APPENDICITIS IN PREGNANCY*

By Archibald L. McDonald, M.D., F.A.C.S., Duluth, Minnesota

THE following experience stimulated this paper. A colleague telephoned concerning a patient at full-term pregnancy with acute appendicitis, for whom he proposed cesarean section and appendectomy. Two objections at once presented—obstetrical: cesarean section for cause other than dystocia should be avoided if more conservative method of delivery is available; surgical: an acute abdomen with probable peritonitis is an unfavorable field for hysterotomy.

Mrs. G., 21 years old, para ii, gave a history of attacks of pain and vomiting previous to and earlier in this pregnancy. For two days there had been severe colic, vomiting, fever to 101° F., leucocytes 18,000. During last twelve hours condition was progressively worse; pain was more constant and severe, suggesting impending labor, vomiting persistent and distressing, fever higher, leucocytes 22,000. Examination: patient anxious, in marked distress, vomiting fecal in character, uterus at full term and in a state of hypertonus with no definite relaxation or contraction. Vaginally: head floating, membranes unruptured, cervix soft and thin, admitted one finger. Diagnosis: acute appendicitis with peritonitis, labor impending. Surgical indication for immediate appendectomy and drainage unmistakable. Labor being imminent, it was decided first to empty the uterus by the most conservative method possible. Under ethylene anesthesia the cervix was dilated manually, and a full-term, living child was delivered by version and extraction, followed by spontaneous expulsion of the placenta. There were no lacerations. The abdomen was then opened by a right rectus incision disclosing free purulent fluid. A gangrenous appendix lying between coils of intestine close to the uterus was removed. Cigarette drains were placed in the pelvis and to the cecum. The entire procedure required less than an hour. Convalescence was uncomplicated; drains were removed on third day. Mother nursed her baby throughout. Both were discharged on the fourteenth day.

The result was entirely satisfactory. Search of the literature, however, discloses a number of radical proposals. DeLee[1] has practiced and recommends cesarean section and appendectomy in acute attacks. The same procedure and also hysterectomy in badly infected cases have been carried out by various foreign authors (Fritz Michel,[2] G. Conrad,[3] Pankow[4]). Vaginal cesarean section has been done preceding abdominal operation for gangrenous appendicitis (Otto Wolfring,[5] Rosenthal[6]).

Acute suppurating appendicitis late in pregnancy or with impending labor is not common. While ten fellows[10] of this association state they have never met it, accurate data concerning 33 well-defined cases have been furnished by other members. From the literature, 37 well-described cases have been added. Emil Jerlov[7] has studied the en-

*Read at a meeting of the Western Surgical Association, Chicago, Dec. 14, 1928.

the right kidney is a complication which may simulate acute appendicitis. In the literature several of the worst cases had been treated for some time as pyelitis, and the true condition was recognized only after diffuse peritonitis was present. Pyuria or bacilluria do not necessarily clinch the diagnosis of pyelitis. Hypertonic contraction of the uterus is a frequent result of peritoneal irritation (Lemeland[10]). It causes diffuse abdominal pain and suggests impending abortion or labor to the degree that nothing else is suspected.

The relative frequency of serious complications of appendicitis in the pregnant woman as compared with the nonpregnant woman is shown by comparative figures. With regard for varying judgments of different authors, I have taken the classification of Quain[11] and compared it with two series in the pregnant: that of Jerlov's 204 cases confirmed by operation, and the Western Surgical group of 33 cases combined with 37 from the literature.

	CONFINED TO APPENDIX		WITH ABSCESS		GENERAL PERITONITIS	
	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT
Quain, 1000 cases nonpregnant	551	55	289	28.9	160	16
Jerlov, 204 cases pregnant	108	45	45	20	51	25.
Western Surgical group and literature, 70 cases pregnant	35	50	6	12	29	39

These figures show a comparative increase in the frequency of general peritonitis and decrease of local abscess as complications.

The comparative mortality is shown in the following table:

	CONFINED TO APPENDIX			LOCAL ABSCESS			GENERAL PERITONITIS		
	NO.	DIED	PER CENT	NO.	DIED	PER CENT	NO.	DIED	PER CENT
Jerlov, 204 cases pregnant	108	0	0	45	9	20	51	16	31
Western Surgical group and literature, 70 cases pregnant	35	1	3	6	3	50	29	8	27
Total, 274 cases pregnant	143	1	0.71	51	12	23.5	80	24	30
Quain, 1000 cases nonpregnant	551	2	0.36	289	7	2.4	160	18	11

The mortality of complicated cases in pregnancy is relatively high, especially when operated late in the attack.

To what extent is abortion or premature labor a factor in the complications and course of acute appendicitis? The following table shows the frequency of this event in various types of the disease.

