An Address

ON

SOME ASPECTS OF THE ABDOMINAL
EMERGENCIES OF CHILDHOOD.DELIVERED TO THE FIFE MEDICAL ASSOCIATION,
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BY

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THE responsibilities associated with the recognition and the treatment of acute abdominal conditions are at all times anxious and considerable; when one comes to deal with the abdominal emergencies of childhood the responsibilities are exaggerated, because the difficulties are increased.

The majority of my hearers are engaged in general practice; their duties are chiefly concerned with the recognition of these conditions, and therefore I propose to limit my remarks to questions of investigation and diagnosis.

First let me unburden my mind of this sentiment: I have the greatest sympathy with the general practitioner in his dealing with cases such as these, because I believe that his judgement is constantly liable to be biased by two influences to which the hospital surgeon and the specialist are less likely to be exposed: (a) the influence of environment, (b) the influence of constant association with the case—"clinical staleness." Let me for a moment elaborate these two points, because I am convinced that they are important, and the more so as it is difficult to see any remedy which may counteract them.

The influence of environment must constantly make itself felt, and its various bearings are legion—the resistance and objection of the patient to an efficient examination, the attitude of parents, the adverse social conditions (only the other day a doctor in a Highland parish told me that the first intussusception he ever saw he examined in a gipsy's tent by the light of a heather fire). How very different, and, I confess, how much easier it is to arrive at a considered diagnosis when your patient lies in a hospital cot surrounded by the diagnostic aids with which science and mechanics have provided us. That is one reason why I sympathize with the general practitioner, and appreciation of the difficulties cultivates the best of all virtues—a humble spirit.

The second adverse influence I believe to be as important as the first, because its effect is insidious, and the appreciation of it therefore more difficult. I have termed it "clinical staleness," an inelegant term perhaps, but it expresses what I mean. Paget knew the danger of it, for you will find the remark in his *Letters*:

"If I am in constant attendance on a difficult and doubtful case my endeavour is to approach it on each successive occasion as though it were an entirely new problem. I attempt to shake myself free from all previous impressions."

I am convinced that Paget was right, and it is in the doubtful abdominal emergency that the danger is greatest. You see the case and you examine it. You find it difficult to arrive at a definite decision regarding it. You see it again, and you pick up the thread where you left it. Doubt begins to enter your mind. You revise your impressions, but the diagnosis is more uncertain than before. This means delay, and in abdominal emergencies delay is always dangerous. Such is the process which I have crudely termed "clinical staleness." You now ask a consultant to see the case, and he quite readily supplies the diagnosis: it may be because of his greater clinical experience—he has seen similar cases before; it may be because he has made a more thorough examination than you have made; but I assure you in many cases it is because he approaches his subject with a fresh and unbiassed mind, while you have been in some degree the victim of "clinical staleness."

I have said that these two adverse influences are important, because it is difficult to see how they are to be combated. I know one or two simple rules which certainly minimize the danger of the second:

1. When you first see your patient, let your original investigation be as complete as it is possible for it to be.
2. Use the evidence which you have to furnish a diagnosis. I believe that even a wrong diagnosis is preferable to none.
3. If, in spite of your attempts at diagnosis, there is still doubt, err on the side of safety; and, where the diagnosis of acute

abdominal conditions in children is concerned, safety will lie in surgical interference. I prefer to open an abdomen and find nothing wrong rather than to delay my diagnosis until surgical interference is too late.

But these are generalities, and I would speak of something more definite. I have expressed these sentiments, however, because I constantly feel that one sympathizes far too little with the difficulties which the man in a busy general practice has to meet and overcome.

TWO ASPECTS OF THE ACUTE ABDOMEN IN CHILDREN.

If you view the subject from a certain aspect the abdominal diagnosis in children is easier than a similar problem in adults, while from another point of view it is certainly more difficult. Let us consider for a moment the factors which affect the problem and either simplify or complicate it.

1. Simplifying Factors.

(a) *Limited Origin.*—One of the most comforting features in the investigation of the acute abdomen of the child is the knowledge that the pathological conditions which produce the emergency are comparatively few in number. It is obvious that large and difficult groups may be left entirely out of consideration. I may put the matter more concisely by saying that in children emergency surgery of the upper abdomen and of the pelvis is exceedingly uncommon. There are exceptions, of course, but they are rare. In other words, the surgical emergencies of childhood are localized to the large and the small intestines. This fact when realized is constantly of value in the diagnosis of a difficult case.

