areas. In particular, there is a strong bias towards London in the proportion of the population classified as deprived. The index fails to recognise the nature of deprivation in the north of England, and, utilising Jarman's index, any resource allocation exercise would benefit the Thames regions at the expense of peripheral regions. Also, the Jarman index has been used outside its original domain of application—namely, that of general practitioners' workload—to guide the allocation of both health care and other resources. This raises the issue of how a statistical index develops a life of its own.

I thank Doug Anderson and Bill Wood of Doncaster College for their comments on an earlier draft of this paper and Roy Carr-Hill and Trevor Sheldon for comments on a later draft.

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(Accepted 7 January 1991)

Rectal examination in patients with pain in the right lower quadrant of the abdomen

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Abstract

Objective—To determine whether rectal examination provides any diagnostic information in patients admitted to hospital with pain in the right lower quadrant of the abdomen.

Design—Casualty officer or surgical registrar recorded symptoms and signs on admission on detailed forms. Final diagnosis was noted on discharge from hospital.

Setting—District general hospital.

Patients—1204 Consecutive patients admitted to hospital with pain in the right lower quadrant of the abdomen as their major complaint; 1028 had a rectal examination on admission.

Main outcome measures—Odds ratio for each symptom and sign related to final diagnosis. Results of multiple logistic regression analysis for acute appendicitis.

Results—Right sided rectal tenderness, present in 309 of those examined, was more common in patients with acute appendicitis (odds ratio 1.34, $p < 0.05$). This odds ratio was considerably less than that for other clinical signs—namely, tenderness in the right lower quadrant (odds ratio 5.09), rebound tenderness (3.34), guarding (3.07), and muscular rigidity in the abdomen (5.03). In the logistic regression analysis of patients with acute appendicitis, when allowance was made for the presence or absence of rebound tenderness, rectal tenderness on the right lost its significance. Six patients had masses palpable rectally, of which three were palpable on abdominal examination; the other three patients had acute appendicitis. No other unexpected diagnoses were established, and no useful additional

diagnostic information was obtained by routine rectal examination.

Conclusion—If patients presenting with pain in the right lower quadrant of the abdomen are tested for rebound tenderness then rectal examination does not give any further diagnostic information.

Introduction

The diagnosis of the cause of pain in the right lower quadrant of the abdomen rests largely on the clinical history and results of clinical examination. Rectal examination is considered to be essential in this evaluation,^{1,2} but it is unpleasant for the patient, particularly when it is repeated by different doctors, and there is scant evidence that it provides any information of diagnostic value.^{3,5} We aimed to assess whether rectal examination is valuable in determining the diagnosis in patients admitted to hospital with pain in the right lower quadrant of the abdomen.

Patients and methods

We studied 1204 consecutive patients admitted to Bangour General Hospital between September 1983 and June 1989 with pain in the right lower quadrant of the abdomen as their main presenting complaint. At the time of admission a casualty officer or surgical registrar recorded on to a detailed form the patient's age, sex, and symptoms and the findings on clinical examination; these data were then entered and stored in a BBC microcomputer. Rectal examination was recorded as having been performed at admission in 1028 (85%) patients, and rectal tenderness, if present,

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BMJ 1991;302:386-8

was assessed as right sided, left sided, or generalised. To minimise discomfort for the patient rebound tenderness was assessed principally by percussion of the abdomen rather than release of the hand after palpation. Any mass palpated rectally was recorded separately. At the time of discharge from hospital the final diagnosis was recorded on computer to complete the data file. Only those patients with histological evidence of acute inflammation in the appendix were listed as having had appendicitis.

Features in the history and findings on clinical examination were compared in different diagnostic groups by χ^2 tests and odds ratios calculated.⁶ The odds ratio is a measure of the diagnostic value of a test: the higher the odds ratio the greater its diagnostic value. A multiple logistic regression analysis was also performed⁷ to identify those factors in the history and findings on clinical examination that were of independent significance in predicting acute appendicitis. Adjusted odds ratios for these factors were estimated from the exponentials of the logistic regression coefficients.

