general practitioners to the Radiology Department where both examinations were carried out over a 2-day period.

Although this policy has been discussed in foreign publications (Hippeli and Eibach, 1979; Redlich, 1970; Jeliaskov, 1968; Rifes and Mezentsev, 1966) we have been unable to find a report of a recent major study on this subject in the English text.

Patients and methods

The study group consisted of 1,444 patients of whom over 90% were referred directly by local general practitioners. Each referring doctor was required to fill in a comprehensive X-ray referral

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form with clinical details and likely diagnosis. Patients were then sent an appointment to attend the Radiology Department, usually within a week of referral. The examination was carried out over 2 days. On the first day a plain X-ray of the abdomen was taken. Patients were then given six biloptin capsules (3 g) being instructed to take these that evening; nothing further by mouth except water was permitted until the following morning. On the second day a double-air-contrast barium meal was performed. Effervescent tablets were given followed by finely divided barium. An examination of the oesophagus, stomach (including careful positioning to examine the cardia), duodenum and first part of jejunum was carried out. The barium meal was followed immediately by a cholecystogram. An initial radiograph was taken and then several further radiographs (including one erect) after a fatty meal. Acceptable visualisation of the gall bladder was nearly always possible despite the presence of alimentary gas. Where visualisation was poor a further examination could be carried out at a later date. If the gall bladder did not show evidence of concentration a further oral cholecystogram was carried out the following day using Telepaque (3 g) as the contrast medium.

For the purposes of analysis, patients were divided into diagnostic categories depending on the most likely diagnosis suggested by the referring doctor. Where symptoms were vague or not typical of any one condition, patients were placed in the non-specific dyspepsia group. When two or more disease processes were thought to be present, the patient was placed in the combination of symptoms category. A barium meal was termed positive if any disease process was found. A cholecystogram was termed positive if gall stones were found or if it failed to demonstrate function on two examinations. Tests of significance were carried out using the Chi-squared test.

Results

Of the 1,444 patients, 498 were male (mean age 45.6 years, s.d. 15.4) and 946 were female (mean age

46.6 years, s.d. 15.8). Overall 702 (48.6%) patients had at least one positive finding. Of these 310 (21.5% of total) were positive for barium meal only, 275 (19%) of total were positive for cholecystogram only and 117 (8.1% of total) were positive for both examinations. Both examinations were negative in 742 (51.4%) of patients. Forty-five percent of the male patients had a positive finding compared with 51% of the female group (not significant (NS)). A positive barium meal only was more common in male patients (29%) compared with female patients (17.5%), ($P < 0.001$), whereas a positive cholecystogram only was more common in females (24%) than males (9.2%), ($P < 0.001$). A positive result in both examinations occurred in 6.6% of males and 8.9% of females (NS). Table 1 gives the diagnoses found in each sex. As anticipated, the proportion of patients with duodenal ulcer was greater in males than in females whereas the reverse was true of gall bladder disease.

Analysis of patients by diagnostic category

The number of patients within each diagnostic category is broken down according to which examinations were positive (Table 2). Patients in whom both examinations were negative are also included in this table.

Patients presenting with peptic ulcer symptoms

Fifty-five percent of these patients had a positive finding on one or both examinations. The clinical diagnosis of peptic ulcer was correct in 38.7%. A positive cholecystogram was found, either alone or in combination with a positive barium meal, in 13.4%.

Patients presenting with symptoms suggestive of gall bladder disease

61.2% of these patients had a positive finding. Gall bladder disease was found in 50.9%. A positive barium meal was found in 21.2%, either alone or in combination with a positive cholecystogram.

TABLE 1. Radiological findings in male and female patients

	Male (% of males)	Female (% of females)	Total (% of total)
Hiatus hernia/reflux	68 (13.6)	154 (16.2)	222 (15.3)
Oesophageal leiomyoma	1 (0.2)	0 (0.0)	1 (0.07)
Gastric ulcer	11 (2.2)	16 (1.7)	27 (1.8)
Gastric carcinoma	1 (0.2)	2 (0.2)	3 (0.2)
Gastric leiomyoma	1 (0.2)	1 (0.1)	2 (0.15)
Duodenal ulcer	109 (21.9)	84 (8.8)	193 (13.3)
Duodenal diverticulum	2 (0.4)	1 (0.1)	3 (0.2)
Gall bladder disease	79 (15.8)	313 (33.0)	392 (27.1)

