

THE EARLY DIAGNOSIS OF ACUTE ABDOMINAL EMERGENCIES IN INFANCY AND EARLY CHILDHOOD

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It is not generally appreciated that acute abdominal emergencies are common in infancy and early childhood. Although chemotherapy and antibiotics, improved techniques in pre- and post-operative care, and better anaesthesia have been responsible for a steady and reassuring decline in the annual mortality rate from these emergencies, there is still much room for improvement. The reduction in mortality has not equalled that found in adults, and disconcerting facts are the alarming death rate from neonatal obstructions still prevalent in many centres, the frequency of irreducible intussusception, and the persistently high fatality-rate from acute appendicitis in children under the age of 5 years.

It is the purpose of this paper to ascertain the causes of the higher mortality figures in small children, and to consider the distinctive clinical features of the commoner conditions which present as acute abdominal emergencies in childhood. The data, which are based mainly on personal experience, are correlated with the views expressed in current literature and illustrated by an analysis of 314 abdominal emergencies treated in our Children's Surgical Department during the 2-year period January 1953 to December 1954.

The Causes of the Mortality

There are two main factors responsible for the higher mortality-rate in children, viz. the rapid progress of disease processes in the very young and delay in diagnosis. This is best illustrated by reference to 3 common surgical emergencies, viz. neonatal obstructions, acute intussusception and acute appendicitis.

Neonatal Obstructions. Even in simple obstructions necrotic changes may occur in the bowel wall within 24 hours and the mortality rises steeply with every day's delay in treatment until a figure of 80% is reached on the 5th day. This must be coupled with the fact that over 30% of our cases were admitted on the 5th day and later.

Acute Intussusception. As a rule the viability of the bowel is seriously affected when the intussusception has been present for 48 hours and the mortality rises from practically nil with treatment in the first 24 hours to approximately 40% if treatment is delayed until the 4th day. The average duration of symptoms in our cases was 46 hours.

Acute Appendicitis. The percentage of cases with rupture of the appendix rises with every hour that passes. Approximately 10% may perforate in the first 12 hours, and this figure rises to 30% after 24 hours and 70% after 48 hours. The mortality of ruptured appendicitis is approximately 5 times that of uncomplicated appendicitis. In 52% of our cases the organ had already

ruptured, with either a localized abscess or diffuse peritonitis on admission.

Delay in Diagnosis

From the above it should be obvious that delay in diagnosis is the most important preventable factor concerned, and before we consider the symptomatology of the various surgical emergencies it would be as well to analyse the reasons for delay. These may be classified under the following headings:

1. *Delay in Calling in the Advice of a Doctor.* This is one of the most important reasons. Vomiting is so common in newborn infants that midwives are seldom concerned about it, and in this they are often aided and abetted by irresponsible teachers who fail to stress the possible grave significance of persistent vomiting in the newborn. In older children a minor 'upset tummy' is equally common and parents get used to the idea that teething powders, castor oil, vermifuges, etc., will cure it. The result is that the ominous belly-ache or episode of vomiting which heralds the onset of a serious surgical emergency is often neglected until the child is desperately ill.

2. *Inaccuracy of the History.* An accurate description of the symptoms by the child is often sorely lacking owing to his very limited powers of description. At the same time the parent is often equally unreliable, tending to be either over-anxious or too matter-of-fact.

3. *Difficulties in Eliciting and Interpreting Physical Signs.* 'The common practice of starting the examination with the child's head, gagging him with a throat stick, upsetting him with a cold stethoscope and then pummeling his belly with a heavy hand, always fails to elicit the important physical signs.' (Gross, 1953). Furthermore, it is often forgotten that children react differently from adults to disease processes. This applies particularly to the child's reaction to pain. Some may wince, others whimper and others cry and shout, and yet others may lie quietly in bed. Also, vomiting occurs more readily than in adults and is often the most prominent symptom, while diarrhoea occurs in conditions which, in adults, are associated with constipation. High fever occurs even apart from acute infections, localized tenderness and rigidity may be absent, and rectal examination is often misleading in regard to pelvic tenderness.

4. *A Lack of Awareness on the Part of the Medical Profession* that surgical emergencies are indeed common in small children. In recent years the indiscriminate prescribing of antibiotics has led to even more errors, because these drugs tend to mask the true nature of the underlying disease until complications have arisen.

