

organisms in the living state, since sections prepared by Levaditi's method revealed their presence in the viscera of the first guinea-pig in the series. There is in any case a great contrast between the sharpness with which these micro-organisms are defined in culture and their relative elusiveness in the tissue juices, and it may be useful to laboratory workers unfamiliar with these forms at the outset of their investigations, as we were, to draw attention to it. When you have once seen them, the extremely characteristic movements of the leptospira are very helpful in their recognition. We found it notably difficult to get a convincing preparation by staining smears from tissues or cultures.

Discussion

The most interesting problem in connexion with this case was the source of infection, since it was entirely isolated, no case having been recorded in Leeds or its vicinity for many months. The most plausible suggestion, and the only one which seems to have any claim to attention, is that this was a bathing infection.

The patient was in the habit of bathing in the Yorkshire streams as and when he had the opportunity, and especially in the River Wharfe and some of its tributaries. In the second week of July, 1933, he went for a fishing holiday to Upper Wharfedale, and bathed frequently in one of the becks. He complained of being unduly tired at this time, and he had a long-standing abrasion on one heel. The last occasion on which he bathed—in the Wharfe at Ilkley—was on September 3rd, four days before he was taken ill. The river was unusually low at the time.

The French observers draw attention especially to the importance of contact with mud rather than water (Vincent, 1933), but Troisier, Bariéty, Erber, and Gabriel (1934) mention the possibility that swimmers habitually passing through dirty water may acquire immunity from latent or mild infections, and show abnormal agglutinating powers in their sera for suspensions of leptospira.

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According to L. Fischer (*Zentralbl. f. Gynäk.*, February 2nd, 1935, p. 249) in the pre-insulin era the comparatively rare cases of gestation in diabetic women almost invariably gave issue to over-weight children, of whom two in five were "giant children"—that is, weighed over 5 kilograms. In a series of thirty-one recent collected cases of childbirth in diabetics who had been treated with insulin there was, however, no "giant child": that some of the children were over-weight is explained by the fact that not all the mothers had received sufficient insulin treatment. In pre-insulin days an improvement of the maternal sugar metabolism was not infrequently noted towards the end of pregnancy, and this has been attributed to the activity of the foetal pancreas in making up the deficient insulin production of that of the mother. Anatomical and biological evidence has been adduced, from many sides, of the insular activity of the foetal pancreas in the second half of pregnancy. A more probable explanation, according to Fischer, is that the foetus abstracts from the maternal circulation considerable amounts of sugar, which are converted in the foetal circulation to glycogen and indirectly to deposited fat. Probably the insulin molecule is too large to pass through the placenta, and certainly "giant children" show insular hyperplasia and hypoglycaemia.

RADIOLOGY OF THE APPENDIX (APPENDICULOGRAPHY)

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There are many cases of obscure abdominal pain in which an accurate x -ray representation of the appendix may be of considerable aid in the diagnosis. It is not generally realized that this can now be obtained in all cases in which the lumen of the appendix is not obliterated by disease or obstructed. The method of filling the organ is relatively simple, and consists in giving a preparation of barium with milk or cornflour at night, following this after an interval of three hours by a dose of magnesium sulphate varied according to the requirements of the individual patient.¹ Radiograms are obtained on the following morning, and are continued at such intervals as may appear necessary during the following days, until the caecum is entirely empty.

What are the normal appearances of the appendix in a radiogram? Rönberg² states that the appendix may be considered as normal if it lies in its usual position, is freely movable, has a smooth outline, fills rapidly, and empties at the same rate as the large bowel. Not every normal appendix fulfils these requirements.

Position.—There is no definite position for the appendix, but it is most frequently identified medial to the caecum. It may point upwards, downwards, or transversely, and may even lie lateral to the caecum; in the latter case it is probably abnormal.

Contour.—When completely filled, the walls are smooth in outline until emptying commences. The presence of peristalsis then gives it a segmented appearance rather like a string of small sausages.³ Incomplete filling can impart an irregular appearance to a perfectly normal appendix.

Emptying Rate.—The appendix normally empties at the same rate as the caecum. Any delay in emptying after forty-eight hours is suggestive of an appendicular lesion.