	CONFINED TO APPENDIX			LOCAL ABSCESS			GENERAL PERITONITIS		
	NO.	ABORTED	PER CENT	NO.	ABORTED	PER CENT	NO.	ABORTED	PER CENT
Jerlov, 204 cases	108	16	13.8	45	25	55	51	32	63
Western Surgical group and literature, 70 cases	35	4	11.4	6	4	66	29	21	72

The above-mentioned figures indicate that the liability to abortion increases directly with the duration and severity of the appendicitis. In some of the more serious cases termination of pregnancy occurred before operation, proof that it was due to the disease rather than to surgery. The complication is of some prognostic significance.

There are factors predisposing to bring on interruption of pregnancy: (1) Fever and toxemia, as in pneumonia or influenza; (2) Gastrointestinal disturbances of themselves are not important; (3) Reflex irritation from peritonitis causes hypertonic contraction of the uterus. This results in painful uterine spasm. While this contracture may go on to active expulsive contractions, the hypertonus often persists as such, for several days. (4) Extension of infection through communicating lymphatics to the right fallopian tube and endometrium may cause death of the fetus and abortion. In 57 cases of appendicitis complicated by abortion Jerlov found 12 with salpingitis of the right tube. (5) Operative manipulation adds little if anything to the danger of abortion provided the stability of the pregnancy is not already disturbed. Early operation is the best safeguard. Spinal anesthesia is contraindicated, Brindeau et Juge.[12] It causes undue relaxation of the cervix. Postoperative complications of the ordinary sort may have some untoward influence and must be controlled.

The direct harmful effect of abortion or labor has been much exaggerated. This effect might be due to shock from prolonged labor, to excessive bleeding, to absorption and sepsis through the placental site or lacerations, or to disturbed relations in the abdomen. Jerlov concludes: in mild cases with no peritonitis, labor and involution whether premature or full term have no harmful effect. In cases with peritonitis delivery, whether preceding or following operation, has some harmful effect. He gives the following figures:

	ABORTED	DIED	PER CENT	NO ABORTION	DIED	PER CENT
Early General Peritonitis	10	1	10	15	0	0
Late General Peritonitis	19	12	63	7	3	43
Late Abscess	24	8	33	21	1	4.8

The mortality is higher in the cases which aborted. This does not prove that abortion is the chief determining factor in the result, because extensive peritonitis and sepsis were also present. Study of many of the cases in my data indicates that abortion or labor occurred in persons already prostrated by sepsis and had but little influence in the untoward result. This could have been avoided by earlier surgical intervention rather than by interruption of pregnancy. Many of them aborted because they were dying; they did not die because they aborted.

To what extent does the danger and possible untoward influence

CONCLUSIONS

1. Pregnancy as a complication of acute appendicitis presents problems for differential diagnosis but does not modify the indications for surgical treatment.

2. Abortion or labor gives a relatively grave prognosis. Obstetric procedures are indicated only when the event is actually impending.

3. Delivery should be completed by the most conservative method consistent with good practice.

REFERENCES

(1) *DeLee, J. B.:* Practical Medical Series, Obstetrics, p. 55, 1926; p. 82, 1927. (2) *Michel, Fritz:* Zentralbl. f. Gynäk. **51**: 2477, 1927. (3) *Conrad, G.:* Zentralbl. f. Gynäk. **52**: 162, 1928. (4) *Pankow, O.:* Arch. f. Gynäk. **133**: 5, 1928. (5) *Wolfring, Otto:* Zentralbl. f. Gynäk. **52**: 374, 1928. (6) *Rosenthal, M.:* Zentralbl. f. Gynäk. **52**: 436, 1928. (7) *Jerlov, Emil:* Acta obstet. et gynec. Scandinav. **4**: 1925. (8) *Portes et Segury:* Gynéc. et Obst. **15**: 114, 1927. (9) *Brindeau, A.:* Leçons du Jeudi Soir, Clinique Tarnier, 1926, No. 3, Vigot Freres, Editeurs. (10) *Lemeland:* Bull. Soc. d'obst. et gynec., No. 1, 29, 1926. (11) *Quain, E. P., and Waldschmidt, R. H.:* Arch. Surg. **16**: 868, 1928. (12) *Brindeau et Juge:* Gynéc. et Obst. **14**: 145, 1926. (13) *Mussey, R. D.:* Am. J. Obst. & Dis. Child. **77**: No. 5. (14) *Phaneuf:* J. A. M. A. **88**: 282, 1927. (15) *Fairbairn, J. S.:* Brit. M. J. **1**: 456, 1927. (16) *Royson and Fisher:* Am. J. Obst. & Gynec. **11**: 184, 1926. (17) *Wilson:* Surg. Gynec. Obst. **45**: 620, 1927. (18) *Davis:* Progressive Medicine, 1924. (19) *DeLee, J. B.:* S. Clinics, N. America, **1**: 1003, 1921. (20) *Findley:* J. A. M. A. **54**: 612, 1912. (21) *Grattan:* Gynéc. et Obst. **2**: 300. (22) *Tedenat:* Bull. Soc. d'obst. et de gynec., No. 3, 240, 1925. (23) *Couvelaire:* Bull. Soc. d'obst. et de gynec., Dec., 1926.

Lyceum Building.