THE SURGICAL EMERGENCIES

Fig. 1 reflects under 11 headings the various abdominal

surgical conditions that were treated over the period of 2 years and the respective mortality (dark portions of graphs). Table I gives some of the details of the rarities

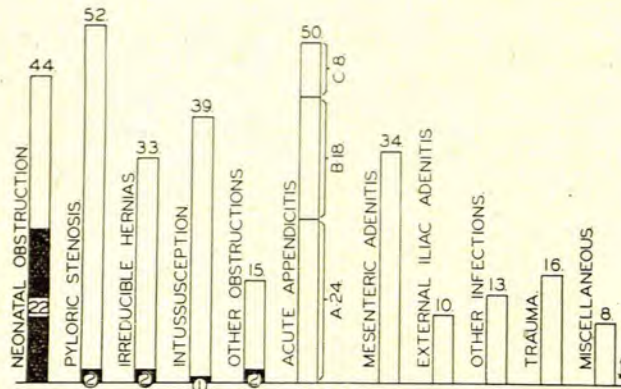


Fig. 1. Acute abdominal emergencies—children of 10 years and under. 314 cases.

TABLE I

<i>Other Obstructions</i>	
Volvulus	4 (2 due to Meckel's diverticulum).
Lymphoma	3
Mesenteric cyst	2
Tuberculosis	2
Bands and adhesions	3 (1 due to Meckel's diverticulum).
<i>Other Infections</i>	
Tuberculous mesenteric adenitis	4
Meckel's diverticulitis	2
Primary peritonitis	2
Hepatic abscess	2
Perinephric abscess	1
Crohn's disease	1
Foreign body	1
<i>Abdominal Trauma</i>	
Penetrating wounds	5
Ruptured bowel	2
Ruptured spleen	2
Ruptured kidney	3
Closed injury—no visceral damage	2
Haematoma of abdominal wall	2
<i>Miscellaneous</i>	
Haemorrhage from Meckel's diverticulum	2
Haemorrhage from liver infested with flukes	1
Torsion of ovarian cyst	2
Round-worm obstruction of common duct	1
Acute pancreatitis	1
Biliary peritonitis	1

(under 4 of these headings) which will not be discussed. It is of interest that 7 of these cases suffered from complications of a Meckel's diverticulum which should always be kept in mind when a child presents with severe intestinal haemorrhage or persistent abdominal pain.

Acute non-specific mesenteric adenitis and acute suppurative external iliac adenitis have been included (as 2 headings) in Fig. 1 because these conditions are so frequently confused with surgical emergencies especially with acute appendicitis. 50% of our cases of mesenteric

adenitis were submitted to laparotomy because of doubt in the diagnosis, and 70% of the cases of iliac adenitis eventually required surgical drainage.

The remaining 5 conditions, viz., neonatal obstructions, pyloric stenosis, irreducible hernia, acute intussusception and acute appendicitis accounted for 2/3rds of our surgical emergencies and will be considered in some detail. The first 3 will be discussed only briefly, while the 2 most important conditions in practice, viz., intussusception and appendicitis will be dealt with at some length.

NEONATAL INTESTINAL OBSTRUCTION

One newborn baby in every 1,000 develops acute intestinal obstruction at, or soon after, birth and will present symptoms within the first few days of life. There are numerous causes of such obstruction, the

TABLE II. NEONATAL OBSTRUCTION: AGE AT OPERATION IN 39 URGENT CASES

Age in hours	No. of cases	Deaths	Mortality
Less than 24	5	1	20%
24-48	7	3	43%
48-72	8	4	50%
72-96	5	3	60%
96-120	5	3	60%
120-144	3	2	67%
Over 144	6	5	83%

commonest being ano-rectal malformations and malrotation of the midgut, with or without volvulus and atresia. These infants will die unless treated surgically, and if operation is delayed beyond 48 hours the mortality becomes appalling (Table II). Early diagnosis by the practitioner is thus of paramount importance, and in this connection the following observations will be of value:

1. Repeated or bile-stained vomiting in a newborn infant is always serious and demands prompt hospitalization to exclude intestinal obstruction.

2. Routine examination of the anus and rectum for malformations at birth will reveal the cause in approximately 1/3rd of the cases suffering from an obstructive lesion.

3. The passage of meconium does not exclude a diagnosis of obstruction; it may occur even with complete occlusions.

4. Abdominal distension is often not present in the early stages of high obstructions, and in duodenal occlusions may not appear for several days.

5. Visible peristalsis is a valuable physical sign, but is present only in a minority of cases.

6. The baby's general condition may remain apparently good for several days even in complete obstructions.

Many of the infants can be cured by surgical operation and in some centres the over-all mortality has already dropped to 20%, but the most essential factor that makes for success is early diagnosis.