I have said that there are exceptions to the rule, and it is interesting to notice that the exceptions are examples of congenital errors in development, and therefore become apparent in the first few days or weeks of life. The emergencies of the upper abdomen are congenital obliteration of the duodenum, congenital obliteration of the bile ducts, and congenital stenosis of the pylorus. The inclusion of the last condition as an emergency may be criticized, and of course it does not rank as an acute one, but I believe that it should be included, for I am convinced that when the condition is recognized, early operation offers the best prospect of cure. In the pelvis, imperforate anus in any of its varieties constitutes the common emergency.

This is the first point which I would make—the limitation, with the exceptions which I have stated, of abdominal emergencies to the distribution of the small and large intestines.

(b) *Limited Pathology.*—The second simplifying feature is the recognition that one can practically exclude the malignant conditions and the various chronic ulcerative diseases, both of which are fertile in the production of adult abdominal emergencies, but both of which are practically negligible in the abdominal surgery of the child.

(c) *The Psychological Factor.*—The third simplifying feature is of a psychological nature. Children are largely free from the mental and nervous conditions which in the adult so often lead to the exaggeration of abdominal complaints, or even to the creation of phantom signs and symptoms. If the child is old enough to describe his sensations his description is generally correct. An experienced clinical observer, whose knowledge of the surgery of children is based on twenty-one years' work in a children's hospital, has repeatedly told me that, when investigating a possible case of appendicitis in a child he attaches the main importance to the single instruction, "Point to the place where you have the pain." He very rarely has reason to question the diagnosis which the child himself really makes.

There are other simplifying features, but I have mentioned the most important. This is the bright side of the picture; there is another, however—the difficulties which beset the diagnosis. I shall mention these in less detail.

2. Complicating Features.

(a) *Difficulties of Examination.*—In young children there is difficulty in obtaining a subjective history. Such a deficiency may often be supplied by the parents, more especially by the mother, and while the maternal instinct often makes a mother a shrewd clinical observer, we have to exercise discretion in the degree of value we attach to the story. There is further the difficulty which exists in obtaining the confidence of the child to such a degree as to permit of an efficient examination. A certain amount of tact in dealing with older children generally overcomes this obstacle—the spoilt child is the type which is embarrassing. Where young children are concerned, and such a question as that

of an abdominal tumour (intussusception) falls to be considered; there should be no hesitation in producing light anaesthesia, merely sufficient to induce relaxation of the abdominal musculature. Many mistakes will be avoided if this plan is followed. I use the method of light anaesthesia in the investigation of inflammatory abdominal conditions also. There is a type of child it is impossible to comfort, who resists with all the musculature at its command the slightest attempt at examination. A few drops of chloroform induce a light slumberous condition, but the stupor is so superficial that local muscular rigidity can be detected, and the information so obtained is infinitely more reliable than the erratic manifestations of a struggling child. I would, of course, remind you of the importance of the fact that to ensure the desired effect the anaesthesia, if I may so call it, must be of the lightest possible description.

(b) *Rapid Progress of the Disease.*—The time factor is worthy of closer attention in children than in adults; certain of the acute conditions may progress with great rapidity in the child, such as intussusception, acute appendicitis, and intestinal obstruction. Resistance has not yet reached the stage which it does in the adult body, and the sudden flooding of the child's system with powerful toxins may rapidly lead to a fatal termination. The lesson is specially impressed upon one in dealing with acute intestinal obstruction, where, after a certain stage is reached, and that quickly, there is an extremely rapid collapse.

But these questions are, after all, of general interest, and it would seem as though I had difficulty in getting down to the more essential details of the discussion. Let me therefore tabulate the common clinical conditions which we may group together as constituting the "acute abdominal emergencies of childhood."

- A. Acute appendicitis.
- B. Pneumococcal peritonitis.
- C. Intussusception.
- D. Acute intestinal obstruction.
- E. Volvulus.
- F. Strangulated hernia.

They are not numerous, and you will observe the truth of the statement that they are localized to the distribution of the large and small intestines. I propose to deal with each of them in turn, not in any detail, but rather with the question of diagnosis continually before us, and to bring out one or two points of special interest in regard to each.

