MEDICAL PRACTICE

Clinical Problems

Clinical Presentation of Acute Abdomen: Study of 600 Patients

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British Medical Journal, 1972, 3, 393-398

Summary

This paper presents the clinical features of 600 patients suffering from abdominal pain of acute onset and admitted to either the General Infirmary or St. James's Hospital, Leeds. The survey was initially retrospective, but later put on a prospective basis. Roughly two-thirds of these 600 patients presented a "typical" picture of the disease with which they presented, while the remaining third presented one or more atypical features. Since other prospective studies have indicated that the diagnostic accuracy of a group of clinicians in respect of the acute abdomen is roughly 65% it is tentatively suggested (a) that clinical diagnosis contains a large element of "pattern-matching," and (b) that such a policy can be expected to be ineffective in roughly one-third of all cases of acute abdominal pain.

Introduction

The advent of the digital computer and the resultant revolution in data handling have had a great impact in many walks of life. But in medicine that impact has been severely curtailed, not least because of difficulties in providing such a machine system with adequate clinical data, without which it is of little value. In Leeds, therefore, before the creation of any such system¹ we set out to collect an adequate "database" of clinical informa-

tion—that is, a substantial volume of carefully collected data on a large series of patients. This paper describes the clinical information collected from a series of 600 patients with acute abdominal pain.

Methods and Clinical Material

The 600 patients who form the basis of this study were admitted to either the General Infirmary or St. James's Hospital, Leeds, as emergency cases suffering from abdominal pain of acute onset (less than one week's duration at the time of their admission). Most patients were admitted under the care of the professorial surgical unit at the Leeds General Infirmary, though a small proportion of cases were admitted to St. James's (University) Hospital, Leeds, under the care of Mr. D. B. Feather. (These latter cases were studied to exclude the possibility that cases presenting to the professorial surgical unit were in some way not representative of the general surgical admissions in the city.) The composition of the series by disease is shown in Table I.

TABLE I—Composition of Series by Disease

	No. of Cases		No. of Cases
Acute appendicitis	100	Acute cholecystitis	100
Acute diverticulitis	100	Small-bowel obstruction	50
Perforated peptic ulcer	100	Acute pancreatitis	50
Non-specific abdominal pain	100		

Cases were studied initially retrospectively from 1970 backwards by a detailed examination of the available case notes. Later, however, the survey was put on to a prospective basis. The series (though not in practice consecutive) was unselected in that the sole criterion for admission to the survey was the

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TABLE II—Clinical Features Considered

General:	General Examination:
Sex	Mood
Age	Colour
Pain:	Temperature
Site at onset	Pulse
Site at present	Respiration
Aggravating factors	Blood pressure
Relieving factors	Abdominal inspection:
Progress	Movement (of abdomen)
Duration	Scars (abdominal)
Type at onset	Distension
Type at present	Abdominal palpation:
Other Symptoms:	Tenderness
Nausea	Rebound tenderness
Vomiting	Guarding
Appetite	Rigidity
Previous indigestion	Swellings
Jaundice	Murphy's sign
Bowels	Other:
Micturition	Abdominal auscultation
Periods	Rectal examination
Past History:	
Previous similar pain	
Previous surgery (abdominal)	
Drugs	

availability of adequate case notes made at the time of the patient's admission to hospital (Table II).

Most of the diagnoses were operative. Occasionally other evidence was accepted—for example, serum amylase level above 1,000 Somogyi units/100 ml was accepted as evidence of pancreatitis. The category "non-specific abdominal pain" indicates that a firm diagnosis was not made, that the patient's symptoms settled, and that the patient was discharged. We followed each such patient for at least a month (mean 3.2 months) without any recurrence of symptoms. Cases of cholecystitis were accepted only if later (operative) evidence indicated the presence of a diseased gall bladder. Patients with diverticulitis were all admitted suffering from acute diverticular disease. (Whether diverticulitis or diverticulosis is a preferable term is open to question.³) Cases with known dual morbidity were excluded from the survey.

