# Appendicitis in pregnancy

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**Summary: Over a 9-year period at one hospital 25 appendectomies were performed during pregnancy. In 20 cases the appendix was acutely inflamed. All mothers survived. Two women aborted and two went into premature labour. One of the premature infants survived. The fetal loss associated with acute appendicitis was 15%. Early diagnosis and operation is essential.**

**Résumé:** *L'appendicite durant la grossesse*

**Au cours d'une période de 9 ans, 25 appendectomies survenues pendant la grossesse ont été pratiqués dans un seul hôpital. Dans 20 de ces cas l'appendice était le siège d'une inflammation aiguë. Toutes les mères ont survécu. Deux femmes ont avorté et chez deux autres le travail a été déclenché prématurément. Un des prématurés à survécu. La mortalité fétale associée d'une appendicite maternelle aiguë a été de 15%. Il importe de porter un diagnostic précoce et d'opérer sans tarder.**

Abdominal surgery during pregnancy is not without risk. However, because undue delay in operating on a pregnant woman who has acute appendicitis can have fatal consequences, a reasonable suspicion of acute appendicitis demands immediate surgical intervention. The inevitable removal of a number of normal appendices is preferable to a single unnecessary maternal death.[1]

During a 9-year period, 1964 to 1972, 25 pregnant patients had their appendices removed at the Ottawa Civic Hospital. The gross and histologic diagnosis was acute appendicitis in 20 cases; among these cases, one appendix had perforated and another was gangrenous. Two of the other five appendices showed fibrosis obliterans; three were normal and no cause for the symptoms was established.

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## Findings

### *Age and parity*

Of the 20 patients with proved acute appendicitis, the youngest was 17 and the oldest, 38 years of age. Sixteen women were in their 20s and three were more than 30 years old. Ten of the patients were pregnant for the first time, six for the second and four for the fourth time. Twelve patients became ill in the 1st trimester, of pregnancy, six in the 2nd and two in the 3rd.

### *Symptoms*

The initial symptoms were abdominal pain in 16 patients, and nausea and vomiting in 4. On admission to hospital all complained of abdominal pain. Anorexia was noted in 5 cases, nausea and vomiting in 20, fever in 15, and chills in 4. The interval from appearance of the initial symptoms to admission to hospital varied from 4 to 48 hours. Eighteen patients were admitted between 12 and 30 hours after becoming sick.

### *Clinical and laboratory findings*

In 20 of the 25 women maximal tenderness was in the right lower quadrant of the abdomen and in 3 it was in the right upper quadrant; in 2 patients there was generalized abdominal tenderness. Rebound pain and guarding of the abdomen was present in all 25 patients. Right costovertebral angle tenderness was noted in four patients, with concomitant symptoms of dysuria and frequency. In all patients rectal examination yielded normal findings.

The pulse rate varied between 80 and 110 beats per minute; in six patients it was more than 100. The highest temperature recorded was 101°F (38.3°C) and the lowest 99°F (37.2°C). No patient was dehydrated.

In 10 patients the leukocyte count was between 8000 and 10 000/mm$^3$, in 13 it was between 10 000 and 15 000 and in 2 it was between 15 000 and 20 000. No abnormalities were reported in the differential count. The normal leukocyte count in pregnancy varies between 8000 and 12 000/mm$^3$.

### *Operation and results*

All 25 patients underwent surgery within 18 hours of hospitalization, and 18 of these within 12 hours. Two patients in the 2nd trimester delivered prematurely, at 30 and 31 weeks' gestation respectively: one patient delivered 4 weeks and the other 10 weeks after operation; one baby was stillborn, the other survived. Two patients aborted at 2 and 4 weeks, respectively, after operation, one at 12 weeks' and the other at 19 weeks' gestation. The two patients with fibrosis obliterans and the three with normal appendices recovered satisfactorily and went on to deliver healthy infants at term.

Progesterone and antimicrobials were used infrequently and their usefulness could not be assessed.