A. ACUTE APPENDICITIS.

I have no intention of announcing to you the well-known features of the ailment. In the comparatively short time which has elapsed since it was first described it has probably received wider literary notice than any other surgical condition, but I would ask you to consider one or two aspects of the disease which have not always received the attention they merit.

1. *There is no Age Limit of the Disease.*

In my comparatively short experience I have seen five cases of acute appendicitis occurring in breast-fed babies at relative periods of four, six, six and a half, seven, and nine months, and the pity of it is that in every one of these cases the condition was recognized too late to save life. In every case the same erroneous observation had been made, "It cannot be appendicitis; the child is too young." For one of these mistakes I must assume personal responsibility, but it taught me a painful lesson, and I am anxious that others should not fall into a similar error. There is this comforting side to the age question, that owing to the comparatively small amount of appendicular lymphoid tissue which is present in the early months of life the disease does not assume the fulminating character which it may do in the older child. The greater reason therefore that it should be efficiently treated in the time which is available.

2. *The Relation between Appendicitis and the Biliary Attacks of Childhood.*

My surgical suspicions are always aroused when I am told that a child has been constantly subject to biliary attacks. My suspicions fall upon the appendix. As the appendix may be responsible for the appendicular dyspepsia of the adult, so it is often the feature at fault in the child. In the latter, however, the irritability of the juvenile mucosa is reflected in vomiting, while in the former the evidences are more chronic; possibly, too, an imperfect association of the sympathetic nervous system of the child may play a part.

The essential point is the realization of the fact that repeated attacks of sickness in a child should at once suggest that close attention be paid to the condition of the appendix. If this is neglected, a severe perforating attack may be the result, with all its dangerous and unpleasant accompaniments; if an acute attack should not develop, the digestive system, and, in fact, the general health, becomes weakened and debilitated.

3. *The Order of the Occurrence of Symptoms in Appendicitis.*

It is largely due to the work of Murphy that the significance of the sequence of signs and symptoms has been realized. He classed the features in the following order as regards the time of their appearance:

- (a) Pain—epigastric, umbilical, sometimes general.
- (b) Nausea or vomiting.
- (c) Local iliac tenderness.
- (d) Fever.

The features occur almost without exception in the above order, and when the order varies doubt may justifiably be entertained as to whether the condition is actually one of appendicitis. A recognition therefore of the relative time occurrence of the various features is an important factor in arriving at the diagnosis.

It is interesting to note the explanation of the various features. They are, of course, perfectly well known to you, but I would refresh our memories on the point.

The causes of the early pain (and you will remember that it is referred to the umbilicus or epigastrium) are two—exaggerated peristalsis of the appendix and painful contraction of the caecum. Obstructive types of appendicitis—such, for example, as are associated with concretions—are accompanied by severe referred pain, because in these cases the peristalsis is especially well marked. It has been said (though I cannot vouch for the accuracy of the statement) that in these obstructive varieties the early pain is epigastric in position.

The second feature is the vomiting, and you will notice that it appears subsequent to the early pain. It is reflex in origin, the result of an antiperistaltic wave in the stomach and the emptying of that viscus. There are two points in regard to the vomiting to which I would allude. Though in adults it may be absent, in which case its place is taken by nausea, in children vomiting occurs almost without exception. The second point is that, if vomiting is especially severe, it means a distension of the appendix with contents, and in all likelihood early perforation of the organ.

Local iliac pain and tenderness is third in the order of sequence, and its comparatively late appearance has two explanations: at first it tends to be masked by the more generalized pains, and its full degree is not appreciated until the overlying peritoneum becomes irritated and inflamed. Accompanying the local tenderness there is muscular rigidity. The closer the appendix lies to the parietal peritoneum the more marked is the rigidity, and the distribution of the muscular rigidity is generally an indication of the position of the appendix. The last point is well illustrated in such a condition as retrocaecal appendicitis, when rigidity of the anterior muscles is slight or even absent, while the contraction can be made out in the muscles of the loin.

In connexion with the occurrence of fever, its appearance is comparatively late, because its development denotes an actual bacterial infection and the absorption of toxic products.

4. *The Variation of Signs and Symptoms According to the Position of the Appendix.*

I refer to this point because we sometimes forget how striking may be the variations in symptomatology dependent on the situation of the appendix.

