

Acute Appendicitis in Pregnancy

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SUMMARY

Acute appendicitis in pregnancy and its treatment are reviewed. Six cases are described. Early surgery is recommended, and a conservative watchfulness for more than 4 to 6 hours is condemned.

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Acute appendicitis in pregnancy deserves special attention because of its very high maternal and fetal morbidity and mortality rates. According to the literature since 1950, the mortality seems to have decreased since the introduction of antibiotics. There can, however, be no grounds for complacency when young women are still dying from this easily curable disease. The most important reason for the high mortality and morbidity is an inability to make an early diagnosis and to institute prompt operative treatment.

The incidence of appendicitis in pregnancy in 1935 was quoted as being 1:2 000 pregnancies.¹ In 1944, the incidence quoted by Child and Douglas² was 1:1 000 and a report in 1972 showed the incidence to be 1:704.³ It therefore appears that this condition is becoming more common. Aird⁴ pointed out that appendicitis is a disease of modern civilisation, caused by a sedentary life, and a high-residue flesh diet. Until about 5 to 10 years ago, appendicitis in the Black population of South Africa was rare, but it is becoming more common, which supports the above hypothesis.

Since appendicitis in pregnancy is not a common condition, the personal experience of any one clinician is likely to be limited. Therefore, the author's experience of 6 cases may be of value, if only to demonstrate that an inability to make the proper diagnosis incurs a delay which gives rise to complications. This is well demonstrated in the first two cases.

CASE REPORTS

Case 1

A Coloured woman, aged 30 years, gravida 3, para 2, presented at 34 weeks' gestation with upper abdominal pain of a cramp-like nature, which was associated with nausea and vomiting, and she also had dysuria. She had no history of a similar complaint.

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Examination revealed that her temperature was 38°C, her tongue was furred, and her pulse rate was 100/min. She was found to be 34 weeks pregnant on obstetric examination. There was rebound tenderness, maximal in the right upper quadrant, and no rigidity, but guarding. Alders's sign was present and ballottement was painful.

An acute surgical abdomen was diagnosed and the patient was referred to a teaching hospital where degeneration of a fibroid was diagnosed. Her condition did not improve and she was then referred to the surgical outpatient department with the confident diagnosis of appendicitis in pregnancy. The patient returned with a cryptic note, which stated that the condition was not surgical. Her condition deteriorated and an emergency laparotomy revealed a ruptured appendix. Appendicectomy was performed, the abdomen was drained, and antibiotics were administered. She made a remarkably uneventful recovery and delivered at term a male infant of 2 950 g.

Case 2

A White woman, aged 33 years, gravida 6, para 5, who was 22 weeks pregnant, presented with a history of para-umbilical cramp-like pain of 2 days' duration. The pain settled in the right loin and was not associated with nausea or vomiting. She experienced severe dysuria and frequency, and had in the past had similar episodes of pain in the right iliac fossa.

On examination, she was afebrile, had a furred tongue, and her pulse rate was 88/min.

Abdominal examination revealed that she was 22 weeks pregnant. There was tenderness, mainly in the right loin, and extreme tenderness on bimanual palpation. There was muscle-guarding but no rigidity, or rebound tenderness. Alders's sign was absent. Ballottement was painful, and the heel-stamping sign was present. The urine contained albumen and red blood cells.

A diagnosis of renal stone was made and an intravenous pyelogram with a single exposure was ordered (Fig. 1). This revealed obstruction of the right ureter at the pelvic inlet. The patient was therefore referred to a urologist and a retrograde pyelogram which was performed 2 days later confirmed an extraluminal obstruction (Fig. 2). Laparotomy was performed and a perforated retrocaecal appendix with an abscess which compressed the ureter was found.

Appendicectomy and drainage of the abscess were carried out and antibiotics were administered.

The patient, however, remained critically ill for about 5 weeks and developed subphrenic abscesses, intestinal obstruction, wound infections and multiple abdominal abscesses, which necessitated surgical drainage on 5 occasions.

