APPENDICITIS IN THE YOUNG CHILD

BY

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While appendicitis below the age of 3 years is not uncommon it is so frequently overlooked in the early stages and so often complicated when diagnosed that I am placing on record the common clinical features and problems encountered in dealing with 42 children with appendicitis in this age group. The object of this paper is to help the family doctor to understand more clearly the clinical pattern and problems of appendicitis in the young child, to indicate how it differs from that in the older child and so enable him to establish a diagnosis before complications have developed. It is mainly by early diagnosis and prompt treatment that the mortality and morbidity will be lowered. The situation is that uncomplicated appendicitis can be successfully treated, but complicated appendicitis, especially if general peritonitis be present, is a very dangerous illness with a high mortality.

The incidence of the disease in young children is shown in our figures from the Children's Hospital, Melbourne. Between 1935 and 1940, 1,487 children under the age of 14 years were treated for acute appendicitis, of whom 42 were under the age of 3 years. One patient was under 1 year, 11 between 1 and 2 years, and 30 between 2 and 3 years of age.

Pathological Features

In this group of 42 patients three main morbid anatomical states were found at operation.

1. *Acute Uncomplicated Appendicitis*.—In 6 patients the acutely inflamed appendix was lying free in the general peritoneal cavity. Although gangrene was present in several, the appendix was unruptured. In some a little clear or slightly turbid fluid was found in the peritoneal cavity.

2. *An Inflammatory Mass*.—In 21 patients an inflammatory mass was found. This mass was the result of a local peritonitis, the appendix being walled off from the general peritoneal cavity by fibrinous adhesions between intestinal loops and peritoneum. The appendix was usually gangrenous and perforated, and a small abscess was commonly present. The omentum by reason of its immature development at this age played a negligible part in localizing the spread of the inflammation.

3. *A General Peritonitis*.—In 15 patients a general peritonitis was present, the result of either (a) rupture of an obstructive type of appendicitis with dissemination of appendicular contents over the peritoneal cavity, or (b) extension from a local peritonitis with an abscess.

It is thus very evident that appendicitis in this young age group, unlike that in older children, is usually complicated by either a local or a general peritonitis. The two important factors accounting for this are the long time interval from the onset of symptoms to the diagnosis and the more rapid progression of the inflammatory process to gangrene and perforation. The small immature omentum also fails to assist in sealing off the appendix effectively from the general peritoneal cavity. While it is uncommon for acute appendicitis to become complicated in under 24 hours, the variability of the rate of progress of the inflammation in this young age group makes it difficult to predict in any one patient what precise morbid state will be present at any particular time. Three examples from this series illustrate this variability: one patient who had been ill for as long as 60 hours had an uncomplicated unruptured appendix; another patient who had been ill for only 24 hours had an inflammatory mass; while another who had been ill for a period as short as 4 hours had a general peritonitis, the result of rupture of an obstructive type of appendicitis.

Clinical Features

Bellyache and *vomiting* are the predominant symptoms. The illness almost always begins in a child who has been quite well. Not infrequently the initial symptoms may be of a general nature—peevishness, irritability, feverishness, refusal of food, and vomiting. Usually within an hour or two the mother is made aware that the child has pain or discomfort in the belly. He may wince, whimper, or cry and say that his "tummy is sore," or he may hold his hands to his belly. He will want to be comforted. Owing to their very limited powers of expression these young children are unable to give any accurate information as to the nature, quality, or situation of the pain. This is a matter of secondary importance, the significant fact being that the child shows by his behaviour that he has pain in his belly. No fewer than 36 of the 42 mothers were quite definite that their children had pain, discomfort, or soreness in the belly. In 21 of the 36 the pain appeared to come in definite spasms, during which the child would whimper or cry. In 15 of the 36 the pain seemed to be of a more constant nature. It is important to appreciate that the pain may be quite mild. These children may be very bright and active in between the spasms of mild bellyache. We should not be lulled into a sense of false security in interpreting a mild pain as a pain of no importance.

Vomiting is an even more constant symptom than pain; 39 of the 42 patients vomited repeatedly. There are no distinguishing features about the vomiting in appendicitis: it may precede or follow the onset of pain. Late in the illness with peritonitis the vomiting may be faeculent.

I cannot sufficiently stress the clinical significance of continued abdominal pain and vomiting in the young child. Appendicitis should at once be suggested as a probable cause.