The Pelvic Appendix.—If the appendix is dependent and lies low within the pelvis abdominal symptoms may be comparatively few. There are three features, however, one or all of which may be present—suprapubic tenderness, frequency with pain on micturition, and diarrhoea. The last two symptoms depend upon the proximity of the inflamed appendix to either the bladder or rectum. In all cases of pelvic appendicitis rectal examination shows severe local tenderness. I would allude to another feature sometimes present in pelvic appendicitis—the so-called "obturator test." If an inflamed pelvic appendix lies in relation to the obturator internus muscle it produces rigidity of that muscle, and the rigidity is demonstrated by the inability to rotate

the flexed thigh inwards and by the pain which is produced within the pelvis when the movement is attempted.

The Retrocaecal Appendix.—If the appendix lies in a retrocaecal position there may be very real difficulty in the interrogation of the symptoms. The situation is altered by the deep position of the appendix, and by the fact that in some of these cases it is actually an extraperitoneal organ. I should say that the distinctive points of a retrocaecal appendicitis are the comparative slightness of the symptoms in the early stages, the possible absence of vomiting (and this is one of the few instances in children in which appendicitis may be unaccompanied by vomiting), and the tenderness and rigidity of the loin. There is one evidence of retrocaecal appendicitis which, in my experience, is practically constant, and to which I believe insufficient attention has been paid. When the inflammation of the appendix causes oedema of any contiguous part of the abdominal parietes (posterior, anterior, or lateral), muscular rigidity invariably appears. In retrocaecal appendicitis rigidity of the psoas and iliacus muscles results, and this rigidity may be demonstrated by attempting to extend the right thigh while the patient lies on the left side.

The Mesenteric Appendix.—A third situation which may be accompanied by distinctive signs arises when the appendix lies in relation to the lower end of the ileum. It most frequently occupies a position behind the bowel and beneath the mesentery. Three or four features suggest this position of the appendix—umbilical pain with marked central muscular rigidity, early and persistent vomiting, severe small intestine colic, and early abdominal distension. These distinctive features exist because this variety of appendix is so apt to be accompanied by early small intestine semi-obstructive symptoms.

The High or Hepatic Appendix.—Finally, we may have distinctive signs in that variety of appendicitis which occurs with an undescended caecum. It is really a congenital abnormality in so far as the caecum retains a high position beneath the liver, while the appendix is foetal and terminal in type. This variety may be most disconcerting, because in its local features it simulates so exactly a basal pneumonia or a diaphragmatic pleurisy. I shall have occasion to allude to it again when I speak of the question of diagnosis.

5. The Differential Diagnosis of Appendicitis in Children.

Let me remind you that in any problem of diagnosis two questions fall to be discussed, and these arise in appendicitis in common with other conditions. There is the actual diagnosis—I know by certain signs and symptoms which the case presents that this is an example of appendicitis. But there is the problem of differential diagnosis. What are the conditions which resemble appendicitis, and how am I able to exclude the possibility that I am dealing with one of these conditions?

I have nothing to say in regard to the question of the actual diagnosis of appendicitis; you are as familiar with the problem as I am. I would remind you of the importance of noting the order of appearance of symptoms, and of the variability of local signs according to the position of the appendix. But I would tell you something regarding the differential diagnosis in children. It may be that it is a record of error, but one's mistakes are among the most valuable lessons if we only possess the wit to benefit by them.

The subject may be said to resolve itself into the question, What are the conditions in children which we are liable to mistake for appendicitis? I have said that this may be considered a record of error, and I confess that I have made most of the possible mistakes I record, but to know the possibilities of misdiagnosis is a step towards their avoidance in future. Let me record the possible errors one by one.

(a) *Acute Pyelitis.*—This condition is a fruitful source of confusion. Your attention is directed to a female child—and note the sex! A history is obtained of indefinite abdominal pain, of high temperature, of vomiting and constipation, of marked general disturbance, and frequently of rigors. On examination one is struck with how ill the child appears to be, and there is a degree of general irritability which is typical of the disease. Abdominal examination reveals local tenderness, with a certain degree of muscular rigidity. In certain respects the case resembles one of acute appendicitis, but it is really an example of acute pyelitis. The main safeguard against error is the examination of the urine, and, of course, such an examination should

be a matter of routine in every abdominal case. It is possible that such an examination is forced upon you by the occurrence of dysuria and frequency of micturition, but in many cases these regional signs are absent. The urine is opalescent and acid, a deposit is slow to form, albumin is present, but slight in amount, and if microscopical examination is made of a drop from the middle of the specimen—not from the deposit, and this is an important detail—pus cells and colon bacilli are found to be present.