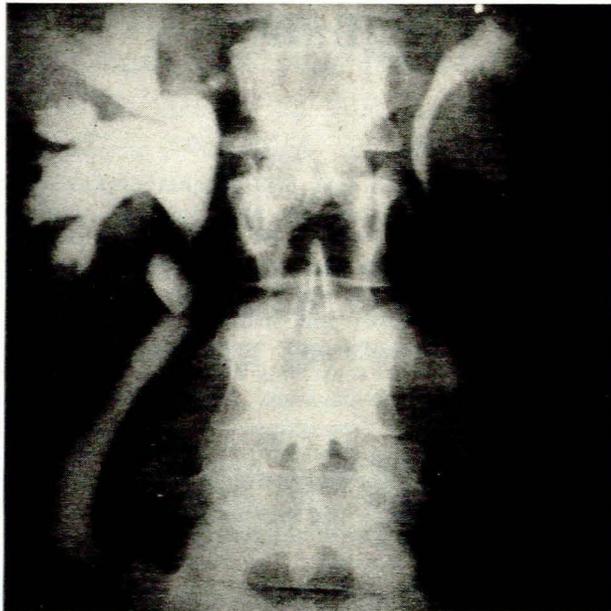


Fig. 1. Intravenous pyelogram showing obstruction of right ureter at pelvic brim.

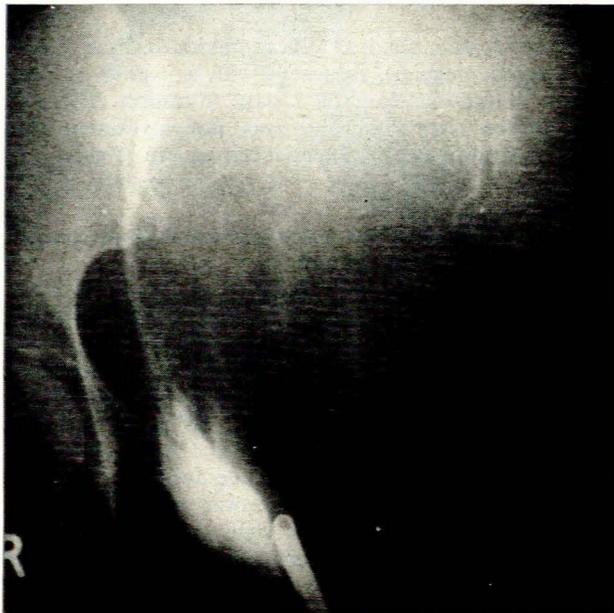


Fig. 2. Retrograde pyelogram showing obstruction of right ureter.

Seven weeks later, she was examined again when she was thought to be about 29 weeks pregnant, but the size of the uterus corresponded to that of a 22 weeks' pregnancy. Termination of pregnancy was strongly suggested because of the excessive irradiation to which she had been submitted during her illness, and because of the various antibiotics

which had been administered and which might have been harmful to the fetus.

In view of the fact that there was gross retardation of intra-uterine growth it was anticipated that she would abort spontaneously, and this did happen one week later when she delivered a macerated male infant who weighed 1 200 g. She slowly regained her health.

Case 3

A White woman, aged 23 years, gravida 1, para 0, who was 20 weeks pregnant, presented with a history of acute, central, abdominal pain which lasted for 1 day and settled in the right loin. It was associated with nausea, but not with vomiting. She also experienced rigors, and the pain radiated into the right leg. She had never had a similar experience.

On examination, her temperature was found to be 38°C, her pulse rate was 94/min and her tongue was normal.

Abdominal examination revealed that she was 22 weeks pregnant. There was maximal pain in the right loin and muscle rigidity, but no rebound tenderness. Alders's sign was present. Ballottement was painful and the heel-stamping sign was present. Urine was normal.

No improvement occurred over 6 hours, her pulse rate increased and a laparotomy was performed. A retrocaecal, acutely inflamed appendix was removed. The right ovary and tube were normal. Histological examination confirmed acute appendicitis.

She recovered rapidly and delivered at term a healthy female infant of 3 540 g.

Case 4

A White woman, aged 28 years, gravida 3, para 2, presented at 32 weeks' gestation. She had developed acute, upper abdominal, cramp-like pain, accompanied by nausea and vomiting. Initially, an acute spastic colon was diagnosed, but over 24 hours her condition deteriorated. The pulse rate increased and she was also very tender in the para-umbilical area. There was no history of previous pain in the right iliac fossa, and no urinary symptoms.

Examination revealed that her temperature was 36.4°C, her pulse rate was 90/min and her tongue was not furred.

She was 32 weeks pregnant and had rebound tenderness in the right loin. There was no rigidity, but guarding was present. Alders's sign was absent, but ballottement was painful and the heel-stamping sign was present. A diagnosis of acute appendicitis was made.

At laparotomy an acutely inflamed appendix with a gangrenous tip was found.