Data-processing Methods.—In all, roughly 24,000 items of data were collected. After collection the data were double-checked and triple-checked; subsequent validation and initial analysis was carried out with a Mathatronics Mathatron Biostatistician 848 desk-top computer/calculator. Eventually the processed data were stored in the form of a database on disc in an English Electric KDF9 computer situated in the University of Leeds and connected to the department of surgery by a remote Westrex ASR 33 terminal situated in the department. Further details of these processing methods and of the uses to which the information has been put are given elsewhere.^{1 4 5}

Comparison of Results at Two Hospitals.—We were reassured and impressed by the similarity of data from the two sources, an illustrative example of which is given in Fig. 1. In Fig. 1 we have selected patients suffering from perforated peptic ulcer, since this disease is of particular interest to the professorial unit and any bias due to selection of cases might be expected to have maximal effect here. In fact, there was virtually no difference between the groups, and this is representative of our findings as a whole. We therefore concluded that cases were not being selected for admission, that the data from the two hospitals could be combined for presentation, and that the results would probably reflect a representative picture—at least so far as Leeds was concerned.

Results

AGE AND SEX

The age and sex of the 600 patients are shown in Table III and Fig. 2. Much of this information is unremarkable and merely serves to confirm our hopes of access to a representative population. But it is worth re-emphasizing that perforated peptic ulcer and acute cholecystitis are both occasionally though rarely seen in teenagers, and acute diverticular disease may also present before the age of 30. By contrast appendicitis does occur in the older age groups, 5% of the patients with appendicitis being over the age of 60. As regards sex distribution we were somewhat surprised to find that no less than 15% of patients with perforated peptic ulcer were female.

TABLE III—Distribution of Disorders by Sex of Patients (Percentage of Total Group for Each Disease)

	Males	Females
Appendicitis	60	40
Diverticulitis	39	61
Perforated peptic ulcer	85	15
Non-specific abdominal pain	42	58
Cholecystitis	32	68
Small-bowel obstruction	60	40
Pancreatitis	38	62

FIG. 1—Comparison of patients presenting with perforated peptic ulcer to two different hospitals. Note similarity between groups of patients from the two sources.

TABLE IV—Comparison of Disease in respect of Site of Abdominal Pain* at Time of Admission to Hospital (Percentages of Total Groups Involved)

	R.U.Q.	L.U.Q.	R.L.Q.	L.L.Q.	Upper Half	Lower Half	Right Half	Left Half	Central	General
Appendicitis			74		1	13	3		6	2
Diverticulitis			7	23	3	35			9	10
Perforated peptic ulcer	2				35	3	6		2	52
Non-specific abdominal pain	1	1	29	3	11	9	7	2	25	9
Cholecystitis	38	1	4		34	1	5		6	8
Small-bowel obstruction			4		8	18			40	26
Pancreatitis	6		2	2	38	6		2	14	29

*Excluding 26 patients who were pain-free at time of admission.

R.U.Q., L.U.Q., R.L.Q., L.L.Q. = Right, left, upper, lower quadrants.

PAIN

We analysed the patients' complaint of pain in some detail since in the vast majority of instances this was the presenting complaint that precipitated their admission to hospital.

Site of Pain.—The most striking feature of Table IV is that the "stereotype" site of pain is seen to be little more than an approximate guide to the diagnosis of the disease concerned. Thus as regards acute diverticular disease only 65% of the patients concerned had pain restricted to the lower abdomen and in less than a quarter of the patients was pain restricted to the left lower quadrant. Similarly, only 38% of patients with acute cholecystitis complained of pain localized in the right upper quadrant of the abdomen.

FIG. 2—Composition of series by age and specific diagnosis.

