

Papers and Originals

Acute Abdominal Pain in Childhood: Analysis of a Year's Admissions

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In a group of 500 children under 12 years of age two will in the course of a year develop acute abdominal pain that is severe enough to require admission to hospital; one will require laparotomy, the other will not.

Present Investigation

This statement, based on the findings of this survey, illustrates the well-known fact that, although acute abdominal pain is fairly common in childhood, many children recover without operative treatment. The aim of this investigation was to record all cases of acute abdominal pain as they entered hospital during one year and then, in the light of subsequent developments, to identify those symptoms and signs which had helped most in reaching or rejecting a diagnosis of surgical disease. In doing this we have obtained useful information on the incidence of acute abdominal disease in a known population.

The Royal Aberdeen Hospital for Sick Children is the only hospital for children in North-east Scotland and it receives acute abdominal emergencies from a population of about 450,000 people, among whom are about 76,000 children under the age of 12. All patients accepted from the family doctor by telephone are admitted. During 1965 315 children came in with an acute abdominal pain, and for each child a record form was filled up on admission. The reasons for adopting an operative or non-operative line of treatment were recorded. Later, operative findings and the clinical course of all patients were noted, with a final diagnosis.

For ease of analysis we have placed each child in one of five groups.

Group 1.—This comprised 114 patients with histologically proved acute appendicitis.

Group 2.—In 21 children it was impossible to exclude acute appendicitis, and they were operated on as emergencies. Acute mesenteric adenitis was present in 11, two had appendices containing threadworms, one had had a haemorrhage into an ovarian cyst, one was subsequently found to have paratyphoid fever, and one child with leukaemia had an acute pyogenic infection of the mesenteric glands. In the remaining five children no cause for the abdominal pain was found.

Group 3.—A firm diagnosis of a medical condition was made in 43 children and operation was not considered. Seventeen had an acute infection of the urinary tract, 10 had pneumonia, and six had Sonne dysentery. Paratyphoid fever was diagnosed in two children, two had acute tonsillitis, and two were in diabetic ketosis. One child had acute nephritis, one had inguinal lymphadenitis, and in one a foreign body in the vagina had produced secondary pelvic inflammation. Finally, one child was brought in gravely ill and suffered a cardiac arrest shortly afterwards; at necropsy a gangrenous volvulus of the midgut was found; he was the only child who died among the 315 children treated.

Group 4.—No diagnosis was reached in 119 children. In every case the symptoms and signs settled without treatment, usually within one or two days, and none was readmitted shortly after leaving hospital. Some months later one of these children developed acute appendicitis and in another a Meckel's diverticulum caused intestinal obstruction.

Group 5.—A diagnosis of a surgical emergency other than appendicitis was made in 18 children. Eleven had intestinal obstruction: this was due in seven to intussusception, in three to bands, and in one to a Meckel's diverticulum. The remaining seven had been involved in accidents and complained of abdominal pain: four had ruptured spleens; one had rupture of liver, adrenal, and kidney; one had a ruptured kidney; and one had extraperitoneal bleeding but no ruptured viscus.

Analysis of the Survey

Boys made up 60% of groups 1 and 4, but girls were twice as numerous as boys in groups 2 and 3. Of the 114 children with acute appendicitis, only 10 (9%) were under the age of 5, which is a low proportion (see Table). In comparable series Mason Brown (1962) and Bunton (1953) found that 20% and 34%, respectively, of patients were under 5 years of age.

Children Arranged by Age in Years and by Clinical Groups

Age	Group 1	Group 2	Group 3	Group 4	Group 5
< 1 year	0	0	0	1	6
1 "	1	0	0	4	0
2 years	2	1	2	2	1
3 "	2	1	3	5	0
4 "	5	1	4	8	0
5 "	10	0	7	13	2
6 "	9	3	7	11	2
7 "	13	2	5	16	2
8 "	10	5	1	8	0
9 "	25	6	4	23	1
10 "	16	6	4	12	2
11 "	20	1	9	16	2
12 "	1	1	0	0	0
Total	114	21	43	119	18

We found no seasonal differences in the numbers admitted in the various groups.

