

## A STUDY ON ECTOPIC PREGNANCY

by

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*All of the pathologically proved cases of ectopic pregnancy on the files in National Taiwan University Hospital, Provincial Keelung Hospital and Taipei Medical College, during July 1949 to June 1964 were collected and yielding 1,122 cases of tubal pregnancy, 9 cases of ovarian pregnancy, 12 cases of abdominal pregnancy and 5 cases of other miscellaneous ectopic pregnancy. Their clinical history, pathological record and histological slides were reviewed. Only those cases which were clinically trustworthy were treated in this series. Pathological discussions were held from every possible angle on only those cases which were adequately identified. Attempts were also made to cover the incidence rates, etiology, pathogenesis, pathognomosis, growth rates and cause-and-effect relationships with regard to each category of ectopic pregnancy.*

### INTRODUCTION

Ectopic pregnancy is one of the most dangerous conditions in the field of gynecologic disease. Although its incidence is not very high, it is still one of the most important ailments because of its severe emergency manifestation, worldwide distribution and the fact that the occurrence has not been reduced significantly after the discovery of antibiotics. Some authors even believe the incidence of ectopic pregnancy increases after inadequate antibiotic treatment for genital tuberculosis or other infectious diseases affecting the genital organs.<sup>(1-8)</sup> Efforts have been made to tackle this problem from different angles. Many assumptions have been forwarded but neither etiology nor pathogenesis has so far offered any solution to the problem which is considered to be really convincing. This researcher had a chance to conduct a histologic analysis of 135 ectopic pregnancy cases at the Provincial Keelung Hospital in 1963 and found many interesting pathological problems which remained unclearified. A larger number of cases have been analyzed to acquire more knowledge about this problem. The

findings and conclusions of the research are dealt with in full detail in this paper.

### METHOD AND MATERIAL

All ectopic pregnancy cases on file in the Departments of Pathology of the Taiwan University Hospital, Provincial Keelung Hospital and Taipei Medical College from July 1949 to June 1964 have been studied. Because the Provincial Keelung Hospital and Taipei Medical College opened their pathology departments in February 1955 and March 1963 respectively their cases earlier than the two dates were not available for study. Since these three departments alone collect the surgical specimens from out side clinics in addition to keeping the relevant data gathered at their own hospitals in north Taiwan, the materials gathered here in best represent the situation in the northern part of the island of Taiwan.

Clinical data, such as age, menstrual history, parity, past history, last menstrual period, the onset of symptoms, dates of operations, their findings, and methods were obtained. The gross description in the patho-



logical report sheets and slides were carefully studied. A thorough note was taken of all relevant observations. The clinical data were checked against gross and microscopic findings. All the topics and their criteria for grading had been decided before the study began. When an absolutely credible record is lacking, the topic in the case is assigned

to the unknown group.

Available for study are 1,003 cases from the National Taiwan Hospital, 202 cases from the Provincial Keelung Hospital and 52 cases from the Taipei Medical College. They are listed below according to the types of ectopic gestation.

#### Content of material

|                                        |           |             |
|----------------------------------------|-----------|-------------|
| 1. Tubal pregnancy                     |           |             |
| Fetus or chorionic villi present       | 1,049     |             |
| Only trophoblasts demonstrable         | 73        | 1,122       |
| Slide lost                             | 30        | }           |
| Only decidua demonstrable              | 17        |             |
| No fetus, no villi, no decidua         | 62        |             |
| 2. Ovarian pregnancy                   | 9         |             |
| 3. Abdominal pregnancy                 | 12        |             |
| 4. Others                              |           |             |
| Combined uterine and tubal pregnancy   | 3         |             |
| Accessory tube pregnancy               | 1         |             |
| Pregnancy in one horn of double uterus | 1         |             |
| * Not included                         | 109 cases | Total 1,148 |

### RESULT AND COMMENT

#### I. TUBAL PREGNANCY

##### 1. Age Distribution in Tubal Pregnancy

Table 1 shows that tubal pregnancy has actually occurred in every child-bearing age

bracket. More susceptible, however, are women 26 years to 40 years of age who account for nearly three-quarters of all victims. The youngest victim was a 17 year old girl and the eldest a 48 year old housewife

Table 1. Age Distribution in Tubal Pregnancy

| Age (year) | <20      | ~25   | ~30   | ~35   | ~40   | ~45  | >46  | ?    | Total  |
|------------|----------|-------|-------|-------|-------|------|------|------|--------|
| Cases      | 26       | 171   | 301   | 313   | 227   | 53   | 6    | 25   | 1,122  |
| Percentage | 2.31     | 15.22 | 26.82 | 27.90 | 20.23 | 4.72 | 0.53 | 2.22 | 100.00 |
| Youngest   | 17 years |       |       |       |       |      |      |      |        |
| Eldest     | 48 years |       |       |       |       |      |      |      |        |

##### 2. Distribution of Tubal Pregnancy according to the Season

The distribution made on the basis of the days operations were performed. Tubal pregnancy occurred most often in spring and

summer. Autumn was the season when the fewest cases of tubal pregnancy were operated upon. The difference is significant statistically when checked with the Chi square method. The probability is less than 0.02%.