Bowel Function.—Constipation is by no means the rule, and in almost half of the patients the bowels acted normally. Of the patients 14 were constipated, while 9 had diarrhoea.

Disturbance of Urination.—In 3 children with pelvic appendicitis and local peritonitis the frequent and painful passage of urine was the outstanding feature of the illness, and in one patient retention occurred. It is quite likely that the pain was lower abdominal and was simply associated with frequent micturition.

Examination

In no other field of medicine is there greater need of patience and gentleness than in the examination of these young patients. Examination at the first attempt is often unsatisfactory owing to the child being fretful, irritable, and resentful of being disturbed. To persist with an immediate examination is worse than useless, for reliable information will not be obtained and examination later may be made more difficult. Call again in half an hour or wait over a cup of tea, and by this time the child is often co-operative and examination easier. Should the child still be fretful and resentful the practitioner is wise to refer the patient to a hospital, where expert opinion can be obtained. The practitioner as a rule has not the necessary time to call at half-hourly or hourly intervals at a patient's home until a satisfactory examination can be made. These patients cannot be safely left till the morning to see what develops. In hospital it may be necessary in a few cases to administer either a sedative or a light ether anaesthetic to obtain a satisfactory examination of the abdomen.

While one is gaining the confidence of the child an assessment of the state of the general health and condition is made. Some of these patients have a characteristic attitude in that they lie still either on their back or with their legs

curled up. Often they resent being disturbed or asked to sit up, as active contraction of the abdominal wall is painful. In this they differ from children with acute infections such as tonsillitis or otitis media or gastro-enteritis, who are restless or change their posture frequently.

Abdominal examination is the most important and most difficult part of the procedure. The two chief abdominal signs of appendicitis are tenderness and rigidity, and they are rarely absent. Valuable evidence of rigidity is obtained from observation of restricted movement of part or whole of the abdomen. Palpation is best carried out with the warm hand pressing gently on the abdomen and quietly feeling with the finger-tips as the child breathes. Always begin palpation in the upper and left side of the abdomen in the area where you do not suspect tenderness, and gradually move to the suspected areas of tenderness—namely, the right lower quadrant of the abdomen, the suprapubic region, and the right flank. Tenderness is determined by observing whether the child winces or attempts to pull away the palpating hand when pressure is applied to a focal part. It is better not to ask a child of this age whether a particular area is or is not sore. The reply may be misleading. Objective evidence of tenderness is much more reliable than subjective evidence. The usual site of tenderness is in the right lower quadrant of the abdomen. Suprapubic tenderness, especially on the right side and when pressure is directed towards the pelvic cavity, is quite common owing to the frequency of pelvic appendicitis. With spread of the peritonitis the tenderness may extend over the entire abdomen. While tenderness is usually very definite in most patients it may be slight in others, especially in the patient with pelvic appendicitis. The degree of tenderness is not reliable in assessing the precise state of the inflammatory lesion inside the abdomen.

Muscle-guarding is best determined by comparison and by judging whether relaxation or guarding remains when the child is breathing quietly. Do not move the palpating hand rapidly from area to area comparing muscle tension, as one is likely to be deceived by voluntary guarding. The area of muscle on guard may be quite small. In pelvic appendicitis it is frequently in the lower portion of the right rectus muscle.

An abdominal mass occurred in half of these patients; it was commonly felt as a firm discrete non-mobile mass, but in a few patients as a diffuse thickening. The degree of tenderness and muscle-guarding over a mass is very variable; it may be minimal, in which case the mass is easily felt, or so acute that it is difficult or at times impossible to determine the presence or outline of the mass.

Abdominal distension is common when general peritonitis is present, and is often observed in pelvic appendicitis and peritonitis.

Rectal examination can be misleading, for no matter how quietly and gently performed it will cause some children so much discomfort that it is impossible to assess whether there is any tenderness in the pelvis. If the child cannot be coaxed to be quiet during the examination then it is useless and misleading to attempt to determine whether there is any tender area in the pelvis. Some children will be quiet and co-operative. Rectal examination, however, is an invaluable measure to determine the presence or absence of a pelvic mass.