PYLORIC STENOSIS

Whereas intestinal obstruction presents with symptoms in the first few days of life, pyloric stenosis rarely causes symptoms until the infant is some weeks old (Fig. 2). In other words, if an infant presents with vomiting in

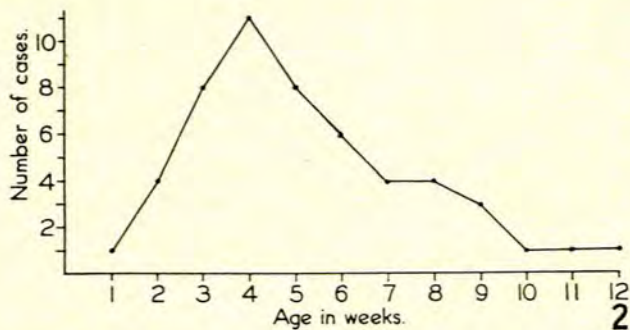


Fig. 2. Pyloric stenosis—age incidence. 52 cases.

the first week of life always regard intestinal obstruction as a more likely possibility than pyloric stenosis. From the second week onwards pyloric stenosis is the more likely possibility, although partial obstructions must also be considered.

Although the diagnosis of pyloric stenosis, which is based on the triad, projectile vomiting, visible peristalsis and a palpable tumour, is usually not difficult, cases are not infrequently neglected simply because a tumour cannot be felt. Such neglected cases become serious emergencies and it is among them that all the deaths occur. The tumour is often difficult to feel and a great deal of patience and experience are required. Occasionally it is more easily detected from the left. Another useful hint is to feed the baby until he vomits, because this is followed by a momentary period of relaxation of the abdominal muscles. Visible peristalsis is also best elicited during a feed. However, it is important not to delay treatment and if an infant behaves like one suffering from pyloric stenosis, he should be hospitalized regardless of the presence or absence of physical signs. The practice of trying the effect of Eumydrin must be condemned.

The mortality of pyloric stenosis should not exceed 1%; in experienced hands Ramstedt's operation can offer even better results, provided the diagnosis is not

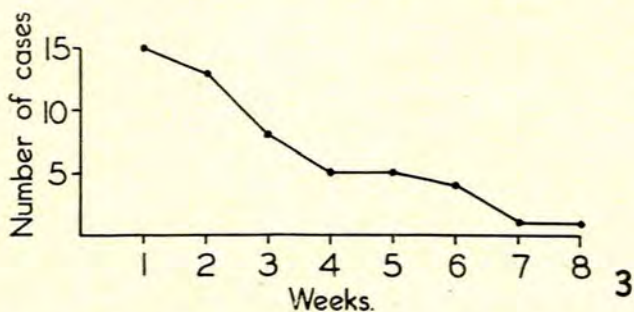


Fig. 3. Pyloric stenosis—duration of symptoms. 52 cases.

delayed. In our cases the duration of symptoms before admission to hospital leaves a good deal of room for improvement (Fig. 3).

STRANGULATED HERNIA

Approximately 6% of infants with inguinal hernia

require emergency herniotomy for irreducibility. During the 2 years we had 33 cases who required emergency operations while another 28 irreducible hernias responded to conservative treatment. There were no cases of irreducible umbilical hernia; 90% were boys.

Congenital hernias tend to become irreducible in the first 2 years of life, with the peak incidence during the first 6 months (Fig. 4)—our youngest case was 5 days

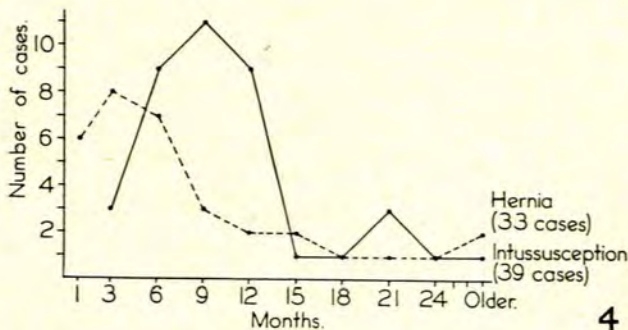


Fig. 4. Irreducible hernia and intussusception—age incidence. 72 cases.

old. Simple irreducibility is much commoner than actual strangulation but the latter is particularly liable to occur in small hernias of recent appearance during the first 6 months of life and may lead to gangrene in less than 12 hours. The bowel was gangrenous in 4 of our cases and they were all under 6 months of age. Two of these died—both were premature infants of less than a month old.

The diagnosis is not always obvious, because the parents may be unaware of the hernia and not infrequently abdominal pain and vomiting are the only symptoms. Mistakes will be avoided only if we adhere to the golden rule that all hernial sites must be examined in any patient presenting with an 'acute abdomen'. Inspection alone is not sufficient—a very small hernia may not be seen, especially in a fat baby, but the tense, tender swelling of an irreducible hernia can always be felt. Local redness and oedema as well as obstructive vomiting and abdominal distension are indications that strangulation has occurred.

