Acute abdominal pain in children[1]

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Summary: During a twelve-month period, 416 children with acute abdominal pain required emergency admission to Southampton General Hospital; 46% had operations. Appendicitis was the commonest organic cause of acute abdominal pain identified (31%). Constipation (9%) can present as acute abdominal pain simulating appendicitis. All children should have a urine sample examined microscopically and the finding of significant pyuria is suggestive, but not diagnostic, of a urinary tract infection (7%). Mesenteric adenitis, which can only be diagnosed with certainty at laparotomy, was less common (4%). Despite careful clinical assessment and follow up, 45% of children in this series remained undiagnosed. Sedation but not analgesia may assist in the diagnosis of the acute abdomen in children.

Introduction

Emergency admission to hospital with acute abdominal pain is a common event in paediatric surgical practice. A survey from Aberdeen demonstrated that for every 500 children under the age of 12 years, two each year will develop abdominal pain necessitating hospital admission (Winsey & Jones 1967). One of these two children will require a laparotomy, and the cause of the other's illness will not require surgical intervention. In children with acute abdominal pain, the largest diagnostic group is that of nonspecific or undiagnosed abdominal pain (Jones 1969, Pullan *et al.* 1979).

Patients and results

This clinical series consisted of 416 patients admitted between 1 November 1977 and 31 October 1978 to the Wessex Regional Centre for Paediatric Surgery at Southampton General Hospital. These patients had acute abdominal pain and a suspected diagnosis of acute appendicitis; 50% had a history of less than 24 hours, 17% of between 24 and 48 hours and the remaining 33% a history of more than 48 hours. They came from a community of approximately 100 000 children. Patients admitted following trauma or with a diagnosis such as incarcerated hernia or torsion of the testis were excluded, as were neonatal admissions. Admissions in August were 40% below the monthly mean, but no seasonal variations were noted. The age and sex of the patients are shown in Table 1; although the policy of the unit is to admit any child of school age, some teenage patients were referred to adult surgeons and therefore were not included in this series.

One hundred and ninety-one patients had an operation and in 11 of these patients no cause was found for the abdominal pain. In 17 patients with enlarged ileocaecal lymph nodes a diagnosis of mesenteric adenitis was made and a normal appendix removed. The remaining 225 children had no initial surgery and of these 3 presented again within 6 months with acute appendicitis.

The patients were subdivided into diagnostic groups (Table 2) and in 45% of the children it was not possible to reach a diagnosis. Acute appendicitis, diagnosed by laparotomy, and confirmed by histological examination of the appendix, was the commonest organic cause of abdominal pain identified (31%). Children included in the constipation group were those who had palpable hard faeces, either on rectal or abdominal examination, and in whom the abdominal pain was completely relieved by two Dulcolax (bisacodyl) suppositories.

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Table 1. Age and sex distribution of 416 children with acute abdominal pain admitted to Southampton General Hospital during a 12-month period (1977–78)

Age (years)	Total in series		Appendicitis		Undiagnosed	
	Boys	Girls	Boys	Girls	Boys	Girls
<1	5	5	0	0	0	2
1	3	2	0	0	2	1
2	4	1	0	0	1	1
3	7	2	1	0	1	2
4	6	6	0	1	4	5
5	7	4	3	1	3	1
6	20	20	7	3	9	9
7	12	14	3	3	5	8
8	6	15	3	6	2	6
9	25	25	5	7	10	12
10	23	26	10	6	8	12
11	29	14	12	4	12	9
12	32	15	9	4	20	9
13	26	22	12	9	10	8
14	17	12	11	7	6	3
15	3	7	2	1	1	3
16	0	1	0	0	0	1
Total	225	191	78	52	94	92
	416		130		186	

Table 2. Diagnostic groups in children with acute abdominal pain

	No. of patients	
Undiagnosed	186	(45%)
Appendicitis	130	(31%)
Constipation	37	(9%)
Mesenteric adenitis	17	(4%)
Intussusception	9	(2%)
Urinary tract infection	7	(2%)
Other surgical and gynaecological	20	(5%)
Medical	10	(2%)
	416	