But, apart from the characteristic condition of the urine, certain points should arouse suspicion—the female sex (in 75 per cent. of cases); the early and high temperature, remittent in type; the marked degree of illness in the absence of severe local signs; the irritability, which is not in keeping with the apparent prostration; the situation of the abdominal tenderness (it is over the pelvis of the kidney and much less marked in degree than the features of acute appendicitis); finally, the order of appearance of symptoms differing from that of appendicitis. Of course there is a great deal more in the differential diagnosis than I have stated, but perhaps I have said sufficient to draw your attention to the possibility of the error. It is a disconcerting mistake to make because pyelitis yields so readily to alkalization of the urine.

There are two minor points I would recall to you, and I have finished with the question. Remember that the symptoms may have lasted for a few days before pus appears in the urine, though colon bacilli are present from the beginning, also that in a unilateral case which has existed for a few days pus may disappear from the urine because the ureter has become blocked.

(b) *Cyclic Vomiting.*—I have put this condition second because it is a frequent source of error, but more especially because it is so important that the error should not occur, operative interference and the administration of an anaesthetic being extremely detrimental to the condition—in fact, they may be the deciding factors in a fatal termination. A child becomes pale, irritable, and tired-looking, and complains of indefinite pain, which is often localized to the pit of the stomach; there has been a preceding period of constipation and flatulence. Then, and often with extreme suddenness, vomiting appears, and it is most distressing in its frequency and severity. The error in diagnosis is most likely to occur if one first sees the child during the maximum period of the attack. The child looks drowsy and exceedingly ill, the abdomen is retracted, and from the persistent retching and vomiting it may be tender and even slightly rigid to the touch. It is then that the error may arise, but it should not. Similar attacks may put one on one's guard. There is an absence of localizing abdominal signs, the breath shows the characteristic odour of acetone, the appearance of the child suggests intense illness without any definite explanatory feature, the urine (and again there is illustrated the importance of routine examination) shows the presence of acetone, together with casts and small quantities of albumin and blood. It is possible that some of you may question the likelihood of this condition being confused with appendicitis, but I assure you the error does arise, and in many cases the dissimilarity between the two conditions is not so marked as you may imagine.

(c) *Ileo-caecal Lymphadenitis.*—Some nine years ago, when interested in certain aspects of glandular tuberculosis, I drew attention to a condition of the abdominal glands which may closely simulate lesions of the abdominal viscera. The condition is most characteristically seen in the ileo-caecal region. The sequence appears to be that the glands become the subject of tuberculosis; as a result, the bacteria-resisting properties are diminished, and from time to time there are attacks of subacute lymphadenitis, which no doubt arise from an intestinal absorption with which the gland is now incapable of efficiently dealing. The pathological process is comparatively common in children, and when it occurs it may simulate very closely an attack of appendicitis. The characteristic points in the history are as follows: There is frequently a preceding attack of diarrhoea or intestinal disturbance, and the association of this is important, because the resulting alteration of the intestinal flora is possibly the exciting feature of the process. Severe abdominal pain appears—there may be vomiting, though such is by no means constant, there is considerable general disturbance and fever. The symptoms rarely last for more than twenty-four to forty-eight hours, when they abate with characteristic suddenness. How is one to distinguish such a case-history from that of appendicitis? I confess it is often exceedingly

difficult—sometimes it is impossible. One or two features may be suggestive.

In lymphadenitis the pain is local from its commencement—it is never referred. This is a point, however, which in young children it may be impossible to verify. The tongue usually remains clean, the attack subsides with characteristic rapidity; fever introduces the illness, while in appendicitis temperature is comparatively late in its appearance. It may be possible to palpate the enlarged tender glands.

But I fully realize that the points I have mentioned, while difficult to verify, are capable of considerable variation, and, if your experience tallies with mine, the diagnosis of the great majority of these cases will be made after they have been operated on for what was considered to be acute appendicitis. In view of the danger in children of the "wait and see" policy where appendicitis is concerned, it is better that things should be so.