Table 2. Seasonal Distribution of Tubal Pregnancy

| Season                                                  | Spring | Summer | Autumn | Winter | Total  |
|---------------------------------------------------------|--------|--------|--------|--------|--------|
| Cases                                                   | 321    | 288    | 249    | 264    | 1,122  |
| Percentage                                              | 28.61  | 25.67  | 22.19  | 23.53  | 100.00 |
| $\chi^2_3 = 10.556$ $P(0.05 = 7.815)$ $P(0.02 = 0.837)$ |        |        |        |        |        |

### 3. Pregnancy History in Tubal Pregnancy Patients

Less than half of the patients had a pregnancy history. Of the 495 patients who had parity records 393 or 79.34% were multiparous. The remaining 102 cases or 20.66% were primiparous. The latter figure is apparently unbelievable because in many cases, a pregnancy history was ignored. This researcher wonders if the incidence of tubal pregnancy among the "non-pregnant women" would not

be greatly reduced had the complete obstetrical history been obtained for the entire unknown group. Among multiparous women, oligoparous state (para 1—para 3) predominated. The largest parity found was para 12. The longest interval between tubal pregnancy and the last delivery was 18 years. But there were many cases in which tubal pregnancy occurred during the lactation period. The shortest interval was three months Post Partum.

Table 3. Parity in Tubal Pregnancy Patients

| Parity              | P. 0  | p. 1—p. 3 | >p. 4 | total  | unknown |
|---------------------|-------|-----------|-------|--------|---------|
| Case                | 102   | 240       | 153   | 495    | 627     |
| Percentage          | 20.66 | 48.48     | 30.86 | 100.00 |         |
| Percentage to total |       |           |       | 44.12  | 55.88   |

Duration between last delivery and operation  
 Minimum: 3 months  
 Maximum: 18 years

### 4. The Clinical History in Tubal Pregnancy

Most of the request sheets to pathological departments did not touch upon clinical history very clearly. The incidence of venereal disease is not credible, because the unknown group is simply too large. The incidence of previous laparotomy is not trustworthy either, but it is not an important factor leading to tubal pregnancy. In the question of abortion, only about one-third (34.4%) of the 1,122 cases answered. The ratio of the patients who aborted to those

who did not is 38.86% to 61.14% or 13.37% to 21.03% if compared with the total number of cases. The abortions referred to here include the spontaneous abortions, threatened abortions, and artificial abortions for contraceptive purposes. This indicates a high abortion percentage in tubal pregnancy. Tubal pregnancy, therefore, may be a sequel of abortion. The shortest interval between tubal pregnancy and abortion was one month and the longest was 12 years.



Table 4. Clinical History Summary

|                                  | Known       |               | Unknown | Total |
|----------------------------------|-------------|---------------|---------|-------|
|                                  | Experienced | unexperienced |         |       |
| Incidence of Venereal Disease    |             |               |         |       |
| Cases                            | 10          | 63            | 1049    | 1122  |
| Percentage                       | 0.89        | 5.62          | 93.49   |       |
| Incidence of Previous Laparotomy |             |               |         |       |
| Cases                            | 60          | 191           | 871     | 1122  |
| Percentage                       | 5.35        | 7.02          | 77.63   |       |
| Incidence of Previous Abortion   |             |               |         |       |
| Cases                            | 150         | 236           | 736     | 1112  |
| Percentage                       | 13.37       | 21.03         | 65.60   |       |

#### 5. Side and Localization of Tubal Pregnancy

There were 577 cases with right tubal ectopic pregnancy and 501 cases with left tubal pregnancy. But there were another 44 cases in which the side of pregnant tube was not stated. If those 44 cases were omitted, the ratio of right side to left side tubal pregnancy will be 53.53 per cent to 46.47 per cent. This difference was checked with Chi square method and the probability was about 2%.

The implantation was located on the basis of: 1) where the embryo was discovered during the gross examination; 2) the most

dilated part of the tube, if the bulging mass were localized; 3) the area where the chorionic villi were most abundant invading the tubal wall and/or 4) the site of the perforation.

The ampulla portion was the site where tubal pregnancy occurred most often followed by the isthmic portion. The former occupied 51.69% and the latter occupied the 18.80% of the 1,122 case. The tubal pregnancy took place in the cornual portion and in the fimbria portion rarely. This difference between the four locations was checked with Chi square and the probability was less than 0.1 per cent.

Table 5. Side of Tubal Pregnancy

| Side of Preg.          | Right    | Left     | Unknown | Total |
|------------------------|----------|----------|---------|-------|
| Cases                  | 577      | 501      | 44      | 1,122 |
| Percentage             | 51.43    | 44.65    | 3.92    |       |
| Unknown Group Excluded | 577/1078 | 501/1078 |         |       |
| Percentage             | 53.53    | 46.47    |         |       |

 $X^2=5.371$  $P(0.05=3.84)$  $P(0.02=5.412)$ 

#### 6. Relation of Tubal Perforation and Location of Implantation in Tubal Pregnancy

Table 6 indicates that most of the tubal pregnancies ended in tubal perforation. The incidence of perforation is 51.87% against the

total of 1,122 cases but will increase to 61.39% when only those cases in which perforation or non-perforation could be definitely ascertained and is so stated in the pathology reports. There is a definite tendency for



Table 6. Location of implantation &amp; it's incidence of perforation in tubal pregnancy

| Site of Preg.    | Fimbria | Ampulla | Isthmus | Cornual | Site Unknown | Total   |
|------------------|---------|---------|---------|---------|--------------|---------|
| No. of Case      | 48      | 580     | 211     | 39      | 244          | 1,122   |
| Percentage       | 4.28    | 51.69   | 18.80   | 3.48    | 21.75        | 100.00  |
| Perforated cases | 21/42   | 305/533 | 155/198 | 31/22   | 70/143       | 582/948 |
| Percentage       | 50.00   | 57.22   | 78.28   | 96.87   | 48.95        | 61.39   |

 $\chi^2=874.829$  $P(0.001=10.827)$ 

tubal perforation if nidation takes place in the cornual or isthmic portion. If the implantation takes place in the ampulla or fimbria portions the possibility of tubal abortion or of the blood in the tubal lumen flowing out to the abdominal cavity before the perforation is increased.