Mobility.—If the appendix is identified on screen examination it can be moved by palpating with the hand, and it will be seen that it moves freely in conjunction with the caecum. However, if it is of sufficient length it will also have an independent mobility of its own. In the serial radiograms it will be seen changing its position under the influences of peristalsis rather like a pendulum. This, however, never occurs if the meso-appendix is short.

Filling Defects.—The barium-filled normal appendix frequently shows partial filling defects apparently due to the presence of faecal material. Filling defects may, however, be due to the presence of faecaliths, when they will be more sharply defined and constant in position.

In a series of one hundred patients examined during the last two years, the appendix was successfully filled in ninety-three and failed to fill in seven. Thirty of the patients were operated upon, and the x -ray appearances correlated with the operation findings and the pathological reports. In twenty-eight cases gross and obvious changes in the appendix were noted at operation, whilst the remaining two showed no evidence of abnormality.

Case Records

The following seven cases are selected from the series in order to demonstrate the changes seen in the radiograms in disease.

CASE I

Male, aged 29, complained of abdominal pain and loss of weight with attacks of indigestion during the last eleven years. *Physical examination*: abdomen soft, no rigidity, no tenderness. *Barium meal examination*: the stomach showed no radiological evidence of abnormality. The radiograms, which were taken at six and eleven hours after the ingestion of the meal, show the appendix filled (see Fig. 1). It formed an S bend with a rather sharp angle near the base. The distal end was incompletely filled. The appendix retained this shape throughout the examination, and was also seen filled after the administration of a barium enema, when a similar shape was observed suggesting that it was fixed in position.

Operation.—The appendix was found to be bound with adhesions from end to end.

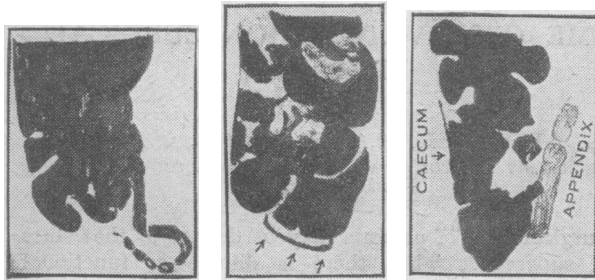


FIG. 1. FIG. 2. FIG. 3.
 FIG. 1.—Eleven hours after the barium meal.
 FIG. 2.—Twenty-four hours after the barium meal.
 FIG. 3.—Twenty hours after the barium meal.

in it (see Fig. 4). There was abnormal retention of barium, but the motility of the organ appeared to be unaffected. The x-ray appearance suggested a lesion of the appendix.

Operation and Pathological Report.—The appendix was found to be long and dilated, but not fixed. It was filled from end to end with faecaliths. No outward sign of inflammation could be seen. The section showed evidence of hyperaemia of the lymph nodes, indicating the presence of inflammation.

CASE V

Male, aged 45 years, complained of attacks of acute pain in the lower abdomen during the last five months, independent of meals but made worse by purges. Improved with bismuth powder. *Physical examination*: there was tenderness across the lower abdomen, more marked in the right iliac fossa below McBurney's point. *Barium meal examination*: radiograms were taken at twelve (see Fig. 5), twenty-two, and thirty-six



FIG. 4. FIG. 5. FIG. 6.
 FIG. 4.—Thirty-six hours after the barium meal.
 FIG. 5.—Twelve hours after the barium meal.
 FIG. 6.—Seventeen hours after the barium meal.

CASE II

Female, aged 19, complained of pain in the right lower abdomen which she had had for some months, and a feeling of sickness accompanying the pain. *Physical examination*: no localized areas of tenderness. *Barium meal examination*: the stomach examination proved to be negative, and an x-ray examination of the appendix was suggested owing to the site of the pain. At twelve hours after the meal the appendix was not visible, but at twenty-four hours it was filled, and could be seen lying close up against, and parallel to, the base of the caecum, with its tip turned upwards (see Fig. 2). Radiograms taken at thirty-four and thirty-eight hours showed the appendix still filled after the caecum was practically empty. There was no change in the position of the organ suggesting fixation by adhesions.