ACUTE INTUSSUSCEPTION

Like irreducible hernia, acute intussusception tends to affect babies in the first 2 years of life, particularly between the ages of 3 months and 18 months, with a peak incidence at 9 months (Fig. 4). Although it is rare in the first 3 months it may occur in neonates and has been described in an infant aged 70 hours. Acute intussusception is a particularly dangerous emergency and demands diagnosis within the first 24 hours if the mortality is to be kept down. Yet in 20% of our patients the intussusception was already irreducible and the average duration of symptoms was 46 hours.

It has been stated that the classical text-book description of intussusception portrays such a dramatic picture

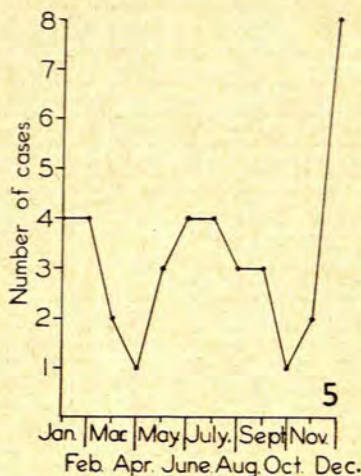


Fig. 5. Acute Intussusception—seasonal incidence. 39 cases.

In connection our seasonal incidence of the condition is of interest (Fig. 5). It would appear that the minor winter peak in May to August (which corresponds to the Christmas peak in the Northern hemisphere) may be related to respiratory infections with lymphoid hyperplasia, while the peak in December to February is probably related to summer diarrhoea.

The patients in whom gastro-enteritis is complicated by acute intussusception often present a very difficult diagnostic problem. However, provided it is remembered that this might be the cause of a 'turn for the worse' the diagnosis can usually be made on the features indicated below.

Pain is always present, although it may require experience to detect it. The classical screaming with each bout of colic, although common, is not always present. Some infants simply cry more than usual, others tend to whine and whimper, while others simply blanch with the spasms.

Vomiting occurs in most of the cases. It was the most prominent symptom in 3/4ths of our cases and the first symptom in 20%. In babies with established obstruction the vomitus becomes profuse and dark green or brown in colour.

The bowels vary considerably but it is very rare for faecal matter to be passed after the first stool. In 10% of our patients the character of the stool was misleading tending to simulate that of gastro-enteritis, and such cases may present most difficult diagnostic problems. Blood was passed *per rectum* in 86% of our cases but in half of them it appeared only after 24 hours. It is thus obvious that it would be a grave mistake to wait for blood to appear before making the diagnosis.

In the early stages the general condition of the child is usually good, except for pallor during attacks of pain, and the abdomen is flat. Later, however, the child becomes listless and dehydrated, with abdominal distension.

A palpable abdominal mass was detected in 80% of our cases. It was found in various parts of the abdomen,

that the inexperienced are misled and often fail to recognize the condition. Nevertheless, the early clinical manifestations of intussusception are almost always alarming and usually so characteristic that the correct diagnosis should be suggested at once.

It is seldom that the infant is not fat and healthy and in 80% of our cases the condition appeared 'out of the blue.' In the remainder gastro-enteritis or upper respiratory infection preceded the onset; in this connection

most frequently in the left iliac fossa. It was always fairly large, had the characteristic sausage-shape, and never disappeared completely between contractions; and in 15% of the cases it was also palpable *per rectum*. However, failure to feel a lump should not lead to delay in diagnosis, because it is often impalpable in small-bowel intussusceptions, or may be hidden under the costal margins.

The diagnosis of acute intussusception must always be entertained if a healthy infant suddenly develops acute abdominal pain or vomiting. In the majority of cases the mother's description of the symptoms will be true to type—it is the very constancy of the clinical picture that suggests the diagnosis. There may be difficulty in deciding between acute intussusception and acute gastro-enteritis, and in such cases a barium-enema examination becomes imperative. Other conditions which may give rise to difficulty include worms, mesenteric adenitis, tuberculous peritonitis, Henoch's purpura, and prolapse of the rectum.