TABLE V—Duration of Pain at Time of Admission to Hospital (Percentage of Each Group with Pain)

Disease	<12 Hours	12-23 Hours	24-48 Hours	48 Hours
Appendicitis	13	47	31	9
Diverticulitis	9	10	12	69
Perforated peptic ulcer .. .	65	12	9	14
Non-specific abdominal pain ..	26	12	32	30
Cholecystitis	29	12	20	39
Acute small-bowel obstruction	14	25	27	34
Pancreatitis	38	22	14	26

Duration of Pain.—Most patients suffered from pain for between 12 and 48 hours before admission (Table V), but on closer analysis some surprising features emerge. It seems from Table V that a substantial proportion of patients reach hospital only after a prolonged period of observation at home. Thus on admission no less than 40% of the patients with appendicitis had suffered from pain for over 24 hours and, more surprisingly, so had 23% of the patients with perforated peptic ulcer. Indeed in this latter group 14% had complained of pain for 48 hours or longer, as did over a quarter of the patients with acute pancreatitis. (This delay is most often seen in children and in the elderly and bears out the findings of Jackson⁶ and of Thorbjarnarson and Loehr⁷ that an atypical presentation is somewhat more common in these age groups.)

Type of Pain.—Most patients (Fig. 3) complained of continuous pain of more or less constant intensity, but in the case of small-bowel obstruction the pain was predominantly colicky.

Just under 4% of the patients had no pain at all on admission to hospital, and the remainder had intermittent pain. Interestingly, this latter group contained occasional patients with appendicitis, pancreatitis, and even perforated peptic ulcer. As regards the severity of pain (Fig. 4) our findings were broadly those which might have been expected, the proportion of patients with severe pain being highest among patients with perforation

FIG. 3—Composition of series according to type of pain at time of admission.

FIG. 4—Severity of abdominal pain on admission in 600 patients.

(93%) and lowest among those with non-specific abdominal pain (18%).

Aggravating Factors.—Here our analysis (Fig. 5) was far from being as thorough as we might have wished, since aggravation of a patient's pain bears an undefined relation to many other variables. Thus although only 24% of the patients with perforated ulcer complained that their pain was aggravated by voluntary movement, clearly this was because most of them were lying still with a rigid abdomen (Fig. 5) and were therefore unlikely to complain of pain aggravated by movement.

Nonetheless, certain features emerge. Thus aggravation of pain by inspiration clearly implies that its cause lies in the upper abdomen, but aggravation by coughing does not. Finally, aggravation by any of the factors shown in Fig. 5 implies a degree of local or general peritoneal inflammation, since none of the patients with small-bowel obstruction complained that their pain was aggravated by movement, coughing, or inspiration.

FIG. 5—Factors aggravating abdominal pain in 600 patients.

FIG. 6—Other gastrointestinal symptoms in 600 patients with abdominal pain of acute onset. (a) Upper gastrointestinal tract. (b) Lower gastrointestinal tract. a = Appendicitis, d = Diverticulitis, u = Ulcer, n = Non-specific abdominal pain, c = Cholecystitis, s = Small-bowel obstruction, p = Pancreatitis.

ASSOCIATED SYMPTOMS

Some of the other gastrointestinal symptoms (Fig. 6) were quite surprising. Half of all the patients with acute diverticular disease experienced nausea and one-third had vomited (as had two-fifths of the patients with perforated ulcer, though usually only once at the onset of their pain). Anorexia was more common in patients with acute diverticular disease than either diarrhoea or rectal bleeding, and the proportion of patients in this category with symptoms referable to micturition (29%) was equally unexpected. We must conclude from this study that the stereotype of acute diverticular disease with rectal bleeding and diarrhoea gives at best an incomplete and at worst a misleading picture of the clinical presentation of this disease. Indeed, since Parks⁸ and May and Loewenthal⁹ noted comparable findings to our own one wonders how much longer the stereotype of "classical diverticulitis" can endure in the textbooks.

PAST HISTORY

Two features of the patients' previous history are shown in Table VI—namely, the proportion of patients experiencing previous abdominal pain and undergoing previous abdominal surgery. In respect of the former two findings seem worthy of comment. Firstly, half of the patients with perforated ulcer claimed not to have suffered from abdominal pain in the past. Secondly, in contrast (though in keeping with the findings of Price¹⁰) over 70% of patients with acute cholecystitis did mention previous pain, despite the fact that for most this was their first admission to hospital.