(d) *Basal Pleuropneumonia and Diaphragmatic Pleurisy.*—If an inflamed appendix occupies an abnormally high position, such, for example, as is associated with an undescended caecum, difficulty may arise in distinguishing this variety of appendicitis from the acute pulmonary conditions which involve the base of the lung and the upper surface of the diaphragm. There are the commonly quoted distinguishing points, that in pleuropneumonic conditions the initial temperature is high (103° to 105°), the respiration pulse ratio is increased, the *alae nasi* are working vigorously. But distinct from these and apart from peculiarities of onset and history, there are two tests which we find of considerable value in doubtful cases. The first is that of "opposite side palpation"—the hand is pressed firmly into the left side of the abdomen. If the origin of the pain is abdominal an accentuation is referred to the site of the infection; if, on the other hand, the pain is thoracic no alteration is produced by the left-sided pressure.

The second test is of great value, though I confess it may be difficult to demonstrate in young children. It is sometimes called the "collar test," and it has a developmental basis. The diaphragm develops in the region of the fourth cervical segment, its musculature is derived from this segment, and its nerve supply (the phrenic) is also derived from the segmental nerve (the fourth cervical). In later development the growth of the thoracic contents displaces the muscle caudalwards, and it ultimately takes up its position at the thoraco-abdominal junction. Its connexion with the higher segment, however, is extremely valuable from the diagnostic point of view, for any irritation of the diaphragm is referred along the distribution of the fourth cervical nerve, and an area of hypersensibility can be marked out which is, roughly, of a collar shape—hence the name given to the sign. In high appendicular infections the collar sign is absent, while in pleuropneumonic conditions it is present, though its demonstration in children may be difficult. It is well to remember that, if the high appendicular infection extends to such a degree as to involve the diaphragm, the collar sign will then become positive.

Of course there are many other conditions which may complicate the diagnosis of appendicitis in children, but I have mentioned these four because in my experience they are the most common sources of error.

B. PNEUMOCOCCAL PERITONITIS.

It is a matter for regret that so little is known regarding the etiological pathology of this condition. It is the most fatal and acute of all the abdominal emergencies of childhood; I have seen death occur within twenty-four hours of the onset of the illness. We meet with the disease under two conditions—there is a primary variety, in which, so far as we know, the original manifestations of the disease are abdominal, and there is a secondary type in which a pneumococcal infection previously existed in some portion of the body, most commonly in the chest, the abdominal manifestations in this instance being secondary.

It is the primary type which is of such special interest. This variety is apparently limited to the female sex, and it is believed that the path of infection is through the vagina and the Fallopian tubes. Such a route would explain many distinctive features of the disease—the sex association, the commencement of the condition as a pelvic peritonitis, the age period, and the occurrence of the infection among the less hygienic classes of society. The last two points require a word of explanation. The age of election at which the disease occurs is five years. It has been suggested that it is

at this age that the genitalia becomes sufficiently patent to admit the infection. The further suggestion has been offered that at this period an alteration takes place in the vaginal secretion, its reaction altering from acid to alkaline, and so permitting bacterial infection. The relationship of the disease to unhygienic surroundings is beyond question. I believe it will be universally acknowledged that the condition is only met with in hospital practice, and it impresses one with the importance of insisting upon the most careful hygiene of the genitalia of the female child.

The clinical features of the disease are characteristic, and the appearance of an acute case leaves a lasting impression. The following actual history is typical of many.

A healthy female child, aged 6, partook of a hearty breakfast, and at 10 a.m. was playing with her companions. At 10.30 she returned home complaining of intense abdominal pain.

Throughout the morning hours she was repeatedly and violently sick, and there were several attacks of diarrhoea. During the afternoon her condition became aggravated in that she was more seriously ill, though the pain and sickness abated and the diarrhoea ceased. She became delirious, and when she was admitted to hospital the following morning, within twenty-four hours of the onset of the illness, she was practically moribund. She died at 11 a.m. on the second day of her illness.

Fortunately all cases do not demonstrate such a degree of intensity, but the quotation illustrates the ravages of which the disease is capable.

There would appear to be a definite sequence in the disease—the invasion of the pelvic peritoneum with a virulent strain of pneumococci, the rapid development of a pelvic peritonitis; diarrhoea and pain on micturition are direct evidences of such. From this point the course of the disease varies. In cases of intense infection and low resistance the peritonitis becomes general, septicaemia quickly supervenes, and it is the last feature which produces such a rapidly fatal issue. In a more promising type of case the infection is limited to the pelvis, the more acute characters of the disease subside, and the case acquires the features of a pelvic abscess.