ACUTE APPENDICITIS

This is the commonest and most important 'surgical emergency' to affect the abdomen of a child. It is particularly dangerous and difficult to diagnose in children of 5 years and less. In this age-group 40-60% of the cases are already complicated on admission to hospital and the mortality is almost 10 times that of

TABLE III. ACUTE APPENDICITIS

Age (years)	1	2	3	4	5	6	7	8	9	10	Total
Uncomplicated	—	—	—	—	1	3	2	5	5	8	24
Peritonitis	..	—	1	2	2	2	2	2	3	2	18
Mass	..	—	—	2	2	1	1	—	—	—	8
Total	..	—	1	4	4	5	6	5	7	8	50

older children. (Below the age of 3 years approximately 85-90% are complicated on admission, while in neonates the diagnosis has not yet been made before perforation occurred). At the same time the disease is not as rare in this age-group as is generally thought. Various authors report that 28-35% of the cases of

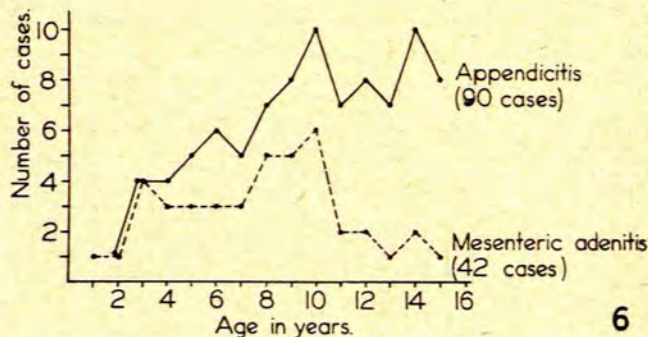


Fig. 6. Acute appendicitis and mesenteric adenitis—age incidence. 132 cases.

acute appendicitis in childhood occur in children under 5 years (about 5% occur in children of less than 3 years and about 20 neonatal cases have been reported).

Table III illustrates the relative incidence of complicated and uncomplicated appendicitis at the various ages in our series and Fig. 6 indicates the increasing frequency of acute appendicitis with advancing years.

Although delay in diagnosis is an important factor in this high incidence of complicated appendicitis, the rapid progress of the disease particularly in young children plays an important part. Both these features are illustrated in Table IV, which shows that in nearly half our patients the diagnosis was delayed beyond

TABLE IV. ACUTE APPENDICITIS: DURATION OF SYMPTOMS—50 CASES

Duration	Unruptured	Peritonitis	Mass	Total
0-12 hours ..	7	—	—	7
12-24 hours ..	10	2	—	12
24-48 hours ..	5	4	—	9
48-72 hours ..	1	5	1	7
3-4 days ..	1	1	1	3
4-5 days ..	—	1	2	3
5-6 days ..	—	1	3	4
6-7 days ..	—	4	1	5
Total ..	24	18	8	50

48 hours and that in almost a quarter of those diagnosed within 48 hours the appendix had already perforated. It is therefore obvious that the diagnosis should be made within the first 24 hours if the mortality and morbidity rates are to be improved. This is possible provided the cases are seen early enough. The main features of the disease in young children which should lead to early diagnosis will be discussed under 4 headings:

1. The Classical Symptoms

The triad of abdominal pain, vomiting and fever in a young child must be regarded as indicative of acute appendicitis until proved otherwise. If the pain and vomiting have lasted for more than 6 hours and an enema has brought no relief, the child should be hospitalized.

It is important to realise that Murphy's sequence of pain-vomiting-fever often does not apply to the child. Any of these three symptoms may predominate and in the early stages any may be absent.

Pain is often difficult to assess, but the majority of the children indicate by their behaviour that they have a belly-ache. Localization is equally poor, and the child usually indicates the site by putting his hand to the umbilicus.

Occasionally the pain is so mild that the patient drops off to sleep and this may also happen in patients who are exhausted by advanced disease; it must be emphasized that the maxim 'Never wake a child at night to have an operation' is not dependable and may lead to serious errors. Sometimes the child may be quite bright and active between spasms of pain, which also tends to fool the unwary; it is important not to be misled by the apparent mildness of the pain. The most dangerous aspect of the pain, however, is its temporary disappearance when gangrene occurs just before perforation. If the child is seen at this stage he may even ask for food or fall asleep quietly; but other features, if looked for, will indicate that something is seriously amiss.

Vomiting is an almost universal symptom although it

may be absent in the first 24 hours—it was present in 84% of our cases. It is often the most prominent symptom and in 30% of our cases it was the first symptom, which contradicts yet another maxim, viz. that pain always precedes vomiting. Indeed, vomiting may precede pain by many hours. There are no distinguishing features about the vomiting until the late stages, when it becomes faeculent.

Fever of a considerable degree may occur in young children even at an early stage. More than half of our young patients had temperatures of over 101°F, and several had temperatures of 102° up to 104°. As a rule the fever tended to be higher in the complicated cases. However, in some of the most dangerously ill patients the temperature was normal or only slightly raised. Not infrequently the temperature on admission was normal simply because of exposure to cold during transport to hospital.

