into the circulation, sensitized the tissues and produced the phenomena described.

DR. FRANK E. SIMPSON, Chicago: The relation of the gonococcus to this form of dermatitis is very interesting. The gonococci have been looked for in the lesions very often, but have never been found, which, perhaps, is simply due to the fact that they were not looked for at the proper time. If they should be found eventually it would tend to uphold the contention that all the parakeratoses are due to a microbic agent.

APPENDICITIS COMPLICATING PREGNANCY

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It is my purpose to present briefly the debatable points of interest in relation to appendicitis as a complication of pregnancy, labor and the puerperium. Obstetricians were slow to appreciate the frequency and gravity of appendicitis as a complication of pregnancy. This was so because appendicitis was not clearly recognized until Fitz, in 1886, substituted the term appendicitis for typhlitis and perityphlitis. Eight years later, Paul F. Munde¹ reported three cases of appendicitis complicating pregnancy and two years later R. Abrahams² added twelve cases. The clinical deductions of Munde and Abrahams are generally accepted to-day. In fact there has been little of importance that has been contributed by later writers. The most elaborate contribution to the subject is that of H. H. Schmid who collected 486 cases of appendicitis complicating pregnancy from the literature of the past twenty years.

Appendicitis occurs with greatest frequency during the child-bearing period, hence it is not strange that it should be found to complicate pregnancy. But we are not to conclude that the combination is a coincidence in all cases. Nearly all authorities agree that a primary attack is not incited by the pregnant state but that there is a very great liability to recurrent attacks during pregnancy, labor and the puerperium.

As to the frequency with which women who have suffered from one or more attacks of appendicitis prior to pregnancy experience a recurrent attack in event of pregnancy I quote the observations of Goedecke.³ He reported sixteen cases of pregnant women who had suffered from an attack of appendicitis prior to their pregnancy and of this number five went through pregnancy and puerperium with no trouble from their appendix, while eleven had a recurrent attack during their pregnancy.

The explanation for recurrent attacks in pregnancy, lies in the vascular engorgement of the appendix, in the constipation which is so commonly associated with pregnancy, in the toxemias of pregnancy, in the encroachment of the uterus in the early months of pregnancy, and in the puerperium and, finally, in the occasional presence of adhesions binding the appendix to the uterus and its appendages. While these factors doubtless tend to incite a recurrent attack of appendicitis they cannot be said to create a primary attack.

I am unable to arrive at any estimate of the frequency of the complication. Treves, in 1895, reported six cases

of appendicitis complicating pregnancy out of a total of 1,000 cases of appendicitis in women. Norris⁴ operated on 445 women of appendicitis, six of whom were pregnant. Sonnenburg performed 2,000 appendectomies, in four of which the appendicitis occurred in pregnancy and the puerperium. Baldwin had six pregnancies in 1,800 appendectomies; Vineberg nine in 731 and v. Eiselberg thirteen in 520. E. Fraenkel⁵ found five cases in 40,000 pregnancies; Schauta four in 34,000; v. Rosthorn⁶ two in 27,000; Fellner none in 4,000; v. Oordt four in 10,000 and Chrobak and v. Rosthorn thirteen in 13,000.

The gynecologist and obstetrician doubtless find a much larger percentage of appendicitis complicating pregnancy for the very good reason that they see more pregnancies and fewer cases of uncomplicated appendicitis.

Appendicitis complicating pregnancy presents a serious problem because of the occasional difficulties encountered in making an early diagnosis. It is true that both mild and severe attacks of appendicitis often go unrecognized in the course of pregnancy, in labor and in the puerperium. Mild attacks are interpreted as the ordinary discomforts of pregnancy and the severe cases occurring in the puerperium are frequently regarded as types of puerperal sepsis. Again, we find these attacks interpreted as intestinal colic, renal colic, ureteropyelitis, threatened miscarriage, salpingitis and tubal pregnancy.

While mild attacks do not alter the course of pregnancy, severe attacks will usually result in the interruption of pregnancy, and not infrequently in the death of the fetus *in utero*. The infection may extend to the uterus by way of the fallopian tubes or by way of the broad ligaments and uterine wall to the placenta. In this manner, the colon bacillus has been conveyed to the placenta and fetus. The large percentage of fetal mortality observed in the reports of cases is due in part to the interruption of pregnancy prior to the period of viability and in part to fetal toxemia. In eighty-nine appendectomies on perforated appendices there were thirty-three abortions after operation. In fifty non-perforated cases seven abortions followed operation. Boije⁷ referred to eighteen cases in Engstrom's clinic in which pregnancy was not interrupted. A gangrenous appendix with general peritonitis was operated on in the fourth month of pregnancy by T. K. Holmes⁸ and pregnancy went to term with the delivery of a healthy child. Several such cases are on record.