TABLE VI—Past Relevant History of 600 Patients

Disease	Percentage with Previous Abdominal Pain	Percentage with Previous Abdominal Surgery
Appendicitis	18	3
Diverticulitis	13	33
Perforated peptic ulcer ..	51	18
Non-specific abdominal pain	30	13
Cholecystitis	71	33
Small-bowel obstruction ..	34	80
Pancreatitis	48	28

As regards previous surgery some 80% of the patients presenting with small-bowel obstruction did so after a previous abdominal operation, perhaps a telling comment on the aetiology of this disorder. Eighteen per cent. of the patients with perforated ulcer had undergone previous surgery (usually for peptic ulcer). Perhaps the most interesting cases of all were those of three patients who developed "avoidable" acute appendicitis after previous abdominal surgery for other complaints which was not accompanied by prophylactic appendectomy.

GENERAL PHYSICAL EXAMINATION

Here much caution is necessary in interpreting our data, since an earlier study¹¹ indicated that there may be wide observer variation in respect of some signs. Nonetheless, some 75% of patients with perforated ulcers appeared anxious and/or distressed, while just under half of the patients with appendicitis were said to be flushed on admission. Finally, some 58% of the patients with small-bowel obstruction had a distended abdomen at the time of admission. These latter findings, if in fact reliable, probably reflect the delay in hospital admission, which is noted above (Table VII).

ABDOMINAL TENDERNESS

Broadly speaking, these results were comparable with those dealing with the site of the pain (Table VII). The area of the

abdomen directly above the involved structure was almost invariably tender, but tenderness *localized to that area* was found in only half to two-thirds of the cases. In other words, tenderness was less helpful than we might have expected in localizing the cause of the patient's pain; although when localized tenderness *was* present its value in discriminating

TABLE VII—Positive Physical Signs on General Examination and Inspection of Abdomen (Percentages of Total Groups Involved)

		Appendicitis	Diverticulitis	Perforated Ulcer	Non-Specific Abdominal Pain	Cholecystitis	Small-bowel Obstruction	Pancreatitis
Colour	Pale ..	9	26	45	11	21	26	42
	Flushed ..	49	1	7	16	6	12	12
Mood	Anxious ..	7	20	15	7	4	12	2
	Distressed ..	8	2	60	3	24	36	42
Abdomen	Poor movement	3	3	42	17	17	58	1
	Distended ..		14	2	3	7		16

between these seven conditions was usually considerable. Thus 85% of all patients with cholecystitis were tender in the right upper quadrant, but in only 60% was the tenderness localized in that region. Nonetheless, in those 60% of cases localization to the right upper quadrant virtually ruled out any other condition (except pancreatitis).

FIG. 7—Findings in 600 patients in regard to rebound tenderness, guarding, and rigidity of the abdomen.

OTHER SIGNS ON PALPATION

These are illustrated in Fig. 7. The reason why only 39% of perforated ulcer patients were said to have rebound tenderness seems fairly clear—namely, that most of them had a rigid abdomen on examination and hence the opportunity to elicit rebound tenderness did not arise. No such explanation, however, can account for the finding that 21% of all patients with “non-specific” abdominal pain were also noted at the time to have rebound tenderness.

AUSCULTATION

The “stereotype” of perforation is a patient with a silent abdomen, but Fig. 8 shows that only 48% of patients were noted to have diminished or absent bowel sounds. In many instances bowel sounds were definitely noted to be present. This information was sometimes underlined in the notes or a further comment

FIG. 8—Findings on auscultation in 600 patients with acute abdominal pain.

added to indicate that the clinician recording the information was as surprised as we were at this finding. Hence the presence of bowel sounds in no way excludes a recent perforated viscus; and indeed in one patient hyperactive bowel sounds were noted on more than one occasion.

In 24% of patients with small-bowel obstruction bowel sounds were diminished or absent. Once again this probably reflects the length of time which elapsed between the onset of obstruction and the patient's admission to hospital.