#### 7. The Changes of Chorionic Villi in Tubal Pregnancy

##### 7-A. Number of Chorionic Villi and Site of Implantation.

In most tubal gestation cases chorionic villi were present in the resected tube or in the blood clots accumulated in the pelvic

cavity. Only 73 cases, or 6.60%, did not show villi but did show trophoblasts. All 1,122 tubal pregnancies are regrouped to fall under five categories according to the presence and number of villi. They are the no-villus (-) category, groups showing a few villi (+), some villi (++), many villi (+++) and abundant villi (++++). Within each group a further analysis according to the sites of implantations. It seems that there is no relation between the site and the number of chorionic villi. In other words the site of implantations seem to have no influence on the proliferation of chorionic villi.

Table 7-A Relation of Implantation Site and Number of Chorionic Villi

| Location<br>Degree | Fimbria | Ampulla | Isthmus | Cornua | Site ? | Total  |
|--------------------|---------|---------|---------|--------|--------|--------|
| - {Cases           | 4       | 41      | 9       | 2      | 17     | 73     |
| - {%               | 8.33    | 7.06    | 4.26    | 4.88   | 7.05   | 6.50   |
| + {Cases           | 10      | 155     | 45      | 10     | 89     | 309    |
| + {%               | 20.83   | 26.68   | 21.33   | 24.39  | 36.93  | 27.54  |
| ++ {Cases          | 20      | 235     | 83      | 11     | 85     | 434    |
| ++ {%              | 41.67   | 40.45   | 39.34   | 26.83  | 35.27  | 38.68  |
| +++ {Cases         | 11      | 124     | 65      | 15     | 41     | 256    |
| +++ {%             | 22.02   | 21.34   | 30.81   | 36.58  | 17.01  | 22.82  |
| ++++ {Cases        | 3       | 26      | 9       | 3      | 9      | 50     |
| ++++ {%            | 6.25    | 4.47    | 4.26    | 7.32   | 3.74   | 4.46   |
| Total              | 48      | 581     | 211     | 41     | 241    | 1,122  |
| %                  | 100.00  | 100.00  | 100.00  | 100.00 | 100.00 | 100.00 |

##### 7-B. Duration of Amenorrhea and the Number of Chorionic Villi

In the same manner, each group is further analyzed on the basis of the length of gestation. It seems that before the first gestation month (the tube resected within 45 days after

the last menstruation), the number of chorionic villi steadily increases as gestation continues but after the first month, the number of chorionic villi is not increased and remains the same.



Table 7-B Duration (LMP-operation) and Number of Chorionic Villi

| Dura. (days) | Degree — |       | Case + |       | Case ++ |       | Case +++ |       | Total Case |      |
|--------------|----------|-------|--------|-------|---------|-------|----------|-------|------------|------|
|              | Case     | %     | Case   | %     | Case    | %     | Case     | %     | Case       | %    |
| <30          | 18       | 15.00 | 30     | 25.00 | 44      | 36.67 | 22       | 18.33 | 6          | 5.00 |
| ~45          | 19       | 11.05 | 49     | 28.49 | 64      | 37.21 | 39       | 22.67 | 1          | 0.58 |
| ~60          | 19       | 6.53  | 77     | 26.46 | 108     | 37.11 | 68       | 23.37 | 19         | 6.53 |
| ~75          | 5        | 2.96  | 53     | 31.36 | 72      | 42.60 | 35       | 20.71 | 4          | 2.37 |
| ~90          | 2        | 2.35  | 26     | 30.59 | 35      | 41.18 | 21       | 24.70 | 1          | 1.18 |
| >91          | 2        | 3.18  | 22     | 34.92 | 17      | 26.98 | 19       | 20.16 | 3          | 4.76 |
| ?            | 8        | 3.60  | 52     | 23.42 | 94      | 42.35 | 52       | 23.42 | 16         | 7.21 |
| Total        | 73       | 5.88  | 309    | 28.17 | 434     | 38.68 | 256      | 22.82 | 50         | 4.46 |

7-C. Number of Chorionic Villi and the Interval between the Day when Symptoms Develop and Subsequent Surgical Operations

The number of chorionic villi is not reduced after the tubal gestation stops. In this series of study, there are three cases in which the tubes were resected more than 90 days

after symptoms of tubal pregnancy had been recognized and the chorionic villi were still clearly demonstrable, although they showed marked degenerative changes. This fact is probably of great use to the pathologist, when he diagnoses a very old ectopic tubal pregnancy and there is no chorionic villus to be found.