TABLE 2. Positive and negative findings in each diagnostic category

		Peptic ulcer symptoms	Gallbladder symptoms	Reflux symptoms	Non-specific dyspepsia symptoms	Combinations of symptoms
Barium meal only positive	(310)	100 (41.6*)	45 (10.3)	13 (3.5)	107 (18.8)	45 (29.0)
Cholecystogram only positive	(275)	17 (7.1)	176 (40.0)	3 (8.1)	55 (9.6)	24 (15.5)
Both positive	(117)	15 (6.3)	48 (10.9)	4 (10.8)	22 (3.8)	28 (18.0)
Both negative	(742)	108 (45.0)	171 (38.8)	17 (46.0)	388 (67.8)	58 (37.5)
Total	(1,444)	240	440	37	572	155

*Figures in brackets refer to percentages within the particular diagnostic category.

Patients presenting with typical reflux symptoms

In this group 54% had a positive finding. Hiatus hernia or reflux or both was found in 43.2% of patients. In 18.9% of patients a positive cholecystogram was found either alone or in combination with a positive barium meal.

Non-specific dyspepsia patients

Only 32.3% of these 572 patients had a positive diagnosis. Of these, hiatus hernia/reflux was the commonest finding (80 patients), followed by gall bladder disease (55 patients) and duodenal ulcer (48 patients). Combined findings on both barium meal and cholecystogram were rare in this group (3.8%).

Patients presenting with combinations of symptoms

This group had the highest percentage of positive findings (62.5%). As expected it also had the highest percentage of patients with positive findings on both examinations (18%).

Analysis of patients by radiological category

Patients who had barium meal only positive

Table 3 gives a breakdown of those patients who had a positive finding on barium meal but a normal cholecystogram. Of the 22 patients who had more than one diagnosis on barium meal, the commonest combination was hiatus hernia and duodenal ulcer (10 patients). Other combinations were rare (maximum of four in each).

Patients who had cholecystogram only positive

Of these 275 patients, 143 had gall stones in a functioning gall bladder; 92 had a non-functioning gall bladder; 40 had both gall stones (radio-opaque) and a non-functioning gall bladder.

TABLE 3. Radiological diagnosis in patients who were barium meal only positive

Hiatus hernia/reflux	130
Gastric ulcer	15
Gastric carcinoma	2
Gastric leiomyoma	1
Duodenal ulcer	138
Duodenal diverticulae	2
Combinations of above	22
Total	310

Patients who had a positive diagnosis in both examinations

Table 4 shows the barium meal diagnosis in order of frequency for those patients who had both examinations positive. As expected the commonest combination was hiatus hernia/reflux and gall bladder disease.

TABLE 4. Barium meal diagnosis in patients positive for both examinations

Hiatus hernia/reflux	71
Duodenal ulcer	35
Gastric ulcer	4
Gastric + duodenal ulcer	2
Hiatus hernia/reflux + gastric ulcer	2
Gastric carcinoma	1
Gastric leiomyoma	1
Duodenal diverticulum	1
Total	117

Of the total number of patients with a positive barium meal, 27.4% also had a positive cholecystogram (117 out of 427). Of the total number of patients with a positive cholecystogram, 29.8% had a positive barium meal (117 out of 392).

Age and diagnostic yield

In Fig. 1 the patients in each decade are divided into those positive for barium meal and cholecystogram alone, those positive for both and those negative for both. The number of patients with both examinations negative falls substantially with age. There is a gradual rise in positive diagnoses in all

FIG. 1. Age and diagnostic yield (numbers in parentheses represent total within each age group). (◆) barium meal only positive; (▲) cholecystogram only positive; (●) both examinations positive; (■) both examinations negative.

categories with increasing age. In particular the number of patients with positive diagnoses on both examinations rises from zero in the younger age groups to approximately one-fifth in the old age groups.