In 8 patients a fresh midstream specimen of urine was found to contain greater than 10 pus cells per high-powered field (using an objective lens with a magnification of forty in a centrifuged specimen of urine) and greater than 10^5 organisms/ml in pure culture. In some patients repeated urine examinations were required to confirm or exclude the diagnosis of a urinary infection. One of the 8 patients was found at laparotomy to have acute appendicitis and was therefore included in that diagnostic group, thus leaving only 7 patients with a urinary tract infection as the cause of their abdominal pain. Intussusception was diagnosed in 9 patients, 6 of whom were under 1 year of age, and the oldest was aged 4 years. Other surgical and medical diagnoses are listed in Table 3.

Previous episodes of similar abdominal pain were recorded in 21% of these children; 25%

Table 3. Patients with other surgical and gynaecological, and medical, diagnoses

Other surgical & gynaecological		Medical	
Appendix abscess	2	Pneumonia	3
Intestinal obstruction	3	*Salmonella typhimurium*	1
Umbilical hernia	3	Diabetes mellitus	1
Inguinal hernia	1	Leukaemia	1
Torsion of testis	1	Porphyria	1
Torsion of hydatid of Morgagni	1	Acute nephritis	1
Omental cyst	1	Chronic pyelonephritis	1
Biliary colic	1	Iliac lymphadenitis	1
Renal colic	1		—
Bilateral ureteric reflux	1		10
Ovarian cyst	2		
Haematocolpos	1		
Acute salpingitis	1		
Ovulation	1		
	—		
	20		

of the appendicitis group and 18% of the undiagnosed group had had similar pain prior to this admission.

Family histories from the patients with acute appendicitis revealed that 16 mothers and 17 fathers had had an appendicectomy. Included were two families in which both parents gave this history. In addition 8 of these children had a sibling who had had an appendicectomy. By comparison, of the 33 children who had a normal appendix removed, a history of appendicectomy was obtained from 3 mothers, but no fathers or siblings. With Yates correction for small numbers, on the parental data $0{\cdot}10 > P > 0.05$ ($\chi^2 = 2.78$).

Discussion

In the management of children with acute abdominal pain it is essential to reach a working diagnosis within a few hours of admission. This is achieved by careful clinical assessment of the patient frequently repeated after a short interval (Jones 1976, Jackson 1963). Before the second clinical examination, microscopy of a fresh urine sample should be performed and in a small minority of cases radiology may be useful to confirm a clinical diagnosis, such as intestinal obstruction, or an emergency intravenous pyelogram may be performed in a patient with haematuria. In this series a straight abdominal X-ray did not suggest a diagnosis which was not clinically suspected, but there were too few children under the age of 2 years to confirm the value of this investigation for demonstrating a radio-opaque faecolith in the right iliac fossa (Gill & Cudmore 1975).

It is doubtful whether the diagnosis of mesenteric adenitis can be made without operation, despite the classical description by Aird (1945). The majority of the 17 patients found to have enlarged mesenteric lymph nodes at laparotomy did not have palpable cervical lymph nodes or upper respiratory tract infection, and the majority had a fever of less than 38°C. Mesenteric adenitis was diagnosed in 11% of patients who were operated on for suspected acute appendicitis. These clinical findings are similar to those reported from Aberdeen (Jones 1969) and emphasize the difficulty in diagnosing mesenteric adenitis without a laparotomy.