The pulse rate is usually proportionately increased, but it may be comparatively slow. A steady rise is always more significant than the actual rate at a single examination.

2. Unusual Symptoms

Certain symptoms which are uncommon in adults tend to occur in children and may confuse the diagnosis. These are:

(a) *Diarrhoea*, which occurred in 20% of our cases, and is particularly prone to occur in pelvic appendicitis. It may be the first and most prominent symptom (5% of our cases), especially in very young children. In these cases the stool tends to be very loose and often contains mucus, but not blood. Diarrhoea is also a symptom of the late case with a pelvic 'abscess'. Characteristically it comes on 2-3 days after the onset of pain, and consists of small amounts of mucus stained with faeces. There may be a true dysenteric type of stool, which occurs in cases of gastro-enteritis complicated by acute appendicitis. Although this type of case is rare, it very definitely

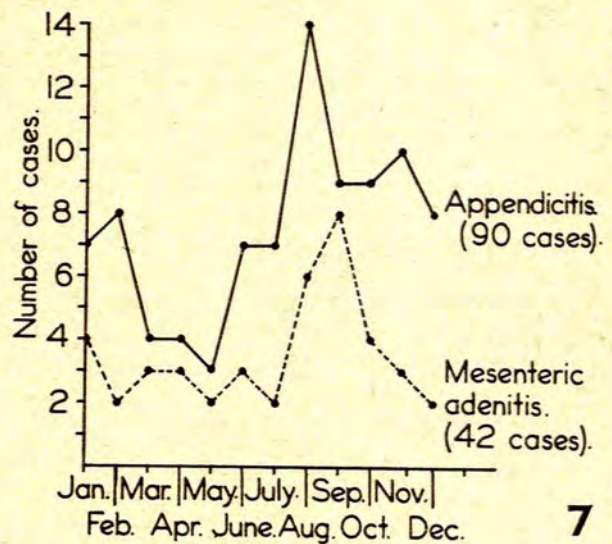


Fig. 7. Appendicitis and mesenteric adenitis—seasonal incidence. 132 cases.

does occur and may lead to great diagnostic difficulties. It should be noted that in most cases the bowels are perfectly normal prior to the attack of acute appendicitis and that constipation is a feature of late cases only.

(b) *Urinary symptoms*, mainly the frequent and painful passage of urine, occurred in 12% of our cases; they may dominate the clinical picture. However, the urine of these cases contains only a few pus-cells and never excessive amounts, while the pain is suprapubic and not urethral.

(c) *Symptoms prior to the onset*. Although most of the children are in good health before the onset of the 'classical' symptoms there are exceptions, viz.:

(i) There may be a history of malaise, peevishness and refusal of food for a day or two before.

(ii) In 15% of our cases there was a history of upper respiratory infection preceding the onset of symptoms. This may have a bearing on the seasonal incidence of appendicitis (Fig. 7) and if it should be treated with antibiotics may be responsible for serious errors.

(iii) The disease may occur during the course of any of the acute infectious illnesses of childhood. One of our patients had measles and two others had chicken-pox.

3. *Misleading Aphorisms*

The fallacy of two of these has already been referred to, viz., 'Never wake a child at night to have an operation' and 'Pain always precedes vomiting'. These require no further discussion.

It has been stated that in children under the age of 6 years the appendix is never the cause of *recurrent* abdominal pain. While this may be so in the majority, there are a fair number (15% of our cases) where the history reveals a 'herald attack' of colic and vomiting 2-3 weeks before the onset of the acute attack. Furthermore, a previous history of one or more acute attacks in the past does not exclude a diagnosis of acute appendicitis.

The old teaching that the presence of headache virtually excludes acute appendicitis is equally fallacious. While it is true that headache is distinctly rare in the early stages, it is not so uncommon later in the course of the disease and sometimes it even precedes the onset of abdominal symptoms.

All these 'negative aphorisms' are of value only in that they tend to stress the rarity of certain features which, if present, should lead the clinician to re-assess the case before making a diagnosis. On the other hand, they are misleading because the inexperienced tend to accept them as 'words of wisdom' without any qualification. They are best erased from all text-books.

4. *Physical Signs*

The final diagnosis obviously rests upon objective evidence of the disease obtained from careful physical examination. In this connection, the following are significant features:

(a) The general appearance does not present anything characteristic and may even be misleading. Some patients tend to adopt a rather characteristic attitude—they lie either on their back with knees drawn up or

curled up on their side. A flushed face, restlessness and frequent changes of postures are uncommon and should lead one to question the diagnosis.

(b) The tongue is almost always furred and the breath is often offensive. Some clinicians even claim that they can spot acute appendicitis 'by its smell'.