Discussion

In many hospitals dyspeptic patients are investigated by double contrast barium meal followed, if negative, by cholecystogram or *vice versa*. Both methods have been shown to be accurate in experienced hands when compared with endoscopy in the case of barium meal (Herlinger, Glanville and Kreel, 1977) or surgical findings in the case of cholecystogram (Crade *et al.*, 1978). However, this can involve a minimum of three hospital visits and often up to five visits (consultation, radiology, consultation, further radiology, further consultation). One major benefit, therefore, from our policy is that these visits are much reduced giving the general practitioner a rapid radiological assessment with equally rapid commencement of treatment. This was especially advantageous in those patients presenting with non-specific dyspeptic symptoms. The positive return from one investigation only in these patients would have been small and patients would have required multiple hospital visits for full radiological assessment of their problem. The difficulty of those patients negative for both examinations of course remains, but at least they are placed in this category rapidly so that early decision on the necessity of further investigation, such as endoscopy and sonic scan, can be made.

The other major advantage of this policy is that it avoids missing the patients with dual pathology.

Hence, the physician is in a better position to avoid the problems of treating one upper abdominal condition while the symptoms are due to another. Of those patients presenting with typical symptoms of peptic ulcer, over one in ten had a positive finding on cholecystogram and of those presenting with symptoms suggestive of gall bladder disease, approximately one in five had both examinations positive, the policy in consequence being particularly useful in the last two groups.

Those patients who had a positive diagnosis on either barium meal or cholecystogram had just less than a 30% chance of having a positive diagnosis on the other, thus giving strong reason for combining the examinations.

Younger patients only rarely had positive findings on both examinations. However, we would still advocate doing both examinations in these patients on the basis that the return from either investigation alone would be small. Also, approximately equal numbers of the younger patients had barium meal and cholecystogram positive, therefore making it difficult to decide which examination should be done in order to give the higher yield.

We have purposely avoided comparing diagnostic yield in these general practitioner referred patients with other studies, since the variables in patient, radiologist and referring doctor are too numerous for any comparison to be valid.

We have also avoided comparing the costing of our policy with the more conventional policy of having the examinations performed separately, since again the variables are numerous. We feel that the time saved, both by patient and hospital staff, in doing both examinations at one sitting compensates for the

cost of extra examinations. Technically it might have been expected that the previous double contrast barium meal would have interfered with the cholecystogram. However, with careful positioning of the patient during cholecystography, this did not prove to be a major problem.

It is felt that the low incidence of malignancy in this series is due to the direct referral by the general practitioner, the numbers in consequence not constituting a typical group of hospital patients.

In conclusion, in hospitals using radiology as a first line investigation of dyspepsia, we would advocate combining barium meal and cholecystogram in all patients over 40, in order to increase diagnostic yield. In other patients we also feel that the combined examination has advantages in reducing hospital attendances.

References

- BLOCK, M.A. & ALLEN, H.M. (1971) Elective repair of esophageal hiatal hernias at the time of cholecystectomy. *Surgery, Gynecology and Obstetrics*, **132**, 46.
- CRADIE, M., TAYLOR, K.J.W., ROSENFELD, A.T., DEGRAFF, C.S. & MINIHAN, P. (1978). Surgical and pathological correlation of cholecystosonography and cholecystography. *American Journal of Roentgenology*, **131**, 227.
- HERLINGER, H., GLANVILLE, J.N. & KREEL, L. (1977) An evaluation of the double contrast barium meal (DCBM) against endoscopy. *Clinical Radiology*, **28**, 307.
- HIPPELLI, R. & EIBACH, E. (1979) Rational combined X-ray examination of gallbladder and stomach. *Leber Magen Darm (Baden Baden)*, **3**, 111.
- JELIASKOV, A.S. (1968) Simultaneous radiographic contrast examination of the gallbladder and gastrointestinal tract on a single working day. *Radiologia Diagnostica (Berlin)*, **9**, 345.
- RAFES, J.W.T. & MEZENTSEV, G.A. (1966) Combined X-ray examination of the gastrointestinal tract and the gallbladder. *Klinicheskaia Khirurgiia (Kiev)*, **8**, 68.
- REDLICH, F.H. (1970) The combined examination of the stomach and the gallbladder. *Radiologia Diagnostica (Berlin)*, **11**, 105.
- ZOLLINGER, R.M. & WILLIAMS, R.D. (1964) Cholecystectomy. *Journal of the American Medical Association*, **190**, 145.

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