Falk⁹ drained an appendiceal abscess containing two liters of pus without interrupting a six months' pregnancy. It is incumbent on the surgeon, therefore, to employ every possible means of preventing miscarriage after operating. When a viable fetus is born early in an attack the chances for the life of the child are not greatly influenced by the appendiceal infection but when the delivery occurs late in the course of a severe attack of appendicitis the fetal mortality is great as the result of sepsis. It has been frequently observed that death of the mother rapidly follows the interruption of pregnancy. While miscarriage is regarded as a contributing factor to the fatal issue, sepsis is the chief determining factor.

It is generally conceded that appendicitis complicating pregnancy and the puerperium runs a more rapid

* Read in the Section on Obstetrics and Gynecology of the American Medical Association, at its Sixty-Third Annual Session, held at Atlantic City, June, 1912.

1. Munde, P. F.: Med. Rec., New York, Dec. 1, 1894; Oct. 20, 1895; March 23, 1895.

2. Abrahams: Am. Jour. Obst., 1897, xxxv.

3. Goedecke: Zentralbl. f. Gynäk., 1912, No. 15.

4. Norris: Am. Gyn. and Obst. Jour., xiv, 425.

5. Fraenkel, E.: Samml. Klin. Vortr., 1898, No. 229, S. p. 1335.

6. Von Rosthorn: Med. Klin., 1907, S. p. 330.

7. Boije: Chap. XXIX, Frommelt's Jahrb. über Geb. u. Gyn., 1903.

8. Holmes, T. K.: Am. Jour. Surg. and Gynec., February, 1903.

9. Falk, Otto: Zentralbl. f. Gynäk., 1900, xl, S. p. 193.

and destructive course than in the non-gravid state. It is true that appendiceal abscesses are particularly liable to rupture into the free peritoneal cavity. The explanation lies in the fact that the growing uterus of pregnancy and the contracting uterus of labor and the puerperium form the inner boundary of the abscess, hence the great liability of the abscess to rupture.

Myers¹⁰ reported nine cases of appendiceal abscesses with three deaths from general peritonitis, and again Meyers collected the records of sixty-nine cases of appendicitis in which the patient was operated on in the course of pregnancy. Of these patients forty-nine (71 per cent.) developed a gangrenous appendix with abscess formation. Babler¹¹ collected 235 cases of appendicitis complicating pregnancy and the puerperium. In a total of 207 cases the appendix perforated in 103; eighty-nine patients were operated on with thirty-six maternal deaths. In fourteen of the perforated cases no operation was done; all the patients died. There were fifty non-perforated cases in which operation was done with one maternal death. Twenty-eight cases occurred in the puerperium, eighteen were perforated, in twelve the patients were operated on with four maternal deaths. Two of the five patients not operated on recovered after rupture of the abscess into the rectum. In all of the non-perforated cases occurring in the puerperium the patients recovered. Babler very pertinently concludes: "The mortality of appendicitis complicating pregnancy is the mortality of delay."

The evidence is convincing that appendicitis runs a more rapid and destructive course when complicating pregnancy and the puerperium and therefore demands prompt consideration at the hands of the surgeon.

If it be true that appendicitis is particularly liable to recur in event of pregnancy it follows that women in the child-bearing period who have suffered one or more attacks of appendicitis present a very special indication for the removal of the appendix.

I would not go so far as does Fraenkel⁵ in advising the removal of the appendix in all attacks, both mild and severe, occurring in the course of pregnancy. When the attack is mild, unless oft repeated, it would seem advisable to postpone operation until the end of the puerperium. When there is a definite pronounced attack in the course of pregnancy or the puerperium the demand for immediate operation is imperative in view of a possible rapid and destructive course. The earlier in the course of both pregnancy and appendicitis the operation is performed the better will be the result. When an appendiceal abscess is recognized drainage should be established without delay because of the great liability of rupture of the abscess into the peritoneal cavity. This applies as well to abscess formation at the beginning of labor when the contracting uterus would be so liable to disseminate the pus. The greatest caution must be exercised to prevent the contamination of the genital tract by the escaping pus.

It is seldom that pregnancy is interrupted in the course of a mild attack of appendicitis but it is the rule that pregnancy is interrupted in the course of severe attacks. When operation is performed in such cases, every precaution should be taken to prevent miscarriage. In operating the uterus should be carefully guarded from undue handling and exposure and after operation opiates should be administered to the patient and absolute rest enjoined.

In severe attacks occurring at the end of pregnancy and without evident abscess formation, the rule should be to induce labor and to remove the appendix at the completion of labor.