Postoperatively, she went into premature labour, but with conservative treatment she eventually had an uncomplicated postoperative period. She delivered at term a normal female infant of 3 400 g.

Case 5

A White woman, aged 24 years, gravida 1, para 0, who was 20 weeks pregnant, presented with abdominal pain

of a cramp-like nature, which radiated to the back; there was no dysuria, nausea, or vomiting. She had had a previous episode of pain in the right iliac fossa during 1972. Initially, her condition was diagnosed as pyelonephritis and treated with antibiotics, but her condition deteriorated.

On examination, her temperature was 38.2°C, her tongue was furred and her pulse rate was 100/min.

Abdominal examination revealed that she was 20 weeks pregnant. There was tenderness in the right loin but no rebound tenderness or rigidity; there was some muscle guarding. Alders's sign was present, and ballottement was painful; the heel-stamping sign was present, and psoas muscle spasm was detected.

A diagnosis of acute appendicitis was made, laparotomy was performed, and an acutely inflamed appendix was found and removed. The postoperative course was uncomplicated and she delivered at term a healthy female infant of 3 345 g.

Case 6

A White woman, aged 27 years, gravida 1, para 1, who had been delivered by forceps for delay in the second stage of labour 2 days before, suddenly developed cramp-like abdominal pain with nausea, but no vomiting. The pain was predominant in the right iliac fossa and radiated into the right leg. Pyrexia of 38°C and progressive tachycardia of 140/min developed in 4 hours.

She had had repeated episodes of right iliac fossa pain during the past year. During her pregnancy she had had an episode of pain in the right loin which was diagnosed and successfully treated as pyelonephritis.

On examination, her pulse was 140/min, her temperature was 38.4°C and her tongue was furred.

Abdominal examination revealed an involuting uterus 2 finger-breadths below the umbilicus, which was not tender except on movement. Alders's sign was present. Psoas spasm was detectable, and the heel-stamping sign was present. A diagnosis of acute appendicitis was made. Laparotomy revealed a normal involuting uterus and appendages. The appendix was retrocaecal and acutely inflamed at the tip. Appendectomy was performed and the postoperative course was uneventful.

DIAGNOSIS

The single most important cause for the high mortality and morbidity of acute appendicitis is the inability to make a diagnosis early enough to institute adequate treatment.

The diagnosis of appendicitis in pregnancy is difficult, but once awareness of this association is aroused, the correct diagnosis can be made, as demonstrated by the last 4 case histories above.

The differential diagnoses of the acute abdomen in pregnancy included infection, which accounts for 40% of acute abdominal emergencies. Of this, appendicitis constitutes a formidable incidence of 63% - 75%,^{5,8} and acute cholecystitis, which includes pancreatitis, diverticulitis,

Meckel's diverticulum and non-specific adenitis, accounts for 10%. All other acute conditions of the abdomen which may occur during pregnancy are far more rare than appendicitis, and therefore the diagnosis of appendicitis should readily be made.

Intestinal disease, which accounts for 20% of acute abdominal emergencies in pregnancy, includes disorders of the upper abdomen, such as pyloric stenosis, hiatus hernia, peptic ulceration and intestinal malrotation, and disorders of the lower abdomen, such as adhesions, volvulus, intussusception and hernias.

Bleeding accounts for 10% of acute abdominal emergencies during pregnancy, and may be caused by haematoma of the rectus sheath, by traumatic or spontaneous rupture of liver or spleen or by various other spontaneous ruptures of vessels.

Thirty per cent of acute abdominal emergencies arise in the genital tract, and include various complications of ovarian tumours, particularly dermoid, fibromyomata and their complications, abruptio placentae and advanced ectopic pregnancy.

There is no statistical evidence that pregnant women who are actually in the age group which runs an appreciable risk of acute appendicitis, are more prone to this condition than non-gravid women.

Appendicitis in pregnancy carries a very high mortality and morbidity for the following reasons:

1. Early Perforation

Rupture of the inflamed appendix occurs 2-3 times more frequently in pregnancy.⁷ It appears that this early and frequent perforation could be ascribed to the fact that the omentum has been displaced upwards and is unable to guard the inflamed appendix and, further, that there is an increased blood supply in pregnancy which gives rise to a more marked inflammatory response and increased vascularity, which produces a softer appendix and earlier perforation.