Table 7-C Number of Chorionic Villi in Relation to Time Interval between Onset of Symptoms &amp; Operation.

| Dura. (days) | Degree — |      | Case + |       | Case ++ |       | Case +++ |       | Total Case |       |
|--------------|----------|------|--------|-------|---------|-------|----------|-------|------------|-------|
|              | Case     | %    | Case   | %     | Case    | %     | Case     | %     | Case       | %     |
| < 7          | 37       | 7.98 | 86     | 18.53 | 177     | 38.15 | 140      | 30.17 | 24         | 5.17  |
| ~15          | 14       | 7.33 | 54     | 28.27 | 91      | 47.64 | 25       | 13.09 | 7          | 3.67  |
| ~30          | 12       | 5.66 | 77     | 36.32 | 79      | 37.26 | 39       | 18.40 | 5          | 2.36  |
| ~45          | 6        | 7.14 | 37     | 44.05 | 25      | 29.76 | 11       | 16.67 | 2          | 2.38  |
| ~60          | 0        |      | 14     | 40.00 | 12      | 34.29 | 7        | 20.00 | 2          | 5.71  |
| ~75          | 0        |      | 5      | 31.25 | 10      | 62.50 | 0        |       | 1          | 6.25  |
| ~90          | 0        |      | 1      | 16.67 | 4       | 66.66 | 0        |       | 1          | 16.67 |
| >91          | 0        |      | 1      | 33.33 | 2       | 66.67 | 0        |       | 0          |       |
| ?            | 4        | 3.60 | 34     | 30.63 | 34      | 30.63 | 31       | 27.93 | 8          | 7.21  |
| Total        | 73       | 6.50 | 309    | 27.54 | 434     | 38.68 | 256      | 22.82 | 50         | 4.46  |

7-D. Degree of Degeneration of Chorionic Villi and the Interval between the Day When Symptoms of Tubal Pregnancy are Recognized and Subsequent Tubal Resections.

The degree of degeneration of chorionic villi is increased in proportion to the time

between the onset of symptoms of the tubal gestation and the resection of the tube. On the other hand, the data seems to suggest the time when symptoms of tubal gestation developed is also the time when the gestation is interrupted.



Table 7-D. Degeneration of Chorionic Villi in Relation to Symptom-to-Operation Duration

| Dura. (days) | Degree |       | Slight |       | Marked |       | No villi |      | ?    |      | Total |        |
|--------------|--------|-------|--------|-------|--------|-------|----------|------|------|------|-------|--------|
|              | Case   | %     | Case   | %     | Case   | %     | Case     | %    | Case | %    | Case  | %      |
| < 7          | 152    | 32.76 | 178    | 38.36 | 75     | 16.16 | 37       | 7.98 | 22   | 4.74 | 464   | 100.00 |
| ~15          | 40     | 20.94 | 77     | 40.31 | 55     | 28.80 | 14       | 7.33 | 5    | 2.62 | 191   | 100.00 |
| ~30          | 44     | 20.75 | 81     | 38.21 | 66     | 31.13 | 12       | 5.66 | 9    | 4.25 | 212   | 100.00 |
| ~45          | 9      | 10.71 | 31     | 35.91 | 36     | 42.86 | 6        | 7.14 | 2    | 2.38 | 84    | 100.00 |
| ~60          | 3      | 8.57  | 8      | 22.86 | 21     | 60.00 | 0        |      | 3    | 8.57 | 35    | 100.00 |
| ~75          | 0      |       | 6      | 37.50 | 10     | 62.50 | 0        |      | 0    |      | 16    | 100.00 |
| ~90          | 0      |       | 3      | 50.00 | 3      | 50.00 | 0        |      | 0    |      | 6     | 100.00 |
| >91          | 0      |       | 2      | 66.67 | 1      | 33.33 | 0        |      | 0    |      | 3     | 100.00 |
| ?            | 28     | 25.25 | 35     | 31.53 | 40     | 36.04 | 4        | 3.60 | 4    | 3.60 | 111   | 100.00 |
| Total        | 276    | 24.60 | 421    | 37.52 | 307    | 27.36 | 73       | 6.51 | 45   | 4.01 | 1,122 | 100.00 |

#### 8. The Changes of Trophoblasts in Tubal Pregnancy

##### 8-A. Relation of Trophoblastic Proliferation to Sites of Tubal Pregnancy

The degree of proliferation of the trophoblast is divided as follows:

1. No more trophoblasts (-)
2. Usual: The trophoblasts can be recognized as 2 layers or less surrounding the chorionic villi.
3. Usual with deep invasion: The number and activity of trophoblasts are usual but the chorionic villi are found deeply invading the tubal muscle layer.

4. Marked: Marked proliferation of trophoblasts is often evidenced by clumps of trophoblastic masses.

5. Marked with deep invasion: Massive proliferation of trophoblasts with deep invasion by either trophoblasts or chorionic villi to the muscle layer of the tube.

From the following table, one may find the proliferation of trophoblasts bears no relation to the sites where they are implanted, but when tubal pregnancy took place in cornual or isthmic portions the trophoblasts tend invade the tubal wall.

Table 8-A. Relation of Trophoblast Proliferation to Site of Pregnancy

| Degree | Location | Fimbria | Ampulla | Isthmus | Cornuu | Site ? | Total  |
|--------|----------|---------|---------|---------|--------|--------|--------|
| -      | {Case    | 6       | 109     | 27      | 2      | 65     | 209    |
|        | {%       | 12.50   | 18.76   | 12.80   | 5.13   | 26.76  | 18.63  |
| Usual  | {Case    | 30      | 342     | 120     | 13     | 137    | 642    |
|        | {%       | 62.50   | 58.86   | 56.87   | 33.33  | 56.38  | 57.21  |
| U + D  | {Case    | 5       | 34      | 21      | 9      | 10     | 79     |
|        | {%       | 10.42   | 5.85    | 9.95    | 23.08  | 4.12   | 7.04   |
| Marked | {Case    | 5       | 76      | 23      | 8      | 18     | 130    |
|        | {%       | 10.42   | 13.08   | 10.90   | 20.51  | 7.41   | 11.59  |
| M + D  | {Case    | 2       | 17      | 18      | 6      | 9      | 52     |
|        | {%       | 4.16    | 2.93    | 8.53    | 15.39  | 3.70   | 4.64   |
| ?      | {Case    | 0       | 3       | 2       | 1      | 4      | 10     |
|        | {%       | 0       | 0.52    | 0.95    | 2.56   | 1.64   | 0.89   |
| Total  | %        | 48      | 581     | 21      | 39     | 243    | 1,122  |
|        |          | 100.00  | 100.00  | 100.00  | 100.00 | 100.00 | 100.00 |



### 8-B. Proliferation of Trophoblasts in Relation to the Interval between the Day When Symptoms are Recognized and Subsequent Surgical Operations.