In the past six years I have had fifteen cases of appendicitis associated with pregnancy, labor and the puerperium. The first seven of these cases were reported in the *American Journal of Obstetrics*;¹² the others are given here:

CASE 8.—Mrs. H., aged 32, quartipara, had a severe attack of appendicitis two years before the present attack and had since suffered from tenderness and pain in the appendiceal region with gastro-intestinal disturbances. Her fifth child was born at term, March 2, 1911, and six hours after the completion of labor the temperature reached 101.5 F.; in forty-eight hours it was 105.6 F., and the pulse was 120. There was intense pain in the region of the appendix, rapid distention of the abdomen, nausea, obstipation and muscular rigidity over the right lower quadrant. I first saw her at the end of the third day of the puerperium and operated within two hours. The appendix was not adherent but was large, congested and contained a small amount of pus. Recovery followed.

CASE 9.—Mrs. S., aged 22, secundipara, first complained of pain in the region of the appendix three years before. In these three years she had had several moderately severe attacks of appendicitis; the last was not severe but her physician advised the removal of the appendix in view of the fact that she was again pregnant. I operated on her in the fifth month of gestation. The appendix was thickened, but contained no pus and no adhesions existed. Recovery followed and the pregnancy proceeded to term with the delivery of a healthy child.

CASE 10.—Mrs. W., aged 28, primipara, entered the hospital in the twelfth week of gestation. Five years previously, she had her first attack of appendicitis. Since then she had had several recurrent attacks of moderate severity; the last was in the fifth week of her present pregnancy. These attacks were of moderate severity. She suffered from the usual gastro-intestinal disturbances of chronic appendicitis, and the pain in the right iliac region had been steadily increasing as the pregnancy advanced. I removed a thickened non-adherent appendix. Recovery followed without the interruption of pregnancy.

CASE 11.—Mrs. S., aged 22, primipara, was about ten weeks pregnant when she experienced her second attack of appendicitis, the first having occurred six months before. I operated on her a few days after the acute symptoms of the second attack had subsided and removed a thickened, congested appendix which was not adherent and did not contain pus. Recovery followed and the pregnancy proceeded to term with delivery of a healthy baby.

CASE 12.—Mrs. E., aged 31, primipara, had never experienced an attack of appendicitis until her present pregnancy. One week before admission to the hospital she had a moderately severe attack. The appendix was removed in the ninth week of gestation; it was in the subacute stage of a catarrhal inflammation. Recovery followed. The pregnancy proceeded to term.

CASE 13.—Mrs. K., aged 24, nullipara, miscarried at the seventh month of gestation. She experienced great pain in the region of the appendix throughout labor. I saw her three weeks after the miscarriage when I drained an appendiceal abscess through the right lateral incision. The abscess contained fully two quarts of pus. The records were not kept for the first three weeks following the miscarriage, but it was stated by her physician that her temperature was elevated to 101 F. by the end of labor and ranged from 101 F. to 105 F. to the time of operation. So far as known, this was her first severe attack, but there were several preceding mild attacks. Recovery followed.

CASE 14.—Mrs. S., aged 29, secundipara, referred to me by Dr. Peters of Stanton, Neb., was then believed to be about

10. Myers, Max: *Am. Jour. Obst.*, March, 1906, p. 358.

11. Babler: *THE JOURNAL A. M. A.*, Oct. 17, 1908, p. 1310.

12. *Am. Jour. Obst.*, 1909, IV, 6.

three weeks pregnant. Two days after her first confinement she experienced her first attack of appendicitis which was moderately severe. This was three and one-half years ago. Since then, she has had more or less discomfort in the neighborhood of the appendix. In her second pregnancy this discomfort was increased. She gave birth to her second child eighteen months ago. For two or three days preceding labor and for a week following labor, the pain in the right side was very intense. The abdomen became distended, there was elevation of temperature and the bowels were moved with great difficulty. She continued to suffer from pain in the right side to the time of operation. I removed an appendix which was distended throughout its entire course with bloody feces; there were no adhesions. Recovery ensued without miscarriage.

CASE 15.—Mrs. B., aged 24, primipara, referred by Dr. Sullivan of St. Edwards, Neb., is in the seventh month of gestation. She has had four severe attacks of appendicitis—the first eighteen months ago, the second one year ago, the third three months ago, when she was about four months pregnant and the last one week ago. All these attacks were typical and severe. At no time since her first attack has she been free from discomfort referable to the appendix. Her last attack has completely subsided, leaving nothing but some localized tenderness. In the effort to save the child I am keeping her under observation in the hospital and should another attack set in she will be operated on without delay.