Results

Table I shows the final diagnoses for all 1204 patients and for the 1028 who had a rectal examination on admission. The patients' mean age was 29 (SD 18) years (range 7-87). Of the total group, 37.3% had acute appendicitis, 38.5% non-specific abdominal pain, and 3.7% gynaecological disorders. The major differential diagnosis was therefore between acute appendicitis and non-specific abdominal pain. Although rectal examination was performed in only 85% of the total

TABLE I—Final diagnosis in all 1204 patients and numbers of patients with each diagnosis who had rectal examination

	No of patients	No who had rectal examination
Non-specific abdominal pain	463	383
Acute appendicitis	449	395
Renal colic	61	45
Gynaecological disorders	44	42
Intestinal obstruction	32	22
Urinary tract infection	30	26
Gall bladder disease	12	12
Perforated duodenal ulcer/dyspepsia	10	9
Diverticular disease	6	5
Other diagnoses	58	50
No diagnosis established	39	39
Total	1204	1028

TABLE II—Findings on rectal examination related to final diagnosis in 1028 patients

Finding on rectal examination	No of patients with sign	No (%) with appendicitis if sign:		Odds ratio
		Absent	Present	
Left side tender	20	389 (38)	6 (30)	0.68
Right side tender	309	261 (36)	134 (43)	1.34*
Generalised tenderness	87	361 (38)	34 (39)	1.03
Mass felt	6	392 (38)	3 (50)	1.61

*Only significant difference between groups ($p < 0.05$).

TABLE III—Findings on abdominal examination related to final diagnosis in 1028 patients who had rectal examination

	No of patients with sign	No (%) with appendicitis if sign:		Odds ratio	95% Confidence interval
		Absent	Present		
Tenderness in right lower quadrant	907	15 (12)	380 (42)	5.09*	2.98 to 9.57
Guarding	537	123 (25)	272 (51)	3.07*	2.34 to 4.04
Rebound tenderness	502	131 (25)	264 (53)	3.34*	2.55 to 4.40
Abdominal rigidity	58	352 (36)	43 (74)	5.03*	2.69 to 9.88

* $p < 0.001$.

TABLE IV—Independent factors for predicting acute appendicitis from history and findings on clinical examination in 1028 patients who had rectal examination, as derived from multiple logistic regression

	Coefficient	SE	Significance	Adjusted odds ratio
Tenderness in right lower quadrant	1.67	0.33	***	5.35
Abdominal rigidity	1.11	0.37	**	3.06
Male sex	1.09	0.15	***	2.97
Guarding	0.91	0.16	***	2.50
No previous surgery	0.87	0.22	***	2.38
Pain of central onset	0.83	0.17	***	2.31
Normal micturition	0.71	0.20	***	2.03
Rebound tenderness	0.67	0.16	***	1.95
Duration of pain 12-24 h	0.50	0.17	**	1.66
Pain aggravated by movement	0.35	0.16	*	1.43
Pain aggravated by coughing	0.35	0.17	*	1.42

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

group, the figures were higher in the groups with acute appendicitis (88%) and gynaecological disorders (95%) (table I).

Rectal tenderness to the right was present in 309 of the patients examined and was more common in patients with acute appendicitis than those with other conditions ($p < 0.05$, odds ratio 1.34) (table II). Rectal examination yielded two findings in 11 patients, the most common combination being both right and left sided rectal tenderness. When patients with acute appendicitis and those with other causes of the pain were compared the odds ratio for right sided rectal tenderness was less than that for abdominal findings on clinical examination (table III). In the stepwise logistic regression for acute appendicitis if rebound tenderness was entered right sided rectal tenderness lost its significance. Of the 395 patients with acute appendicitis, 101 had neither rebound tenderness nor rectal tenderness to the right, 30 had right sided rectal tenderness without rebound tenderness, 160 had rebound tenderness without right sided rectal tenderness, and 104 had both. Of the 1028 patients examined, 116 had right sided rectal tenderness without rebound tenderness, of whom only 30 had acute appendicitis. Right sided rectal tenderness in the absence of rebound tenderness was therefore not significantly associated with acute appendicitis. Only two patients with acute appendicitis presented without any of the four signs in table III, and neither of these had rectal tenderness to the right. Thus no patients with acute appendicitis had rectal tenderness to the right in the absence of abdominal signs.

Table IV gives the factors that were of independent significance for acute appendicitis. Age was not an independent diagnostic factor, although in a univariate analysis acute appendicitis was significantly less common in older patients. The factor that was primarily responsible for explaining the relation with age was whether or not the patient had had previous surgery.

The only other association between the findings on rectal examination and diagnosis was that right sided rectal tenderness was less common in patients with renal colic than in patients with other conditions (odds ratio 0.22 (95% confidence interval 0.06 to 0.61); $p < 0.01$).

Rectal masses were palpated in six patients. Three of these were palpated on abdominal examination (two colonic cancers and one mass due to Crohn's disease), and the other three patients had acute appendicitis. No unsuspected disease was detected by rectal examination.