Operation (Fourteen Days Later).—The appendix was found bound down by adhesions. The symptoms disappeared after the operation.

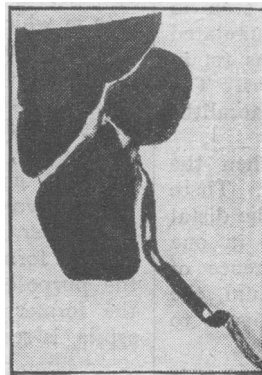


FIG. 7.
 FIG. 7.—Twelve hours after the barium meal.

hours after the ingestion of the meal, and the appendix was visible at each examination. It was dilated at the tip, fixed in position, and had a residue at thirty-six hours, when the caecum was empty. The appearances were suggestive of an appendix lesion.

Operation.—The appendix was found exactly in the position indicated in the x-ray films. It was adherent throughout its length and dilated in its distal third, which contained faeces. Adhesions were present between the ileum and the lateral abdominal wall. There were definite signs of chronic appendicitis.

CASE VI

Male, aged 31 years, complained of a burning sensation in the epigastrium after food during the last six years, with some pain in the right iliac fossa during the last two years. Referred to x-ray department for investigation

—" ? gastric ulcer ; ? chronic appendix." *Barium meal examination*: the stomach was dilated and atonic. There was no evidence of ulceration. The appendix was seen filled at seventeen (see Fig. 6), twenty-six, forty-one, and fifty hours, and retained the barium after the caecum was empty. The organ was fixed and dilated at its extremity.

Operation and Pathological Report.—Adhesions were present between the appendix and the caecum. There was naked-eye evidence of subacute inflammation. The appendix contained a considerable amount of debris in its lumen, with red blood cells. There was evidence of round-celled inflammation, and the appearances suggested the presence of subacute inflammation.

CASE VII

Male, aged 64 years, complained of colicky pains in the right lower abdomen. *Barium meal examination*: the appendix was seen filled at twelve (see Fig. 7), twenty-two, thirty-six, and forty-eight hours. The lumen was dilated, and filling defects were present. The organ appeared abnormally long and relatively immobile. The appearances were suggestive of a lesion of the appendix.

Operation.—The appendix was filled from end to end with faecaliths. There was no sign of inflammation or adhesions.

CASE III

Female, aged 12 years, was admitted to a sanatorium under suspicion of tuberculous peritonitis. *Barium meal examination*: radiograms were taken of the appendix owing to localized pain in the right iliac fossa. The appendix was seen filled at twenty hours (see Fig. 3), and it appeared abnormally large, with a definite dilatation of its extremity. There was retention in the organ up to four days, at which time the caecum and colon were quite empty. The abnormal retention and dilatation of the appendix suggested the presence of a lesion of the appendix.

Operation.—Three months after this examination the condition became acute and appendicectomy was performed. The appendix was found to be acutely inflamed.

CASE IV

Male, aged 25 years, gave a history of attacks of pain in the right lower quadrant of the abdomen. *Barium meal examination*: stomach negative. The appendix was seen filled with barium at twenty and thirty-six hours after the ingestion of the meal, and obvious filling defects were visible

Discussion

The radiologist is not always asked to examine patients suspected of appendicitis. This is in part due to the fact that the radiology of the appendix has been up to now suspect. One of the reasons for this is that in the past we have failed to fill the normal appendix owing to defective technique, and there has been a tendency to rely on indirect signs such as pyloric spasm, abnormal filling of the caecum, and localized tenderness, etc. These indirect signs are frequently misleading. An unfilled appendix should only be diagnosed as abnormal if it fails to fill after repeated examination.

The normal appendix gives characteristic appearances in the radiogram, and, *per contra*, the abnormal appendix can also readily be detected, as a rule, from alteration in its contour, emptying rate, position, and other changes. Adhesions are revealed by fixation of the appendix in an abnormal position in relation to the caecum, or by the retention of unusual curves or kinks in the serial radiograms. It must be remembered, however, that in many patients without signs of disease there is diminution of the swaying or pendulum movements of the appendix. The presence of adhesions must therefore be diagnosed with caution, the more so since a short meso-appendix will limit the movements of the organ.