After abdominal examination routine clinical examination is conducted, particular care being directed to the chest, ears, and throat. Too much attention is often given to alterations in the pulse rate and temperature in the diagnosis of appendicitis. Neither pulse nor temperature gives a reliable indication of the inflammatory state inside the abdomen. It is well to realize that a child may be dangerously

ill with a normal temperature or one of only 99° F. (37.2° C.), while a temperature of 103 or 104° F. (39.4 or 40° C.) by no means makes a diagnosis of appendicitis unlikely. A very rapid weak pulse is a good indication of the severity of either dehydration or toxæmia or both, and usually is found in patients with general peritonitis. In some patients with appendicitis the pulse rate is only very slightly increased.

Diagnosis

In some cases diagnosis may be difficult owing to a considerable variation in the clinical pattern, but the following are the essential facts.

A history from the mother of continued bellyache or discomfort and repeated vomiting should be presumptive evidence of appendicitis. I am of the opinion that such a history places the responsibility on the medical attendant of suspecting appendicitis and of acting accordingly. Determination of either focal abdominal tenderness or rigidity, or both, leaves no doubt that the clinical diagnosis is acute appendicitis. If in addition to these signs a mass is present in the pelvis or lower half of the abdomen then one should be very confident of the diagnosis. Should abdominal tenderness and rigidity be minimal one may be hesitant about the diagnosis if experience is limited. It is at this stage that expert opinion should be sought, and the practitioner should not carry the responsibility by waiting for the signs to become more definite.

Two kinds of patient present a different clinical onset and pattern which may be misleading. The first is the patient who has predominantly urinary symptoms and is suspected of having pyelocystitis. Should microscopical examination of the urine reveal the presence of only a small number of pus cells it is most improbable that a pyelocystitis is the cause of the illness. Patients with pyelocystitis who have pain and frequency of micturition have urine which is almost without exception heavily laden with pus cells and bacilli. The second is the patient with diarrhoea and abdominal pain who is suspected of having gastro-enteritis. Diarrhoea often occurs in pelvic appendicitis. Diagnosis is very difficult in the early stages of the illness, for the abdominal physical signs are usually minimal or absent and rectal tenderness is difficult to assess. Should a pelvic mass be present diagnosis is at once established.

In hospital practice total and differential leucocyte counts are commonly carried out as a diagnostic measure. They are of very limited value owing to the wide variations of the readings from normal to a very high figure of over 30,000 with a polymorphonuclear response. A normal, low, or very high reading would not for a moment deter me from making a diagnosis of acute appendicitis and of acting accordingly. The only real value of a leucocyte count in this disease would seem to be that if an unusual reading is found then the clinical evidence should be reconsidered before arriving at a final decision.

Treatment

The treatment of these 42 patients, although conducted by several surgeons, was carried out on a uniform plan. All underwent operation as early as possible, the one factor delaying surgical intervention being a seriously ill child with peritonitis. Resuscitation by means of warmth, rehydration by intravenous therapy, and alleviation of intestinal distension by continuous gastric suction drainage were instituted until improvement of the patient permitted surgery to be undertaken safely. The time taken for improvement was from 6 to 12 hours and occasionally longer. The principles guiding the operative procedure were a planned incision giving the best access to the appendix, which was removed with the minimal possible disturbance of the

general peritoneal cavity. All patients with a mass or peritonitis were drained so that a tract for any exudate would be left from the site of the inflammatory lesion to the exterior. In all 42 patients the appendix was removed at operation. Post-operative measures were directed towards obtaining rest for the patient, and rest in particular for the alimentary canal. Morphine was given liberally, and when necessary continuous gastric suction and intravenous therapy were employed. The semi-Fowler position was adopted for all patients. Sulphonamides were used either by mouth or intravenously in one-third of the cases.

Results of Treatment

There were eight deaths among the 42 patients. Three occurred in 11 patients aged 1-2 years; the remaining five deaths were among the 30 patients aged 2-3 years. The most important factor in mortality was the presence of general peritonitis. No fewer than seven of the 15 patients with general peritonitis died. The remaining death in the series was that of a patient with a mass and an abscess who developed a general peritonitis after operation. The other important factor in relation to mortality was the length of time the child had been ill before admission to hospital. Seven of the eight children who died had been ill for longer than 48 hours, while the other child had been ill for 40 hours.

Conclusions

It is readily evident that the two major problems in appendicitis in the young child are: (1) How can an early diagnosis be established and so avoid complicated appendicitis with the accompanying high mortality and morbidity? (2) What is the best treatment for a patient with a complicated appendicitis, especially if general peritonitis is present?