(c) Abdominal breathing is soon replaced by thoracic respirations. This is an important indication of 'splinting' of the abdominal muscles, but may lead the unwary into suspecting pulmonary disease.

(d) Tenderness is a constant sign and the most important evidence of local disease. In uncomplicated cases it may be localized to a very small area of the abdomen, and in pelvic appendicitis it is usually only slight. With spreading peritonitis the tenderness spreads and may affect the whole abdomen. The significance of local tenderness must never be underestimated and if it is indubitably present appendicitis must be strongly suspected. It must also be remembered that the appendix may occupy any part of the right side of the abdomen and may even lie in the left hypochondrium or iliac fossa; in only 50% of our cases was the tenderness at the 'classic' McBurney's point.

(e) Muscle guarding is a common and important sign. In the early case there is simply a difference in the tension of the two sides of the abdominal wall, best detected by light palpation with the finger tips. The area of muscle on guard may be quite small and should be sought for carefully by systematic palpation of the whole abdomen. Psoas spasm may be present in retrocaecal appendicitis, but is seldom very marked and usually considerably less than in external iliac adenitis.

(f) Percussion tenderness is a most valuable sign in older children but difficult to assess in those under 5 years. It serves to localize the point of maximal tenderness more accurately than palpation.

(g) A mass, distension or ileus all indicate advanced disease with complications. In the early case there is no distension and bowel sounds are normal, but occasionally (8% of our cases) the thickened appendix wrapped up in omentum may be palpable.

(h) Rectal examination, which is an essential part of the clinical examination, may reveal the presence of a pelvic mass; in 20% of our cases who had developed an abscess, the swelling could be detected *per rectum* only. On the other hand, the procedure causes so much discomfort in small children that it may be misleading as far as tenderness is concerned.

(i) The white-cell count shows gross variations—from 8,000 to 35,000 in our cases. In complicated cases, however, it is almost always raised above 12,500. Furthermore, if an unusual count is found, the clinical evidence should be reconsidered before a final diagnosis is made.

(j) The erythrocyte sedimentation rate is also variable but tends to remain low prior to rupture of the appendix. In several of our cases of acute uncomplicated appendicitis the ESR was within normal limits.

5. *Diagnosis*

Acute appendicitis must be suspected in every child

with a history of belly-ache and vomiting that has lasted for more than 6 hours. If a diagnosis cannot be made when the child is first seen, he should be examined again in an hour or two or, if this is impossible, must be hospitalized for observation.

Localized tenderness is the most useful early physical sign. If it is indubitably present and associated with muscular guarding, laparotomy is demanded.

Conditions which are responsible for most of the errors in diagnosis are acute non-specific mesenteric adenitis and gastro-enteritis. In our experience mesenteric adenitis, which occurs in the same age-group (Fig. 6) and manifests a similar seasonal incidence (Fig. 7), is most frequently mistaken for appendicitis, and in 50% of our cases laparotomy was performed because of uncertainty. It is felt that more harm can be done by 'sitting on' a case of acute appendicitis diagnosed as mesenteric adenitis than by doing a laparotomy for mesenteric adenitis mistaken for acute appendicitis.

Gastro-enteritis presents more difficult problems. It would be a most serious error to operate on a child suffering from gastro-enteritis, while it is also serious to treat a case of acute appendicitis as for gastro-enteritis. The former error is not frequently made but it is common practice to treat children suffering from abdominal pain and diarrhoea with antibiotics. It has already been pointed out that diarrhoea may be a prominent symptom of acute appendicitis and in such cases the antibiotics will only serve to mask the symptoms even further. The most difficult problems are presented by those patients in whom gastro-enteritis is complicated by appendicitis.

In all cases the presence of blood in the stools and excessive, turbulent peristalsis on auscultation favour a diagnosis of gastro-enteritis.

Other conditions which may cause difficulties include acute external iliac adenitis, primary peritonitis, pneumonia, and lesions of the right kidney and ureter, e.g. acute pyelitis.

CONCLUSIONS

From the above considerations it should be obvious that the *first step* towards improving the mortality rate from acute abdominal emergencies should be better education of the public. The dangers of castor oil and other 'home remedies' should be stressed, and nurses, midwives and parents should all be made aware of the potential dangers of 'upset tummies' in small children. Abel and Allen have demonstrated that a great deal can be done by public education, and it is the duty of general practitioners to pursue this most energetically.