Analysis of subgroups suggested that rectal tenderness on the right side might be more strongly associated with acute appendicitis in older patients than younger patients (table V). In particular, a logistic regression confined to those aged over 30 showed a highly significant effect for right sided rectal tenderness when adjustment was made for sex. These older

patients, however, also had more abdominal signs, and analysis after allowance for rebound tenderness showed that rectal tenderness on the right lost its significance. In women of childbearing age, among whom the rate of appendicectomy at which appendicitis is not found is high, the findings on rectal examination did not correlate significantly with the final diagnosis.

TABLE V—Relation between right sided rectal tenderness and acute appendicitis by age and sex

Age (years)	No (%) of patients with appendicitis if right sided rectal tenderness:		Odds ratio	95% Confidence interval
	Absent	Present		
<i>Male patients</i>				
0-	33 (51)	23 (64)	1.72	0.69 to 4.35
15-	80 (61)	38 (58)	0.88	0.46 to 1.69
30-	25 (45)	9 (75)	3.72	0.80 to 24.39
≥45	25 (31)	2 (40)	1.49	0.12 to 13.83
<i>Female patients</i>				
0-	20 (44)	25 (51)	1.30	0.54 to 3.17
15-	38 (22)	20 (20)	0.86	0.44 to 1.64
30-	27 (32)	11 (55)	2.58	0.85 to 7.91
≥45	9 (13)	5 (31)	3.13	0.68 to 12.82

Discussion

In 1901 William Osler pointed out that in the early stages of acute appendicitis rectal examination rarely provides any valuable information.⁸ Despite this major textbooks of surgery indicate that it is of value. Most studies that have addressed this issue do not in fact show a correlation between the findings on rectal examination and the final diagnosis.^{3,5,9,10} Only three reports have shown that rectal examination might be of diagnostic value in acute appendicitis.¹¹⁻¹³ They, like the present study, showed that rectal tenderness on the right was more common in patients with acute appendicitis. What these three studies failed to do was to determine whether findings on rectal examination were independent of other clinical signs. Our data show that abdominal signs are better predictors of appendicitis and that if rebound tenderness is assessed rectal examination does not provide any further diagnostic information.

The wide range of rates of tenderness on rectal examination in patients with pain in the right lower quadrant is further evidence to suggest that rectal examination is of little value. These rates vary from 2.9% to 72% in patients with acute appendicitis and from 16% to 63% in patients with other causes of pain in the right lower quadrant.^{3,12,13} The rate of acute appendicitis in patients with tenderness on rectal examination varies just as widely, from 3% to 72%.³

It could be argued that rectal examination might pick up other conditions, which would otherwise be

missed. In the present study six patients had masses that were palpable on rectal examination. Of these, three were abscesses associated with acute appendicitis and the other three were palpable on abdominal examination. No patient had any unsuspected disease identified by routine rectal examination. In this group of over 1200 patients—roughly the total number of patients admitted as an emergency with pain in the right lower quadrant of the abdomen seen by a general surgeon during his or her years in training—routine rectal examination seemed to provide no information of diagnostic value, even in specific groups, such as elderly patients or women during their reproductive years.

The question that must be asked is, should rectal examination be performed in any patient with pain in the right lower quadrant of the abdomen? We believe that, in the light of this and other reports, it should not be part of the examination performed by a general practitioner before referral to hospital. In patients admitted to hospital with convincing abdominal signs of acute appendicitis it also seems unnecessary. In elderly patients it might theoretically pick up unsuspected disease, and on this basis it might be justified in patients over 50 years of age.

We thank Mr A A Gunn, who set up the computer system at Bangour General Hospital; the casualty officers and surgical registrars who completed the forms and entered data into the computer; Mrs Julie McLaren and Mrs Liz Wright, who entered the final diagnoses; and Mr Vic Mackinlay, who extracted data from the original computer file. Financial support for the computer analysis was provided by the Royal College of Surgeons of Edinburgh.

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(Accepted 12 December 1990)

Raised γ -glutamyltransferase activity and the need for liver biopsy

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Patients with a raised activity of γ -glutamyltransferase in the absence of other abnormal results on liver function tests are often referred to liver clinics. There is, however, no evidence that an isolated increase in γ -glutamyltransferase activity is associated with major liver pathology, and this study was designed to determine whether an increase in γ -glutamyltransferase

alone was sufficient indication for performing a liver biopsy.

Patients, methods, and results

The case notes of 117 consecutive patients with suspected alcoholic liver disease who had a liver biopsy were reviewed and divided into three groups: increased γ -glutamyltransferase activity only (17 patients); increased aspartate aminotransferase activity with or without increased γ -glutamyltransferase (34 patients); and widespread abnormal results on liver function tests (66 patients). There was no difference in age among the three groups. Liver biopsy specimens were assessed blindly by one observer (NR), looking for steatosis, ballooning degeneration, megamitochondria, Mallory's

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BMJ 1991;302:388-9