Early diagnosis, within 12 to 24 hours of the onset, will be established only by better clinical training of the student, the family physician, and the paediatrician. This is the task of the clinical schools and societies. The two chief reasons for delay in the diagnosis are, first, a failure to suspect appendicitis at this age, and, secondly, a failure to take enough care with the history and clinical examination. It is not sufficiently appreciated that a single clinical examination is often inadequate and that several may have to be made before the physical signs are accurately determined. Rarely, late diagnosis is due to parents bringing their children for examination at a late stage of the illness.

The management of the patient with a complicated appendicitis presents a problem regarding which there is often a difference of opinion. Two main questions require an answer: (a) Should surgery be undertaken as soon as the patient's condition will permit, the object being drainage of pus and removal of the highly septic appendix if possible? (b) Should the body and alimentary canal be put at rest to allow the healing processes either to localize or to resolve the inflammation, the appropriate surgical treatment then being carried out?

While the main purpose of this paper is to assist the practitioner in establishing a diagnosis early and thus prevent complicated appendicitis, many problems concerning the complicated disease require to be solved. I would suggest that the different paediatric schools study these problems involved in the treatment of the complicated disease. Active clinical investigation would be an important measure in clarifying the clinical features for the student, house-physician, general practitioner, and paediatrician, and thus facilitating early diagnosis.

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ENDOCYME FOETUS IN A FIJI INFANT

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It is felt that the following case is of sufficient rarity and interest to merit its being placed on record: I am not aware of a similar case of *foetus in foetu* having previously been reported from this Colony.

Case History

On Aug. 20, 1940, a Fijian female infant was admitted to the Lautoka District Hospital, Fiji, having been brought from Tavua, one of a small group of islands off the west coast of Viti Levu. The infant's age was later checked by reference to the provincial register of native births, and it was shown to have been born on April 11, 1940. Its age, therefore, at the date of admission was a few days over 4 months.

The mother being uneducated and rather unintelligent, an accurate history was difficult to obtain. She stated that the infant was the result of her first and only pregnancy. Nothing untoward had occurred during the pregnancy and she had remained well throughout. Labour had been quite normal, the mother being unattended until after delivery of the infant, when a native nurse had arrived in time to divide the cord and conduct the third stage. The infant had appeared perfectly normal at birth and nothing unusual was noticed until it was about three months old. The abdomen then began to enlarge, and continued to do so during the next month up to the time of admission to hospital. Over the same period the infant's general health had shown some impairment and its limbs had become thinner.

Both parents of the infant were of pure Fijian descent. There was no history of multiple births or of any congenital abnormalities on the mother's side. As the parents were unmarried and the father did not appear, his family history could not be obtained. The mother's age was about 26 years.

Examination of the infant showed it to be rather small for its age and poorly nourished, but there was no marked wasting. The abdomen was greatly enlarged, especially above the umbilicus, the enlargement appearing diffuse and symmetrical. On palpation the upper two-thirds of the abdomen was felt to be occupied by a large firm mass, irregular in outline and movable only within a narrow range.

On Aug. 22, under general anaesthesia, the abdomen was opened by a median supra-umbilical incision. The abdominal wall was greatly thinned from overstretching. The lower border of the stomach was seen crossing the upper angle of the abdominal opening, and below this the great omentum was spread out over a large smoothly rounded mass. An opening was then made through the omentum, revealing a smooth, grey solid mass enclosed in a very thin-walled sac. On incising the sac and passing a hand inside it the nature of the mass was finally revealed and a readily recognizable "foetus" was felt. The smooth-walled interior of the sac in which it lay contained a scanty amount of thin clear fluid. Owing to the large relative size of the foetus, the original abdominal incision had to be extended below the umbilicus before it could be delivered through the wound, and delivery was further facilitated by making one or two small incisions in the "head" of the foetus, from which some straw-coloured fluid escaped, thus reducing its size. Owing to the infant's weakly condition and the degree of shock produced by the delivery of the large intra-abdominal mass the operation had to be concluded without delay, and it was not possible to make any detailed exploration of the relations of the sac. It occupied the upper abdomen, lying between coils of small intestine, and was attached to the posterior abdominal wall. No attachments of the foetus to the interior of the sac had been felt. No attempt was made to remove or otherwise deal with the sac. It was left open, replaced in the abdomen, and the abdominal wound was sutured.

The weight of the foetus after removal was 1 lb. 10 oz. (737 g.), and the infant's weight on the day after operation 8 lb. 4 oz.