A large single faecalith, if it contains calcium, may be visible in a plain radiogram, and is usually seen close to the right iliac crest.⁴ But it is more often the case that the faecaliths when present are invisible, and are only detected as filling defects in the barium-filled appendix. Inconstant filling defects are often seen in normal cases, and are apparently due to accumulated secretion. The filling defects caused by faecaliths retain their contour and position in all the radiograms. The lumen is generally slightly enlarged where many faecaliths are present.

The most characteristic changes are seen when the appendix is the seat of subacute inflammation. There is obvious dilatation of the lumen, especially at the distal extremity, as in Case III; fixation is present in one position, and, owing to the diminution or absence of peristalsis, there is delayed emptying of the barium, the appendix being generally the last part of the bowel to empty. Localized tenderness is frequently present.

When the appendix lies behind the caecum it is concealed from view in the earlier radiograms. As the caecum begins to empty, however, it comes into view, and it is then sometimes possible to obtain films showing its shape and position. These cases are some of the most difficult from the point of view of the radiologist. The size of the lumen of the appendix appears to vary with the condition of the colon. When the colon is spastic the appendix tends to be contracted and the lumen is narrow. On the other hand, when the colon is found to be atonic, the atony appears to affect the appendix at the same time, and it fills with considerable ease and shows a large lumen. It will often fill in such a case under the pressure exerted by a barium enema. This, however, is not usual, since the appendix is normally only visible after the enema has been partially evacuated. Dilatation of the lumen of the appendix appears to be one of the most important radiological signs of disease, especially when it affects the distal extremity and is accompanied by retention of the barium.

Summary and Conclusions

1. It is suggested that the appendix, unless blocked by fibrosis or adhesions, will always be filled with barium if careful attention be paid to the radiological technique.

2. A careful study of the radiographic appearances of the filled appendix enables a reasonably accurate radiological diagnosis to be made in most cases.

3. The following radiological signs are suggestive of disease: (a) dilatation of the lumen, (b) fixation in one position, (c) delay in emptying, (d) clear-cut filling defects, and (e) non-filling after repeated examinations.

I should like to take this opportunity of acknowledging the assistance received from Mr. Rast and other colleagues at the German Hospital who have provided me with clinical material and operation results.

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SOME OBSERVATIONS ON SURGICAL URAEMIA

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The surgical type of uraemia may be defined as that state which supervenes when there is disease or functional derangement of the urinary tract and a failure to excrete toxins present in the blood and tissues of the patient. This implies, first, a derangement of the urinary mechanism, and secondly, an accumulation of toxins as the result. I shall therefore limit myself to a type of case in which there is obstruction to the urinary outflow, accumulation of toxins, and no known previous disease of the kidneys themselves.

In the cases seen in the surgical wards the condition as defined above arises from two causes: (1) mechanical obstruction, most frequently seen in the peripheral passages, as in prostatic cases, and (2) septic changes which involve the kidney itself and injure its function. The latter group of phenomena are often superimposed on the former and complicate the picture, so that for the purposes of this discussion I have concentrated on the former type in which uraemia, uncomplicated by sepsis, is seen in obstructed cases.

Pathology of Urinary Tract Obstruction

What are the toxins which accumulate in a case of urinary obstruction? From time to time someone claims to have isolated a body which is asserted to be the substance responsible for the uraemic state; so far, however, no such single specific substance has been discovered which stands the test of critical examination, and it is probably safe to assume that the phenomena are due to a general accumulation of products, which are normally rejected, but which clog and derange the working of the whole organism by their presence in excess. Among the products accumulating in this way, the ones which primarily focus our attention are due to protein metabolism, and are all of a nitrogenous character. We may regard the condition as due to the soaking of the various tissues of the body in waste metabolic and katabolic products, so that we ought to go a stage further than the examination of the blood, and determine, if possible, when uraemia develops in relation to the accumulation of waste products in the tissues. This is a difficult subject, and there are as yet no definite data available.

The following facts emerge: in the first place, cases with high blood nitrogen and no symptoms of uraemia are common; secondly, a persistent high blood nitrogen ultimately leads to uraemic manifestations; and thirdly, after the removal of the obstructing cause the blood nitrogen does not always show an immediate fall, but a