## Discussion

From 1964 to 1972, 34 270 babies were born at the Ottawa Civic Hospital and there were 20 cases of acute appendicitis in the mothers, an incidence of 1 in 1713 — less than the generally reported 1 in 1000 but consistent with the incidence of appendicitis in the nonpregnant population. Sixty percent of

our patients were in the 1st trimester, 30% in the 2nd and 10% in the 3rd. Although the incidence is low, acute appendicitis is the most common condition leading to an intra-abdominal operation for a nonobstetric problem in pregnancy.

The prognosis for acute appendicitis in pregnancy is graver than in the nonpregnant state. The more intense degree of inflammation leads quickly to perforation and spread of infection. This is influenced by the vascularity of the pelvis in pregnancy and the increased lymphatic drainage. The natural defence mechanism by which the omentum isolates the diseased appendix from the rest of the abdomen is not always effective because of the displacement of the appendix upwards, laterally and posteriorly by the expanding uterus.[2]

The clinical picture of appendicitis in pregnancy varies with the progressive increase in the size of the uterus and the displacement of the appendix. In the 1st trimester the clinical picture is identical to that in the nonpregnant state, with pain, vomiting and localized tenderness at McBurney's point. As pregnancy progresses, the appendix is pushed further upwards and laterally, with axial rotation,[3] so that near the end of the 3rd trimester the pain and tenderness may be localized as far up as the right costal margin or the right costovertebral angle, as was found in four patients in the survey by Thomford, Patti and Teteris.[4] When the tenderness is in this area, pyelitis, peptic ulcer and gallbladder disease must be considered. By the 28th week of gestation the appendix is at the level of the iliac crest.

Early in pregnancy, hyperemesis gravidarum, ectopic pregnancy, renal calculi and salpingitis are possible diagnoses. The normal leukocytosis, raised erythrocyte sedimentation rate and abdominal discomfort in normal pregnancy adds to the confusion, as does the presence of leukocytes in the urine.

With uterine enlargement and stretching of the anterior abdominal wall, not only is the site of pain changed but also the character may be modified. Later in pregnancy the differential diagnosis includes pre-eclampsia, concealed accidental hemorrhage, ruptured ovarian cyst, pyelitis, uterine injury and degenerating uterine leiomyoma.

During labour the clinical picture is difficult to assess, but, unlike the pain of labour, which is intermittent, the pain of appendicitis is persistent. Alders' test[5] may be useful in differentiating pain of extrauterine origin from that of intrauterine origin in the pregnant patient. While the examining fingers are on the area of maximal tenderness the patient is turned on her side so that the abdominal wall is vertical to the table. If of uterine origin, the pain will diminish or will disappear entirely as the uterus falls away from the examining fingers.

Because one expects to find the appendix in the area of maximal tenderness the incision is made near this point. It is important that minimal manipulation be exerted on the pregnant uterus for fear of stimulating premature labour. However, if labour does begin in late pregnancy after appendectomy, it is usually uneventful. Although Cesarean section at the time of appendectomy has been performed successfully by Meiling,[6] most authors condemn this procedure, stressing the high morbidity and mortality as a result of the infected intra-abdominal hematomas, uterine infection and septicemia that may follow. Postoperatively the patient should be given antimicrobials.

Pushed away by the enlarging uterus, the omentum is not able to localize an appendiceal abscess, so that the uterus itself becomes the medial wall of the abscess. This irritant may precipitate premature labour. With expulsion of the uterine contents and reduction in the size of the uterus, the abscess disintegrates and the contents are disseminated throughout the abdominal cavity, leading to general peritonitis. In this situation it may be wise to wash out the peritoneal cavity and to use antimicrobials locally. Peritonitis is more common in appendicitis in pregnancy and increases in frequency as gestation advances. The normal Braxton Hicks contractions contribute to dissemination of infection. When the appendix has perforated, the complications include abscess or fistula formation, wound infection and phlebitis.

Abortion, premature labour and stillbirth are common complications. Hoffman and Suzuki[7] found that fetal loss was 11% with the disease limited to the appendix and 35% when peritonitis was present. Parker[8] found a maternal mortality of 5.8%, predominantly in late pregnancy, mortality being greatest in labour.

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