As one may expect, the activity of trophoblasts is decreasing as gestation discontinues.

When the tube is resected within one week after the clinical symptoms of tubal pregnancy developed, the number and activity are most prominent. After one week, the activity and number of trophoblasts decrease rapidly and then remain stationary.

Table 8-B. Proliferation of Trophoblasts in Relation to Symptom-to-Operation Duration

| Dura. (days) \ Degree | —     |       | Usual |       | Marked |       | U + D |       | M + D |      | ?     |      | Total |        |
|-----------------------|-------|-------|-------|-------|--------|-------|-------|-------|-------|------|-------|------|-------|--------|
|                       | Cases | %     | Cases | %     | Cases  | %     | Cases | %     | Cases | %    | Cases | %    | Cases | %      |
| < 7                   | 57    | 12.28 | 257   | 55.39 | 74     | 15.95 | 40    | 8.62  | 30    | 6.47 | 6     | 1.29 | 464   | 100.00 |
| 15                    | 39    | 20.42 | 112   | 58.64 | 24     | 12.57 | 9     | 4.71  | 6     | 3.14 | 1     | 0.52 | 191   | 100.00 |
| 30                    | 49    | 23.11 | 129   | 60.85 | 16     | 7.55  | 8     | 3.78  | 9     | 4.25 | 1     | 0.45 | 212   | 100.00 |
| 45                    | 26    | 30.96 | 46    | 54.76 | 3      | 3.57  | 6     | 7.14  | 2     | 2.38 | 1     | 1.19 | 84    | 100.00 |
| 60                    | 7     | 20.00 | 22    | 62.86 | 3      | 8.57  | 1     | 2.86  | 1     | 2.86 | 1     | 2.85 | 35    | 100.00 |
| 75                    | 7     | 43.75 | 7     | 43.75 | 0      |       | 2     | 12.50 | 0     |      | 0     |      | 16    | 100.00 |
| 90                    | 1     | 16.67 | 5     | 83.33 | 0      |       | 0     |       | 0     |      | 0     |      | 6     | 100.00 |
| 91                    | 1     | 33.33 | 1     | 33.33 | 1      | 33.33 | 0     |       | 0     |      | 0     |      | 3     | 100.00 |
| ?                     | 22    | 19.82 | 63    | 56.76 | 9      | 8.11  | 13    | 11.71 | 4     | 3.60 | 0     |      | 111   | 100.00 |
| Total                 | 209   | 18.63 | 642   | 57.22 | 130    | 11.59 | 79    | 7.04  | 52    | 4.63 | 10    | 0.89 | 1,122 | 100.00 |

### 8-C. Relation of duration of Amenorrhea to Trophoblastic Proliferation in Tubal Pregnancy.

This is an attempt to acquire a better understanding of the mode of proliferation of trophoblasts in cases of tubal pregnancy

as gestation continues. It seems that the proliferation of trophoblasts is most marked during the first one and a half month (within the 60 days after LMP) and drops rapidly and then persists.

Table 8-C. Duration (LMP-Operation) Related to Trophoblastic Proliferation

| Dura. (days) \ Degree | —     |       | Usual |       | U + D |       | Marked |       | M + D |      | ?     |      | Total |        |
|-----------------------|-------|-------|-------|-------|-------|-------|--------|-------|-------|------|-------|------|-------|--------|
|                       | Cases | %     | Cases | %     | Cases | %     | Cases  | %     | Cases | %    | Cases | %    | Cases | %      |
| <30                   | 21    | 17.50 | 71    | 59.17 | 6     | 5.00  | 15     | 12.50 | 5     | 4.16 | 2     | 1.6  | 120   | 100.00 |
| 45                    | 32    | 18.61 | 88    | 51.16 | 15    | 8.72  | 26     | 15.12 | 9     | 5.23 | 2     | 1.16 | 172   | 100.00 |
| 60                    | 34    | 11.68 | 187   | 64.26 | 13    | 4.47  | 38     | 13.06 | 17    | 5.84 | 2     | 0.69 | 291   | 100.00 |
| 75                    | 40    | 23.67 | 95    | 56.21 | 11    | 6.51  | 19     | 11.24 | 3     | 1.78 | 1     | 0.59 | 169   | 100.00 |
| 90                    | 20    | 23.52 | 48    | 56.47 | 7     | 8.24  | 6      | 7.06  | 4     | 4.71 | 0     | 0    | 85    | 100.00 |
| >91                   | 15    | 23.81 | 36    | 57.14 | 2     | 3.17  | 6      | 9.53  | 4     | 6.35 | 0     | 0    | 63    | 100.00 |
| ?                     | 47    | 21.17 | 117   | 52.70 | 25    | 11.26 | 20     | 9.01  | 10    | 4.51 | 3     | 1.35 | 222   | 100.00 |
| Total                 | 209   | 18.63 | 642   | 57.71 | 79    | 7.04  | 130    | 11.59 | 52    | 4.64 | 10    | 0.89 | 1,122 | 100.00 |

### 9. Decidual Reaction of the Fallopian Tube in Tubal Pregnancy

#### 9-A. Decidual Reaction and Site of Implantation

When an ectopic pregnancy is found in the cornual portion, the decidual reaction in the tube is most prominent. The number of such cases, however, is smallest.