The duration of symptoms before admission to hospital was noted. Some 60% of children came to hospital during the first 24 hours of their illness and 20% during the second 24-hour period. During the third day a further 14% were admitted and 6% came after they had been ill for more than 72 hours. Among the 114 children with acute appendicitis perforation of the appendix had occurred in 37 (32%). Among those who arrived during the first 24 hours 24% had perforated; of those who came during the second 24 hours the proportion of perforations had risen to 43%. Of the eight patients admitted after 72 hours five had perforated, one having a severe diffuse peritonitis and four an appendicular abscess. Jackson (1963), in a study of acute appendicitis among children in Newcastle, found that half had already perforated when admitted, but that

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the perforation rate for those admitted within 24 hours of onset was only 11%.

Symptoms

The numbers of patients in groups 1 and 4 are almost equal, and are sufficient to allow a useful comparison between the two groups.

Site of Onset of Pain.—Pain began centrally in 70% of both groups. In almost all the other patients with acute appendicitis (27%) pain began in the right iliac fossa. In only 3% of group 1 did pain begin elsewhere in the abdomen (right loin or right hypochondrium), compared with 17% of group 4.

Shift of Pain to Right Iliac Fossa.—This symptom can be elicited from young children more easily than is sometimes supposed. It occurred in 64% of the children in group 1 who had central abdominal pain at onset and in 14% of children in group 4.

Aggravation of Pain by Movement or Coughing.—This useful symptom was present in 75% of group 1 and 25% of group 4.

Appetite.—It is common for appetite to be affected in acute abdominal pain but in acute appendicitis it is almost invariably very poor or absent (98%). In group 4 16% had a normal appetite.

Vomiting.—This occurred in four out of five children with appendicitis and in half the children in group 4. Repeated vomiting is also more common in appendicitis. However, one child in five with acute appendicitis did not vomit.

Diarrhoea.—This important symptom occurred in 18% of group 1 and in 9% of group 4, and is clearly commoner in acute appendicitis than is generally supposed. We could not explain its presence in every case, but 15 out of the 20 children with diarrhoea in acute appendicitis had rectal tenderness and most of these had pelvic appendicitis or peritonitis. Two of these children had so little abdominal tenderness that their abdomens might have been passed as normal. This is the dangerous group—if a rectal examination is not done they are liable to be diagnosed as having gastroenteritis, and we would reiterate Anderson's (1963) warning to beware of diarrhoea in a child whose illness presents with abdominal pain.

Disturbance of Sleep.—In 65% of children in group 1 sleep was disturbed, but this was true for 30% of children in group 4.

Headache.—This symptom, supposed to be very unusual in acute appendicitis, was present in 14% of group 1 and in 23% of group 4. The number rose to 56% in group 3.

Sore Throat.—This symptom was present in 5% of both groups 1 and 4.

Signs

Temperature.—Readings of 99° F. (37.2° C.) or less were obtained in 62% of children in group 1, and in only 2% was the temperature 102° F. (38.9° C.) or above. There was no tendency for temperatures to be higher in younger children. Half the children in group 3 had a temperature of 101° F. (38.3° C.) or above, compared with 16% of group 1. Temperatures were generally lower in group 4 than in group 1.

Pulse Rate.—Isolated readings of pulse rates on admission are very likely to be affected by the emotions. In general, tachycardia was more marked among group 4 than among group 1 and was most noticeable in group 3. However, the importance of a sustained tachycardia as a sign of peritonitis is clear. Of 31 children with peritonitis 21 had a pulse rate of 120 or more per minute on admission and in eight others it was between 100 and 119; in only two was it less than 100.

Difficulty in Movement.—This sign can be helpful. It was shown by 60% of children in group 1 compared with 6% of children in group 4.

Tongue.—It surprised us to find that 39% of children in group 1 had a clean tongue. This was also the case in 16 of the 18 patients in group 5.

Inflammation of the Fauces.—This was seen in one in ten children with acute abdominal pain and occurred equally in all groups.

Local Tenderness.—This sign was present in every case in group 1 and was generally localized in the right iliac fossa. When peritonitis was present the tenderness was more widely diffused. Only three children showed local tenderness in peculiar situations: one in the epigastrium, one in the right hypochondrium, and one in the right loin, which led to some delay in diagnosis. In group 4 only 25% were tender in the right iliac fossa and 45% showed no tenderness at all. Not surprisingly, all the 21 patients in group 2 had local tenderness, 15 in the right iliac fossa.