2. Displaced Appendix

The appendix is displaced upwards, laterally and posteriorly (Fig. 3). Because of this anatomical displacement, the normal clinical signs ascribed to appendicitis are not easily elicited, and delay in diagnosis is common. Owing to early perforation of the appendix, which is now situated in the upper abdomen, generalised peritonitis is inevitable, and has a high complication rate.

3. Delayed Diagnosis

Diagnosis of acute appendicitis in pregnancy is usually delayed because, although nausea and vomiting are its most common clinical symptoms, they are also very common in pregnancy. Abdominal pain in pregnancy is also frequent and is usually ascribed to some other conditions, there being reluctance, or failure, to consider

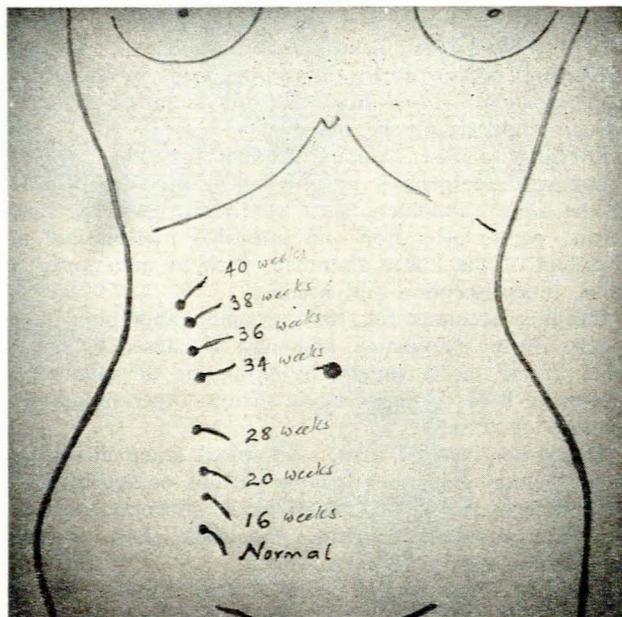


Fig. 3. Graphic demonstration of changing positions of appendix with advancing pregnancy.

appendicitis. Also, because the appendix is displaced, the clinical signs are masked. A particular problem in the early puerperium arises because the anterior abdominal wall muscles are relaxed owing to the growing uterus, and the anterior abdominal wall is unable to respond with the clinical signs of guarding, rigidity, and rebound tenderness.

Because of the absence of the classical signs of appendicitis as they occur in non-pregnant patients, there is delay in diagnosis. This delay leads to complications which may be fatal in the case of the pregnant woman. The maternal mortality, even in the antibiotic era, is variously quoted as being between 1% and 16%, without perforation of the appendix, and it can rise to 35% in the presence of perforation at virtually all stages of gestation.⁵ In the puerperium the mortality is much higher because the delay in diagnosis is invariably even longer. The fetal mortality when perforation has not occurred is said to be between 1% and 4% and with perforation it rises to 35%-50%.⁷ This high fetal mortality can be ascribed to premature labour or abortion as well as to intra-uterine growth retardation as a result of the toxæmia of the infection and, possibly, to the antibiotics and drugs used to treat this dreaded condition once perforation occurs.

The key to improvement of the treatment of appendicitis in pregnancy obviously lies in early diagnosis, so that early operative treatment can be instituted.

Suspicion of appendicitis in pregnancy facilitates diagnosis. If, after a few hours of observation, the clinical picture does not improve, but remains suggestive of an acute abdomen, exploratory laparotomy is mandatory. Suspicion, and not the constellation of classical clinical signs, is the indication for surgical intervention in the pregnant woman with appendicitis.⁸

Vague pain in the right abdomen and signs of an acute abdomen are probably the most constant clinical signs

encountered in acute appendicitis in pregnancy. Although nausea and vomiting are also common complaints in a normal pregnancy, they should never be disregarded as possible evidence of appendicitis.

Previous episodes of pain in the right iliac fossa which may have arisen from an inflamed appendix, are frequently elicited when the histories of patients with acute appendicitis in pregnancy are taken. This flaring-up of appendicitis during pregnancy could be caused by peri-appendicular adhesions and kinking of the appendix. The appendix is moved from its original site as the pregnancy advances and the adhesions and kinking give rise to obstruction, predisposing to acute appendicitis.

As previously mentioned, the appendix is displaced upwards laterally and posteriorly, particularly in advanced pregnancies, and the appendix then lies on, or close to, the kidney. Dysuria is therefore a frequent symptom in patients with acute appendicitis in pregnancy, and white cells are commonly found in the urine. This finding should not preclude a diagnosis of appendicitis.