The results of immediate urine microscopy have to be interpreted in the light of clinical findings; of the 20 patients with greater than 10 pus cells per high powered field, 2 were found to have acute appendicitis, 1 acute salpingitis, 1 mesenteric adenitis, 9 remained undiagnosed and only 7 had a confirmed urinary tract infection. If the clinical signs suggest appendicitis, the presence of significant pyuria should not discourage the surgeon from an early operation. Seven patients with confirmed urinary tract infection included only one boy, aged 6 years, who had posterior urethral valves which had been treated surgically when he was a neonate. The 6 girls with urinary tract infections were investigated: 2 had vesicoureteric reflux and one a

dilated non-refluxing ureter. After the age of 2 years urinary tract infections are more common in girls, a finding recently confirmed in general practice (Dickinson 1979).

The incidence of intussusception is the same as that reported from other centres in the United Kingdom (Steyn & Kyle 1961). The ages of these patients were unremarkable and it is of interest that 2 of the 9 had a Meckel's diverticulum forming the apex of the intussusception. Seven of these patients required an operation; 5 intussusceptions were reduced manually and 2 patients had resection of non-viable bowel. The remaining 2 patients were successfully reduced at barium enema. During this 12 month period, a Meckel's diverticulum was encountered at 5 operations; 2 caused an intussusception, one was associated with a localized volvulus and 2 were found incidentally in children with acute abdominal pain and mesenteric adenitis. All 5 were excised with no postoperative complications.

Constipation has been cited as a cause of recurrent abdominal pain (Dimson 1971) although it is not included as a diagnostic group in all reported series. Constipation as defined in this series (Freeman 1978) includes children with colonic and rectal dysfunction.

The diagnoses listed in Table 3 show that an appendix abscess is an infrequent finding in children. The importance of carefully examining the hernial orifices and external genitalia in patients presenting with acute abdominal pain cannot be over emphasized. Gynaecological causes are more common in older girls and a variety of diagnoses must be considered.

Medical conditions present with acute abdominal pain in childhood, the two commonest reported being pneumonia and gastroenteritis. Recently campylobacter enteritis (Skirrow 1977) has been recognized not only as a cause of diarrhoea but also of abdominal pain. A number of children presenting with abdominal pain in Southampton have had campylobacter vibrios isolated from their stools and one of these children was included in this series. As she also had appendicitis she is included only in that diagnostic group. The urine must be tested for glycosuria in every child with abdominal pain, so as to diagnose diabetes without delay and before proceeding to a laparotomy. Other causes of abdominal pain such as Crohn's disease, hydronephrosis and intraabdominal tumours presented during these 12 months, but were referred electively and not as emergencies.

Three of the 186 children who remained undiagnosed were readmitted with acute appendicitis within 6 months of their initial presentation. Table 1 demonstrates that the age and sex distribution of the undiagnosed children reflects that for the total number in the series. However, the appendicitis group contains more boys in the ratio of 3:2, an unexplained but consistent feature in childhood appendicitis. The incidence of appendicitis in the first 2 years of life is extremely rare in Southampton—no infant being diagnosed during this series or in the preceding two years—and is certainly much lower than the 1% of children with appendicitis reported from Dublin (Puri & O'Donnell 1978).

It has been claimed that a family history of appendicectomy is significantly more common in children with appendicitis and that this is of clinical value in deciding on the management of a child with an acute abdomen (Anderson *et al.* 1979). The data from this series, although demonstrating such a tendency, do not show the difference as statistically significant. The large number of undiagnosed children with acute abdominal pain might suggest that psychological stress was a significant aetiological factor, as demonstrated by Apley (1978) in children with recurrent abdominal pain. A study is in progress to investigate psychological stress, which may be present in children with acute abdominal pain, and in particular the undiagnosed group are being compared with those with acute appendicitis. Preliminary results do not show a difference between these two groups, but both have a higher than expected number of stress factors (B Crossley, in preparation).

Sedation may aid the surgeon in diagnosing an acute abdomen in a distressed child (*British Medical Journal* 1979). The author's preference is to use either a sedative or a general anaesthetic, but to avoid the use of analgesics such as opiates. However, the majority of children can be adequately assessed without recourse to sedation. Once a diagnosis is made, the patient may be given appropriate analgesia.

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