Guarding.—This involuntary contraction of the muscles of the anterior abdominal wall is highly suggestive of underlying inflammatory disease. It is a more objective sign than tenderness, but is not an easy one to elicit because it is vital to have relaxation of the abdomen, and this can be difficult to obtain in the apprehensive child. When it is possible to show complete painless relaxation of the muscles over the left iliac fossa and there is perceptible tightening of the muscles over the right iliac fossa, with tenderness, during gentle palpation, then inflammatory disease is very likely to be found. We elicited this sign in 102 (90%) of 114 children with acute appendicitis, and when it was absent the appendix was in an early stage of inflammation, or lay in the pelvis. Guarding was present in only 10 (8%) of the 119 children in group 4. On several occasions guarding was clearly appreciated only after sedation of the fretful child, and this must be used when abdominal examination cannot be accepted, even after one or two return visits. We gave pentobarbitone sodium in appropriate dosage and allowed two hours for its effect to develop. Jackson (1963) noted the value of sedation and recommended intramuscular paraldehyde. Guarding is a non-specific sign of underlying inflammation and was present in 12 of the 21 patients in group 2.

Rebound Tenderness.—This proved to be another useful sign. It was positive in 80% of group 1 and in less than 1% of group 4. Considerable care must be taken in eliciting this sign because it can distress a young child, and it is generally positive only when other signs are clear. However, it can be helpful in the doubtful case, and our figures support this in so far as only 5 of the 21 patients in group 2 showed a positive result.

Lumps.—These are rarely felt in the acute abdomen of childhood. The classical mass of an intussusception is most often felt. Only four abscesses were palpable among the 114 cases of acute appendicitis.

Rovsing's Sign.—This was present in a quarter of cases in group 1. It was, however, never present without other conclusive signs of acute appendicitis, and is of no help as a diagnostic sign. We made no attempt to elicit the psoas or obturator or hyperaesthesia tests because they demand a degree of subjective analysis which is beyond young children.

Rectal Tenderness.—This can be a vital sign of acute appendicitis, and we had several cases in which a firm diagnosis could be made only by rectal examination because abdominal tenderness was so slight. There is probably no part of the examination of a child with acute abdominal pain which requires more care than examination of the rectum, for it is inevitably uncomfortable and distasteful for a child. It is essential to pass the finger slowly and to stop all movement of the finger once it has been inserted. The situation is assessed and then the response to anterior pressure on the pelvic peritoneum is closely watched. It is this which counts, and only a clear-cut response to this gentle pressure from the distal phalanx of the index finger should be regarded as a positive sign. We recorded this sign in 65% of children in group 1 and in 11% in group 4.

We feel that rectal examination may be omitted when a clear-cut decision to operate has been reached on abdominal examination. It must, however, *never* be omitted when there is still doubt about the diagnosis.

Other Tests

Chest Examination.—When examination of the lungs suggested the presence of inflammatory disease a chest x-ray examination gave valuable additional evidence. Unexpectedly, chest signs were found in eight children with acute appendicitis, and two of these had an established pneumonia as well as proved acute appendicitis. We would also stress the confusing tachypnoea which can be seen in small children with peritonitis.

White Cell Count.—This can give useful information. Counts were made in only 41 of the 114 children in group 1: in 26 (63%) the total count was above 12,000/cu. mm. This contrasts strongly with the situation in group 4, where only 10 out of 100 counts made were in excess of 12,000 and only one exceeded 15,000. A normal count is of no value, but a true leucocytosis can be of considerable help in a difficult case. The sedimentation rate was generally higher in group 1 than in group 4, but normal and abnormal figures were scattered through both groups and we did not find this a helpful investigation.

Urinalysis.—Children do not always give classical symptoms of a urinary infection, so side-room examination of the urine in acute abdominal pain is especially important. Four children with acute appendicitis showed some pus cells in the urine, but the indications for laparotomy were clear; no further evidence of a urinary infection was forthcoming. In group 3, 17 children were found to have an acute urinary infection and all had significant quantities of pus in the first specimen of urine.