Table 9-A. Relation of Decidual Reaction to Site of Pregnancy

| Location<br>Degree | Fimbria | Ampulla | Isthmus | Cornua | Site. ? | Total  |
|--------------------|---------|---------|---------|--------|---------|--------|
| - {Cases           | 15      | 212     | 49      | 5      | 111     | 392    |
| - {%               | 31.25   | 36.49   | 23.22   | 12.82  | 45.68   | 34.94  |
| + {Cases           | 15      | 192     | 70      | 12     | 69      | 358    |
| + {%               | 31.25   | 33.05   | 33.18   | 30.77  | 28.40   | 31.91  |
| ++ {Cases          | 13      | 140     | 72      | 11     | 39      | 275    |
| ++ {%              | 27.08   | 24.10   | 34.12   | 28.21  | 16.05   | 24.51  |
| +++ {Cases         | 5       | 28      | 14      | 5      | 7       | 59     |
| +++ {%             | 10.42   | 4.82    | 6.64    | 12.82  | 2.88    | 5.26   |
| {Cases             | 0       | 1       | 0       | 3      | 1       | 5      |
| {%                 | 0       | 0.17    | 0       | 7.69   | 0.41    | 0.44   |
| ? {Cases           | 0       | 8       | 6       | 3      | 16      | 33     |
| ? {%               | 0       | 1.37    | 2.84    | 7.69   | 6.58    | 2.94   |
| Total              | 48      | 581     | 211     | 39     | 243     | 1,122  |
| %                  | 100.00  | 100.00  | 100.00  | 100.00 | 100.00  | 100.00 |

## 9-B. Relation of Decidual Reaction to the Duration of Pregnancy

One of the interesting findings is that decidual reaction does not steadily increase as gestation continues. It is in the 30-days group, (the tube resected during one to one and a half months after LMP) that the

decidual change of the implanted region is most marked. After this period the decidual reaction decreases. This is probably the reason why the number and proliferation of chorionic villi as well as trophoblasts decrease after this period.

Table 9-B. Relation of Duration (L. M. P.) to Decidual Tissue

| Dura. (days) | Degree | —     |       | +     |       | ++    |       | +++   |      |       |      | ?     |      | Total |        |
|--------------|--------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|-------|------|-------|--------|
|              |        | Cases | %     | Cases | %     | Cases | %     | Cases | %    | Cases | %    | Cases | %    | Cases | %      |
| <30          |        | 43    | 35.83 | 38    | 31.67 | 31    | 25.83 | 3     | 2.50 | 0     | 0    | 5     | 4.17 | 120   | 100.00 |
| ~45          |        | 50    | 29.07 | 58    | 33.72 | 43    | 25.00 | 14    | 8.14 | 1     | 0.58 | 6     | 3.49 | 172   | 100.00 |
| ~60          |        | 93    | 31.96 | 107   | 36.77 | 66    | 22.68 | 19    | 6.53 | 1     | 0.34 | 5     | 1.72 | 291   | 100.00 |
| ~75          |        | 64    | 37.87 | 50    | 29.59 | 46    | 27.22 | 1     | 0.59 | 2     | 1.18 | 6     | 3.55 | 169   | 100.00 |
| ~90          |        | 46    | 54.12 | 17    | 20.00 | 1     | 20.00 | 3     | 3.53 | 0     | 0    | 2     | 2.35 | 85    | 100.00 |
| >91          |        | 24    | 38.10 | 19    | 30.16 | 16    | 25.40 | 4     | 6.34 | 0     | 0    | 0     | 0    | 63    | 100.00 |
| ?            |        | 72    | 32.43 | 69    | 31.08 | 56    | 25.23 | 15    | 6.76 | 1     | 0.45 | 9     | 4.05 | 222   | 100.00 |
| Total        |        | 392   | 34.94 | 358   | 31.91 | 275   | 24.51 | 59    | 5.26 | 5     | 0.44 | 33    | 2.94 | 1,122 | 100.00 |

## 9-C. Relation of the Decidual Reaction of the Tube to the Time Between the Recognition of Symptoms and Tubal Operations

The volume of the decidual tissue is reduced steadily after the symptoms of tubal pregnancy develop or after tubal pregnancy is interrupted. This change is roughly pa

allel to the mode of proliferation of trophoblasts and chorionic villi.