Secondly, practising doctors must be made aware that surgical emergencies may occur at all ages from birth onwards, e.g.:

Age	Surgical Emergency
Days	Congenital intestinal obstructions.
Weeks	Pyloric stenosis.
Early months	Irreducible hernia.
Later months	Acute intussusception.
Years	Acute appendicitis

It requires experience to teach us how to handle a small

child, but a great deal can be done by teaching students the importance of a carefully taken history and a painstaking, gentle and unhurried physical examination. Various subterfuges, such as examining the child under the bedclothes or while he is sitting on his mother's lap, are helpful but the final diagnosis still depends on attention to detail, adequate knowledge and careful interpretation of physical signs.

Thirdly, the value of repeated examinations and close observations cannot be over-emphasized. When seen for the first time the child may present a most puzzling clinical picture and the exact diagnosis is often in doubt. It is the doctor's duty not to prescribe 'shot gun' antibiotic therapy in such cases, but to examine the child again after a couple of hours and yet again if there is still doubt. If his other work does not allow of such 'unceasing vigilance', the doctor must arrange for the child's admission to hospital, where he can be kept under close observation and examined frequently and repeatedly. No hospital authority has the right to refuse admission to a vomiting infant or a child with a belly-ache and, even if only one out of every ten admissions turns out to be a true surgical emergency, all the admissions are more than justified.

Lastly, there is the burning question, 'Shall we operate or not?'. This is a problem which should concern the surgeon rather than the practitioner, and in hospital practice, where all facilities are at hand and 'pressure' from the relations and family doctor usually does not exist, the decision is mostly not so difficult. In private practice, on the other hand, there is often a certain amount of bias which renders accurate judgment most difficult; some parents may violently oppose surgical intervention while others may be over-enthusiastic about an operation, and the same applies to many practitioners and paediatricians. Only too often the easiest way out of the difficulty is to 'look and see' rather than to 'wait and see'. In this connection it must be pointed out that every operation, no matter how minor, carries a certain mortality and morbidity and that unnecessary operations cost lives. On the other hand, it may be equally disastrous to 'wait and see' in a case that requires an urgent operation.

In Table V are listed a number of conditions which have brought children to our surgical wards with a provisional diagnosis of acute surgical emergencies. Some of these have already been discussed in relation to acute intussusception and acute appendicitis. Many

TABLE V. CONDITIONS SIMULATING ACUTE ABDOMINAL EMERGENCIES

A	B	C
Extra-Abdominal Diseases with Associated Abdominal Symptoms	Abdominal—Operation Harmful	Abdominal—Laparotomy Justifiable if Doubt Exists
Infections of throat and ears.	Gastro-enteritis.	Mesenteric adenitis.
Pleurisy and pneumonia.	Intestinal colic.	Iliac adenitis.
Osteitis of spine and pelvis.	Pyelitis.	Primary peritonitis.
Meningitis.	Ureteric colic.	Regional enteritis.
Infectious fevers.	Infective hepatitis.	Acute pancreatitis.
Rheumatic fevers.	Typhoid.	
Poliomyelitis.	Abdominal allergy.	
Bornholm disease.	Worms.	
	Faecal impaction.	

of them may give rise to great difficulties in diagnosis and their varied nature serves to emphasize the im-

portance of a thorough and complete physical examination in every case that presents as an 'acute abdomen'. This should always lead to the correct diagnosis of extra-abdominal diseases with associated abdominal symptoms (A) and laparotomy in such cases would be unpardonable.

Under (B) are listed abdominal conditions which may simulate surgical emergencies very closely. These conditions must always be excluded in a suspected case because laparotomy would be most harmful and, if a final decision cannot be made, the wisest policy would be to 'wait and see'.

Under (C) are listed other abdominal conditions which often mimic surgical emergencies so closely that a diagnosis is impossible. Although operative intervention is not the correct treatment for these conditions, a diagnostic laparotomy is often the only method of excluding a more serious surgical emergency, and hence if there is doubt the best policy would be to 'look and see'. Several of these conditions might require a later operation, and laparotomy would not be as harmful as in those mentioned under (B).

SUMMARY

1. It is pointed out that the mortality of acute abdominal emergencies in children still leaves much room for improvement.

2. The excessive mortality is attributed to delay in diagnosis and the causes of such delay are discussed.

3. Common surgical emergencies are discussed and their features illustrated by an analysis of 314 cases treated over a period of 2 years.

4. The diagnostic features of neonatal intestinal obstructions, pyloric stenosis, and irreducible hernia, are briefly discussed.

5. The clinical features and diagnosis of acute in-

tussusception and acute appendicitis are dealt with in some detail.

6. It is concluded that earlier diagnosis could be made possible by (a) education of the public, (b) improved clinical training of students, (c) increasing vigilance with repeated examination of all suspected cases, (d) hospitalization if there is any doubt, (e) timely laparotomy in selected cases.

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