Discussion

Though acute abdominal pain is a common clinical problem in a children's hospital or ward, the number of such patients seen by a family doctor may be fairly small. In a practice of 5,000 people our figures suggest that during one year only four children will require admission to hospital for this reason. The diagnosis of acute abdominal pain in childhood may be straightforward, but it can be one of the most difficult clinical exercises. The particular aim of this investigation was to show the value of the various symptoms and signs in diagnosis, so that due weight could be given to the different pieces of evidence in the difficult case.

In the history we have found the characteristic shift of pain helpful in the diagnosis of acute appendicitis, though in a quarter of the cases pain started in the right iliac fossa. Aggravation of pain by movement or coughing was highly significant.

A clean tongue should not cause surprise, and the temperature does not rise above 99° F. (37.2° C.) in over half the cases of acute appendicitis. Sustained tachycardia must never be overlooked. The special importance of local tenderness (which may require rectal examination for its detection) and of muscle guarding is clearly brought out.

That medical conditions often present with acute abdominal pain in children is again emphasized in this series, and careful examination of the ears, throat, lungs, and urine should never be omitted.

It is clear from this series that, even with the diagnostic facilities and opportunities for observation available in hospital, it is not possible to reach a correct clinical assessment of every case of acute abdominal pain in childhood. We operated on 21 children in the mistaken belief that they had acute appendicitis, so of 135 children opened for acute appendicitis 15% did not need appendicectomy. We have looked carefully at the records

of these 21 children. Of the 11 with mesenteric adenitis, only two had a shift of pain and only five had vomited. However, most were watched for some hours after admission and their signs had become more convincing: operation seemed to have been fully justified in nine of these 11 children. Among the other 10 children there was a good clinical possibility of acute appendicitis in eight. We believe that very few of these negative operations could, or indeed should, have been avoided. There was no evidence among the older girls in this series of the negative exploration for appendicitis so common in women aged 15 to 25 (Lee, 1961; Ingram and Evans, 1965).

The difficulties of diagnosis of the acute abdomen of childhood were not diminished by the knowledge that 38% of our patients settled after a day or two in bed. When sent into hospital these children must have had symptoms and signs sufficient to worry their practitioners, and yet when they arrived in hospital 45% of this group showed no tenderness at all. There is no doubt that many of these problems can be resolved by re-examination after a few hours, but this is easier said than done when the patient is seen on a late call to a distant farm.

Needless delays in diagnosis were few, though the records of 31 children with peritonitis suggest that in 10 the parents allowed abdominal pain to continue for well over 24 hours before seeking medical advice. Pelvic appendicitis with few abdominal signs led to some delay, and so did the occasional retrocolic appendix with a soft right iliac fossa but tenderness and guarding far out in the flank. One gravely ill child of 1 year 10 months may have been thought to be too young to have appendicitis, and 6 out of the 10 children under 5 years of age had a perforated appendicitis. It therefore seems worth repeating Mason Brown's (1962) statement: "In any child with acute abdominal symptoms the doctor should think first of acute appendicitis, no matter how young the child may be." A number of letters in the notes show that the family doctor had visited several times before deciding on admission; in these cases we generally found ourselves sharing these doubts and had to re-examine the patients before coming to a decision. Jackson (1963) dealt with the causes and dangers of delay in admission in more detail. His plea for the education of parents in the significance of acute abdominal pain is clearly still relevant. We would also strongly endorse his proposal that the family doctor in training should be involved in the care of paediatric abdominal emergencies in hospital before he meets them, rather infrequently, in practice.

Summary

All 315 emergency admissions for acute abdominal pain in a children's hospital during 1965 were analysed. Of these, 135 (42.9%) were believed to have acute appendicitis, and this was confirmed in 114 (36.2%); the remaining 21 (6.7%) did not have an acutely inflamed appendix at operation. A medical condition was diagnosed in 43 (13.7%) and a surgical lesion other than appendicitis in 18 (5.7%). In 119 children (37.8%) a rapid recovery was made without operation, and no firm diagnosis could be made.

The symptoms and signs recorded in these groups have been compared in order to identify those of most value in reaching a diagnosis of surgical disease and those which may mislead.

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