## 10. Follicular Salpingitis in Tubal Pregnancy

## 10-A. Degree of Follicular Salpingitis and Duration of Pregnancy (L. M. P.—Operation)

Follicular salpingitis varies from the minimal degree (plica adhesion) to the max-



Table 9-C. Relation of the Decidual Reaction to the Symptom-to-Operation Duration

| Dura. (days) | Degree - |       | +     |       | ++    |       | +++   |      | ??    |      | Total |        |
|--------------|----------|-------|-------|-------|-------|-------|-------|------|-------|------|-------|--------|
|              | Cases    | %     | Cases | %     | Cases | %     | Cases | %    | Cases | %    | Cases | %      |
| < 7          | 116      | 25.00 | 158   | 34.05 | 140   | 30.17 | 33    | 7.11 | 3     | 0.65 | 14    | 3.02   |
| ~15          | 69       | 36.12 | 62    | 32.46 | 42    | 21.99 | 10    | 5.24 | 2     | 1.05 | 6     | 3.14   |
| ~30          | 86       | 40.56 | 75    | 35.38 | 41    | 19.34 | 5     | 2.36 | 0     | 0    | 5     | 2.36   |
| ~45          | 50       | 59.52 | 21    | 25.00 | 12    | 14.29 | 0     | 0    | 0     | 0    | 1     | 1.19   |
| ~60          | 15       | 42.86 | 11    | 31.43 | 7     | 20.00 | 1     | 2.86 | 0     | 0    | 1     | 2.85   |
| ~75          | 11       | 68.75 | 1     | 6.25  | 3     | 18.75 | 0     | 0    | 0     | 0    | 1     | 6.25   |
| ~90          | 2        | 50.00 | 3     | 50.00 | 0     | 0     | 0     | 0    | 0     | 0    | 0     | 0      |
| >91          | 2        | 66.67 | 1     | 33.33 | 0     | 0     | 0     | 0    | 0     | 0    | 0     | 0      |
| ?            | 40       | 36.04 | 26    | 23.42 | 30    | 27.03 | 10    | 9.01 | 0     | 0    | 5     | 4.50   |
| Total        | 392      | 34.94 | 358   | 31.91 | 275   | 24.51 | 59    | 5.26 | 5     | 0.44 | 33    | 2.94   |
|              |          |       |       |       |       |       |       |      |       |      | 1,122 | 100.00 |

Table 10-A. Relation of Follicular Salpingitis to Duration of Pregnancy (L. M. P.—Operation)

| Dura. (days) | Degree - |       | +     |       | ++    |       | +++   |      | ??    |      | Total |       |
|--------------|----------|-------|-------|-------|-------|-------|-------|------|-------|------|-------|-------|
|              | Cases    | %     | Cases | %     | Cases | %     | Cases | %    | Cases | %    | Cases | %     |
| <30          | 76       | 63.34 | 13    | 10.83 | 9     | 7.50  | 1     | 0.83 | 1     | 0.83 | 20    | 16.67 |
| 45           | 90       | 52.33 | 24    | 13.95 | 22    | 12.79 | 5     | 2.91 | 0     | 0    | 31    | 18.02 |
| 60           | 171      | 58.76 | 40    | 13.75 | 26    | 8.93  | 11    | 3.78 | 5     | 1.72 | 38    | 13.06 |
| 75           | 96       | 56.80 | 22    | 13.02 | 15    | 8.88  | 4     | 2.37 | 3     | 1.78 | 29    | 17.15 |
| 90           | 43       | 50.58 | 14    | 16.47 | 7     | 8.24  | 1     | 1.18 | 0     | 0    | 20    | 23.53 |
| >91          | 36       | 57.14 | 9     | 14.29 | 5     | 7.94  | 0     | 0    | 0     | 0    | 13    | 20.64 |
| ?            | 103      | 46.40 | 25    | 11.26 | 25    | 11.26 | 7     | 3.15 | 1     | 0.45 | 61    | 27.48 |
| Total        | 615      | 54.81 | 147   | 13.10 | 109   | 9.72  | 29    | 2.59 | 10    | 0.89 | 212   | 18.89 |
|              |          |       |       |       |       |       |       |      |       |      | 1,122 |       |

imal degree in four stages (from + to +++). Those without an adequate volume of mucosa presented in the histological slides are assigned to the unknown group. The results are. 27.30% of the total, or 32.41% as against the 990 cases in which an adequate volume of mucosa remained, are showing follicular salpingitis. Most of them are mild to moderate in degree and there is no noticeable tendency to indicate that follicular salpingitis will become serious as gestation continues.

#### 10-B. Follicular Salpingitis in Relation to the Interval between the Day When Symptom are Recognized and Subsequent Operation

This analysis is aimed at establishing some positive relationships between the degree

of inflammatory change, especially follicular salpingitis, and the duration of tubal pregnancy, after its symptoms are obvious. One logical conclusion from the above analysis (Table 10-B) is that the seriousness of follicular salpingitis does not increase after symptoms of tubal pregnancy began to show. The influences of tubal pregnancy—such as invasion by chorionic villi of tubal mucosa, bleeding and/or perforation—may cause inflammatory reaction of the tube. But it seems that tubal pregnancy alone never causes adhesion of tubal mucosa or follicular salpingitis. Hence follicular salpingitis is a change before tubal pregnancy starts or a cause of tubal gestation but not the result of tubal pregnancy.



Table 10-B. Follicular Salpingitis and Duration of Onset of (Symptoms to Operation)