On clinical examination, a furred tongue and an increasing tachycardia are the only reasonably constant clinical signs. Pyrexia may be conspicuously absent. On local examination, mild tenderness in the right upper abdomen is always present. Rebound tenderness, muscle guarding and rigidity are seldom present because of the lax anterior abdominal muscles which have been stretched by the pregnant uterus.

Alders⁹ described a useful clinical test which consists of localising the area of maximal abdominal tenderness and maintaining constant pressure on that point while the patient is being turned to the left. If the pain is constant, the pain is of extra-uterine origin; if the pain disappears it is more likely to be of uterine or tubal origin. This is a very useful and important clinical test which may be employed in all cases of an acute abdomen in pregnancy.

Ballottement frequently aggravates the pain if it is of extra-uterine origin.⁹

Another useful clinical test for the acute abdomen is the 'heel-stamping sign'.¹⁰ The patient, who is standing, is asked to take off her shoes and to separate her heels by about 15 cm. The examiner then stands in front of the patient and asks her to follow his movements exactly. With his hands on his sides, he stands on his toes and then suddenly relaxes and falls back onto both heels. If the patient follows suit and has some form of peritoneal irritation, she will grasp her abdomen. This has been found to be a very accurate clinical test which indicates peritoneal irritation when other signs are still absent.

Special investigations are of very little use, since pregnancy causes a leucocytosis, the magnitude of which is usually at least 12 000/ μ l, and the sedimentation rate is also elevated to at least 20 mm in the first hour.⁹ They are of very little use unless done serially, so demonstrating a progressive rise in both values.

TREATMENT

Immediate appendectomy at all stages of pregnancy is the treatment of choice. The risk of a laparotomy to

mother and fetus is very low with modern anaesthesia. The dangers which may result from a negative laparotomy are not great and, therefore, early surgery for suspected acute appendicitis at all stages of pregnancy is strongly advocated.¹¹

It is of paramount importance to desist from Caesarean section at the time of the appendectomy, no matter what the period of gestation. It is rather to be recommended that these patients be allowed to go into spontaneous labour even shortly after the appendectomy, than that they should undergo Caesarean section.⁹

The reason for this conservative approach is that Caesarean section would tend to spread infection to a fresh wound. The infants also frequently suffer severe sepsis if they are delivered by Caesarean section at the time of appendectomy, particularly if the appendix is ruptured and peritonitis is present.

The stress on a fresh scar is not severe in labour, but it probably increases with the pregnancy. Epidural anaesthesia is ideal for patients with fresh scars, provided that they are not septicaemic. Elective forceps delivery with full dilatation is then recommended.⁸

The incision of choice should be a right paramedian incision at the level of maximal tenderness. The incision should be big enough to allow the whole hand to enter to lift out the laterally, and frequently posteriorly displaced caecum and appendix. Appendectomy should always be performed if possible, even if the laparotomy reveals a normal appendix.⁵ Drainage is only advised if peritonitis is present. Operative exposure is further facilitated if the patient is turned 30° to the left, and if the assistant makes use of a Dever's retractor to pull the abdominal wall laterally. It cannot be sufficiently stressed that there should be as little manipulation of the uterus as possible, to prevent premature onset of labour or abortion.

Postoperative antibiotic cover is advocated, particularly in patients with peritonitis, and a state of adequate hydration is essential.

The complications will be infrequent in appendicitis in

pregnancy if early surgery is performed. Maximal complications occur with delayed surgery, as in the second case history described above. Complications which might arise in patients who have had acute appendicitis during pregnancy and who have undergone appendectomy are wound infections, subphrenic abscesses, intestinal obstruction, deep vein thrombosis, premature labour or abortion, fetal death and even maternal death.

CONCLUSION

Nausea and vomiting and poorly localised right upper abdominal pain in pregnancy are suggestive of acute appendicitis. The prognosis of acute appendicitis in pregnancy is directly proportional to the duration of symptoms and to whether perforation has occurred or not, and the key to further improvement in the results of treatment for appendicitis in pregnancy is earlier diagnosis. A high index of suspicion, and not the constellation of classical clinical signs, is the indication for early operative treatment.

The dangers of a negative laparotomy are minimal, and early surgery is recommended. Conservative watchfulness for more than 4 to 6 hours is condemned, for 'the mortality of appendicitis in pregnancy and the puerperium is the mortality of delay'.¹²

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