CONCLUSIONS

These fifteen cases present several points of interest:

1. In all but one of the fifteen cases there had been previous attacks of appendicitis.

2. Six of the cases were mild attacks, in which all the patients recovered without the interruption of pregnancy. Ten were severe attacks in which seven patients recovered and three died. In all there were three deaths in fifteen cases and in one of the fatal cases the patient was not operated on.

3. In the fifteen cases the attacks occurred in labor in one, in the puerperium in five, and in pregnancy in nine cases.

4. The five cases occurring in the puerperium were of unusual severity.

5. Of the fifteen cases two patients died of septic peritonitis and one of bronchopneumonia. One of these patients was not operated on.

6. In the majority of cases the attacks recurred in the early months of pregnancy.

7. Mild attacks showed no disposition to disturb the pregnancy.

8. In Case 15, the patient refused operation in a severe attack which occurred in the third month of gestation. She had recovered from her last attack before entering the hospital and inasmuch as she was in her seventh month of pregnancy it was thought advisable to delay operative interference in the interest of the child, but with the understanding that she would be operated on at the onset of a subsequent attack.

9. In Cases 4 and 6¹¹ the fetus was dead *in utero*, the latter at term, the former in the early weeks of its development.

10. In Cases 2 and 6¹¹ there was a gangrenous appendix with abscess formation which rapidly spread to the general peritoneal cavity and resulted fatally.

11. In no instance was pregnancy interrupted after the removal of the appendix.

12. These experiences lead me to the conclusion that pregnancy probably has no influence in creating a primary attack of appendicitis but has a very great influence in creating renewed attacks.

13. Of women who have had appendicitis prior to pregnancy 50 to 60 per cent. will suffer more or less disturbances referable to the appendix in subsequent pregnancies.

14. Inasmuch as appendicitis complicating pregnancy and the puerperium tends to run a rapid and destructive course, it is particularly hazardous to delay operative interference in sharp attacks.

15. The earlier in the attack and the earlier in the course of pregnancy the operation is performed, the better will be the results.

16. Wagner estimates the mortality of non-operative severe cases at 77 per cent. as contrasted with a mortality of 6.7 per cent. in cases of all grades of severity in which operation is done within the first forty-eight hours, a record that is not exceeded in operating appendicitis that is not complicated by pregnancy. Doubtless this record of 6.7 per cent. maternal mortality in all cases in which operation is done within forty-eight hours from the beginning of the attack would be materially reduced were these patients operated on within the first twenty-four hours.

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ABSTRACT OF DISCUSSION

DR. JOHN B. MURPHY, Chicago: The mortality of appendicitis is enormously greater than the mortality of any other condition. What are the anatomic and the pathologic conditions that contribute to this mortality? The anatomic conditions that contribute to the mortality are, as shown, the fact that as the uterus enlarges during pregnancy it removes from the appendix its natural protectors, the omentum and the intestine. There are two opportunities for infection to occur: hematogenous conditions in the bladder and rectum, and a severe attack of appendicitis. In miscarriage or labor, infective material is scattered all about. One focus of infection is close to the outlet of the pelvis; infection may occur either through the blood-vessels or by direct transmission from the vagina. We must determine how to avoid these dangers. Dr. Findley emphasizes these two facts, that when the condition was diagnosed and remedied early, the mortality was practically nil; when the condition was diagnosed late and the endeavor to remedy it was also late, the mortality was colossal. Therefore, we go back to the proposition: Can we diagnose the condition early? If we can diagnose the condition early, what is the excuse for waiting? We can diagnose the condition early even in the presence of pregnancy. What are the conditions that we have to differentiate? Hematogenous infections of the kidney; infection of the bladder; obstruction to the ureter. Lesions of the kidney can easily be differentiated from acute appendicitis, with and without pregnancy. The onset of pain is the same in both. The reflexes are normal in both; leukocytosis occurs in both, particularly in the metastatic variety of infection. You have, therefore, the principal symptoms, except the local manifestation, the same in both. One of the important points in the differentiation is the exclusion of kidney and gall-bladder infection. It is easy to exclude gall-bladder disease from infection of the appendix, but it is not always easy to exclude renal complications. You can do it, however, in all cases. You must resort to flat percussion. Have the patient sit on the side of the bed and let the hands come clear down, so as to force the kidney high up. Then place the hand over the left kidney and strike it with the closed fist. If there is an acute obstruction the patient will immediately spring up, and it may be all he can do to keep from striking you. If there is any one thing that a man of experience has concluded, it is that he does not know what is going to occur in the ten or twenty or forty hours following the onset of the appendicitis. If you do not know what is going to happen, what justification have you for taking the hazard which Dr. Findley has accentuated?