To distinguish such cases from other examples of general peritonitis may be a matter of difficulty. In the early stages, an acute pelvic peritonitis in a female child, accompanied by diarrhoea and intense general disturbance, should suggest a primary pneumococcal peritonitis. In the later stages of the more acute type the appearance of the septicaemia overshadows the local abdominal signs. There is a slight cyanosis, the *alae nasi* work vigorously, there is delirium, with intervals of unconsciousness.

I have purposely avoided any reference to treatment in discussing these conditions, but I would say that early operation affords the only prospect of recovery in the great majority of cases. It is necessary to establish drainage, and this should be done with the utmost rapidity under gas and oxygen anaesthesia.

During the later stages of the disease we are beginning to have encouraging results from the use of blood transfusion.

C. INTUSSUSCEPTION.

You are all perfectly familiar with the symptoms and physical signs of this condition—the colic, the appearance of blood and mucus from the rectum, the formation of a mobile abdominal tumour. But there are several features of interest which do not generally find their way into textbooks.

Two potential features govern the occurrence of intussusception—a local point of irritation within the bowel (generally the lower end of the ileum) and abnormal laxity of the colon attachment.

The question of irritation is interesting. If you consult the records of the Children's Hospital you will find that a large percentage of the cases of intussusception originate during the week end, and the explanation appears to be as follows: the father receives his weekly wages on Friday, some special dainties are secured in which baby unwisely shares, and, before the week-end has elapsed, the infant has had every opportunity of developing intussusception. This, further, is the explanation of the fact that the disease affects the children of the poor. During the nine years of my association with the Children's Hospital in Edinburgh over 300 cases of intussusception have been under treatment, and in this period I have only met with five cases in private practice. In respect of feeding, therefore, it is to some extent a preventable disease.

The other etiological point is in regard to the abnormal laxity of the colon attachment. I often remark to students that the intussusception of to-day is the neurasthenic

viscerotonic of to-morrow. There are these two points of interest in regard to the etiology of the disease.

Of the various pathological varieties the one which we most dread is the ileo-colic. In this type the ileum is projected through the ileo-caecal opening, and the tension of the orifice, together with the thickness of the small intestine mesentery, leads to earlier gangrene than in the other varieties. The colic variety is the most promising, because it is at first incomplete in so far as the obstruction of the bowel is concerned.

The Diagnosis of Intussusception.

As a rule the diagnosis of intussusception is easy, but there are two pitfalls to which I would direct your attention. The first is in regard to the question of the passage of blood and mucus. We attach great importance to the presence of blood and mucus in the bowel, and I would remind you that in the enteric or small intestine intussusception, which later becomes the ileo-colic, blood may not appear until late in the history of the disease, if indeed it appears at all. The explanation of this peculiarity is that the irritation of the enteric intussusception produces a closure of the ileo-caecal valve, and the closure leads to a retention of the blood. The second pitfall occurs in the colic variety. In this type the disease is chronic, it may last for weeks, and during that time the obstruction is incomplete, while the extravasation of blood is small. Thus in this variety the bowel may appear to move with a loose blood-stained motion, though a large intussusception is present.

Regarding the question of the differential diagnosis, there should be little difficulty in the distinction from acute enteritis and rectal prolapse. In acute enteritis the absence of a tumour, the absence of persistent vomiting, and the occasional presence of blood in a liquid stool is sufficient to characterize the condition. In prolapse of the rectum the question is purely one of careful examination.

But in distinguishing intussusception from abdominal or Henoch's purpura the problem is a much more difficult one. A surgeon of extensive experience once told me that on five occasions he had failed in his diagnosis regarding possible intussusceptions. On four occasions he had opened the abdomen to find that a Henoch's purpura was the cause of the symptoms; on the fifth occasion operation was negated under the impression that it was purpura, but, as events showed, it turned out to be an intussusception. Often, I assure you, it is no easy matter to come to a decision. If I may be allowed to trouble you for a moment with a personal reminiscence—one of the first emergencies with which I had to deal in the Children's Hospital was an example of Henoch's purpura. It was a regrettable experience, and it taught me a lesson which I have never forgotten.

A boy of 7 was admitted with signs and symptoms suggestive of intussusception—intermittent attacks of colic, vomiting, the presence of a tender tumour in the left iliac fossa obviously in relation to the colon, the appearance of blood and mucus from the bowel. I did not notice a faint purpuric eruption, and to this day I have regretted that want of observation. Laparotomy was done, and it revealed a local haemorrhagic infiltration at the junction of the iliac and pelvic colons. Surgical operation under such conditions is, of course, nothing short of a disaster.