TABLE VIII—Site of Abdominal Tenderness in 600 Patients at Time of Admission (Figures are Percentages of Each Group)

	R.U.Q.	L.U.Q.	R.L.Q.	L.L.Q.	Upper Half	Lower Half	Right Half	Left Half	Central	General	Nil
Appendicitis	1		65	22	2	10	5		1	18	
Diverticulitis			5		2	25			7	20	19
Perforated peptic ulcer	1		2		16		8			73	
Non-specific abdominal pain	4		28	5	7	10	10		9	11	16
Cholecystitis	60	1			11		12			12	4
Small-bowel obstruction			6	6	2	16	2		8	48	12
Pancreatitis	14	6			16		8	4		48	4

R.U.Q., L.U.Q., R.L.Q., L.L.Q. = Right, left, upper, lower quadrants.

RECTAL EXAMINATION

Finally, the findings on rectal examination are shown in Table IX. These are largely unremarkable, although 43% of patients with acute appendicitis were tender rectally, usually (if localized) on the right, and some 10% of patients with diverticulitis were alleged to have a mass on digital examination of the rectum.

Discussion

A vast amount of literature already exists dealing with the acute abdomen,¹² but with the exception of relatively few studies^{3, 6, 10, 12-20} it takes the form of clinical impressions rather than the observed findings from large series, and studies comparing detailed results from a large series of patients such as that listed in Table I are very few.

TABLE IX—Rectal Examination in 600 Patients (Percentages of Groups Involved)

	Normal	Tender on Right	Tender on Left	Tender Generally	Palpable Mass
Appendicitis	57	21	1	21	
Diverticulitis	70	1	2	21	10
Perforated peptic ulcer ..	80	1		19	
Non-specific abdominal pain ..	84	7	1	7	1
Cholecystitis	91	3	1	5	
Small-bowel obstruction ..	82	4	2	10	4
Pancreatitis	94			6	

This is not to say that the present study is without its drawbacks. Firstly, as with any other largely retrospective survey, it may be argued (a) that the cases were selected and (b) that the records were incomplete. The only criterion for entry into the series, however, was the availability of adequate case notes, and the proportion of case notes which were not adequate on the grounds of incompleteness was surprisingly small. Also most of the surprising findings in the present survey were based on positive evidence, such as the high proportion of patients with bowel sounds after perforation, the high proportion of patients with diverticular disease who experienced nausea and vomiting, and so on. Finally, the results from two different hospitals were remarkably similar, and we have not found any major difference between the cases recorded retrospectively and those added prospectively (now some 600 in all).

Another possible criticism concerns observer variation in recording the data. This is again inherent in any clinical survey—prospective and retrospective—and is what Norbert Weiner²¹ calls “characteristic of the semi-exact scientific disciplines.” In this instance there are two problems—the data written in the case notes may be inaccurate or we may have miscoded them. The most surprising features of this survey were noted in respect of variables that previous work¹¹ has shown to be relatively reliably interpreted. We went through very stringent standardization and control procedures before recording the data.¹

With these caveats the chief feature of our results which surprised us at the time and which depresses us in retrospect is that “typical” findings seem to occur in only about 60-70% of patients. Specific instances are detailed at the appropriate points in the text, but one implication for diagnosis is quite interesting.

Many authors²² suspect that there is a large element of “pattern matching” in surgical diagnosis, and if only 60-70% of patients present with typical findings one might reasonably expect some 30-40% of cases to be misdiagnosed on presentation to hospital. This is precisely what we have observed in real life. The overall accuracy of diagnosis in a consecutive prospective series of 440 such cases is currently running at about 65%. This suggests to us (a) that the clinicians concerned are attempting to match new cases in clinical practice to pre-existing patterns or stereotypes of the disease which they have in mind, and (b) that they fail to make the correct diagnosis in 30-40% of cases because in that proportion the cases themselves do not fit these preconceived notions. This hypothesis and its implications for diagnosis, however, are dealt with in greater detail elsewhere.¹

We are most grateful to Professor J. C. Goligher for his advice, encouragement, and support during the conduct of this study. In addition it is a pleasure to acknowledge our gratitude both to Professor Goligher and to Mr. D. B. Feather for permission to study patients admitted under their care.

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