Suspicious of Henoch's purpura should be entertained in older children (and more especially boys) when the abdominal colic is indefinite, when no true obstruction exists, when there is an indefinite abdominal tumour, which, however, is fixed and tender, above all when a scanty purpuric eruption appears in the skin, or haemarthrosis is present, and when rectal examination shows the characteristic oedematous sensation of an infiltrated mucosa.

D. ACUTE INTESTINAL OBSTRUCTION.

This subject is too extensive to deal with in a paper of this description. I would remind you that in children the great majority of these cases, apart from intussusception, have abdominal tuberculous disease as their origin.

In the child the first sign of obstruction should entail the serious consideration of early surgical intervention. It is very undesirable to wait until the obstruction becomes acute. Children stand acute obstruction very badly, but if operation be carried out during the chronic or even the subacute stage, brilliant results may be obtained. Some variety of exclusion operation may then be done, and all the disadvantages of enterostomy, so fatal to children, may be avoided.

There should be little doubt in the diagnosis of intestinal obstruction, though on several occasions I have seen difficulty arise in distinguishing acute obstruction from cyclic vomiting. From your point of view the impression I most desire to make is that where children are concerned the large majority become obstructed because of abdominal tuberculosis. It will be exceptional for the obstruction to be acute from the beginning—weeks, possibly months, will elapse during which the signs will be those of a chronic obstruction, and this is the period during which surgical assistance should be enlisted, because at this period operation offers excellent results. Do not delay until the condition becomes acute.

E. VOLVULUS.

The volvulus of children differs from that of adults in so far as it is ileo-caecal in type; in adults, as you will remember, it is most commonly the sigmoid colon which is affected. To some extent it may be claimed that the disease in children has a congenital origin, for the condition cannot very well occur unless the colon has a long and loose attachment. It is interesting that in children both volvulus and intussusception should have a close etiological relationship to a loose mesocolic attachment of the ascending colon.

The method by which the volvulus is actually produced must remain a matter of surmise. The suggestion has been put forward that there is a preceding period of constipation. The first step in the formation of the volvulus is said to be due to some sudden movement, as turning quickly in bed or playing with other children. When the torsion has been established it is accentuated by the violent peristalsis which invariably results. In the child volvulus gives rise to the most acute and distressing symptoms. The pain is intense, the sickness is early and urgent, collapse quickly appears, and in the absence of operative interference a fatal issue rapidly supervenes.

F. STRANGULATED INGUINAL HERNIA.

Where children are concerned this title is a misnomer. By using the term "strangulation" we mean an interference with the blood supply of the herniated tissues, and it is remarkable that this is an exceedingly rare event in the clinical history of the hernia of the child. I have looked over the records of 3,000 cases of inguinal hernia which have been under treatment in the Edinburgh Children's Hospital, and among such a large number there has been no instance of strangulation as we find it in the adult. Many of the cases have been irreducible, but even in those which have been irreducible for several days strangulation had not resulted. In one instance there were two small devitalized patches on the wall of the bowel at the level at which the external ring exerted pressure, but local invagination was sufficient to deal with the condition.

This clinical detail should give you considerable comfort, but I do not bring it forward with the suggestion that it should induce you to delay operation in these cases. If a hernia is irreducible, the sooner it is operated on the better; but, if your position is such that operation is impossible, you may delay with an infinitely greater sense of security than would be the case where adults are concerned.

CONCLUSION.

As I said at the beginning, I have made no attempt to deal exhaustively with the features of the acute abdomen of childhood; such a subject is too vast to be covered in a single lecture. I have tried instead to present to you certain aspects of the problem which may be of interest to the general practitioner. My purpose will have been served if I have been able to make any easier for you a problem which must always be an anxious and a difficult one.

THE papers set at the third M.B., B.S. examination of the University of London, held last October, have been printed and can be obtained from the University of London Press, 17, Warwick Square, E.C.4, price 1s., postage 1d. extra.

THE Fuel Research Board is instituting a systematic investigation of coal seams at present being worked or developed, with the view of ascertaining the suitability of each particular coal for those purposes for which its individual qualities render it most adequate—gas making, coke making, steam raising, or for domestic use. It has recently recognized the Lancashire and Cheshire Coal Research Association as its representative body in those districts.