| Dura. (days) | Degree |        | —     |       | +     |       | ++    |      | +++   |      | ??    |       | Total |
|--------------|--------|--------|-------|-------|-------|-------|-------|------|-------|------|-------|-------|-------|
|              | Cases  | %      | Cases | %     | Cases | %     | Cases | %    | Cases | %    | Cases | %     |       |
| < 7          | 238    | 51.29  | 47    | 10.13 | 46    | 9.91  | 14    | 3.02 | 7     | 1.51 | 112   | 24.14 | 464   |
| 15           | 111    | 58.12  | 37    | 19.37 | 20    | 10.47 | 4     | 2.09 | 0     | 0    | 19    | 9.95  | 191   |
| 30           | 118    | 55.66  | 36    | 16.98 | 21    | 9.91  | 5     | 2.36 | 2     | 0.94 | 30    | 14.15 | 212   |
| 45           | 51     | 60.72  | 13    | 15.48 | 7     | 8.33  | 3     | 3.57 | 0     | 0    | 10    | 11.90 | 84    |
| 60           | 16     | 45.71  | 8     | 22.86 | 5     | 14.29 | 0     | 0    | 0     | 0    | 6     | 17.14 | 35    |
| 75           | 10     | 62.50  | 2     | 25    | 2     | 12.50 | 0     | 0    | 0     | 0    | 3     | 18.75 | 16    |
| 90           | 4      | 66.67  | 0     | 0     | 0     | 0     | 0     | 0    | 0     | 0    | 2     | 33.33 | 6     |
| >91          | 3      | 100.00 | 0     | 0     | 0     | 0     | 0     | 0    | 0     | 0    | 0     | 0     | 3     |
| ?            | 64     | 57.66  | 5     | .50   | 8     | 7.21  | 3     | 2.70 | 1     | 0.90 | 30    | 27.03 | 111   |
| Total        | 615    | 54.81  | 147   | 13.10 | 109   | 9.72  | 29    | 2.59 | 10    | 0.89 | 212   | 18.89 | 1,122 |

#### 11. Incidence of Endometriosis and Site of Tubal Pregnancy

There are 244 cases or 21.75% of the 1,122 tubal gestations where endometriosis was found in the resected materials. Most of them are very mild in degree and the incidence of endometriosis is highest in the cornual pregnancy group and then in the isthmic group.

It is difficult to tell tubal endometriosis from salpingitis isthmica nodosa, especially in the mislocated endometrial tissue containing no stroma tissue. For this reason, salpingitis

isthmica nodosa cases may have been included in this study.

#### 12. Duration of Tubal Pregnancy and Tubal Phases

About one-fifth of the surgical specimens contain not enough or no relevant tubal mucosa for judging the phase. Of the remaining, one-half (41.62%) show a picture at the secretory phase and 26.86% at the proliferative phase. This ratio is roughly the same in every duration group except the first group (which includes all cases of tubes resected within 30 days after the LMP), in which the

Table 11. Incidence of Endometriosis and Site of Pregnancy

| Degree     | Location |  | Fimbria | Ampulla | Isthmus | Cornua | Site   | Total  |
|------------|----------|--|---------|---------|---------|--------|--------|--------|
| — {Cases   |          |  | 38      | 403     | 104     | 10     | 153    | 708    |
| %          |          |  | 79.17   | 69.36   | 49.29   | 25.64  | 62.96  | 63.10  |
| + {Cases   |          |  | 9       | 74      | 35      | 3      | 29     | 150    |
| %          |          |  | 18.75   | 12.74   | 16.59   | 7.69   | 11.94  | 13.37  |
| ++ {Cases  |          |  | 0       | 34      | 19      | 8      | 8      | 69     |
| %          |          |  |         | 5.85    | 9.00    | 20.51  | 3.29   | 6.15   |
| +++ {Cases |          |  | 0       | 4       | 7       | 7      | 2      | 20     |
| %          |          |  |         | 0.69    | 3.32    | 17.95  | 0.82   | 1.78   |
| ?? {Cases  |          |  | 0       | 1       | 2       | 1      | 1      | 5      |
| %          |          |  |         | 0.17    | 0.95    | 2.57   | 0.41   | 0.45   |
| ? {Cases   |          |  | 1       | 65      | 44      | 10     | 50     | 170    |
| %          |          |  | 2.08    | 11.19   | 20.85   | 25.64  | 20.58  | 15.15  |
| Total      |          |  | 48      | 581     | 211     | 39     | 243    | 1,122  |
| %          |          |  | 100.00  | 100.00  | 100.00  | 100.00 | 100.00 | 100.00 |



ratio is reversed. From the data presented in table 12 no clear cut conclusion can be drawn. The reason may be that: 1) the interpretation of tubal phases by a few slides alone is inadequate; 2) there is no real relationship between tubal phases and the duration of tubal pregnancy; 3) that most tubes during tubal pregnancy stop at the secretory phase; and 4) the tubes cannot react organically to the abnormal gestation and soon interrupt the mechanism of implantation.

### 13. Arias-Stella's Phenomena in Tubal Mucosa and Duration of Tubal Pregnancy

Only 6.86% of the total or 8.63% of those containing adequate mucosa cases show Arias-

Stella's reaction in the tubal mucosa. This value is apparently lower than that found in endometrium during the intrauterine pregnancy. In most of those cases which show Arias-Stella's phenomena, the change is very weak and all of them happened in epithelial cells.

### 14. The Duration of Pregnancy and Size of Embryo

The embryo was found in only 133 of all the 1,122 cases of tubal pregnancy. It included one case of twine embryos. Over half (52.18%) of the embryos were between 0.6 cm. to 2.3 cm. in the crown-heel length (corresponding in size to 2 to 4 weeks of intrauterine gestation). The size of embryos was

Table 12. Duration (L. M. P.) Related to Tubal Phases

| Phase<br>Dura. (days)                   | Prolife.<br>Cases % | Mixed<br>Cases % | Secret.<br>Cases % | Mens.<br>Cases % | Pregn.<br>Cases % | ?<br>Cases % | Total |
|-----------------------------------------|---------------------|------------------|--------------------|------------------|-------------------|--------------|-------|
| <30                                     | 48 40.00            | 7 5.83           | 39 32.50           | 2 1.67           | 1 0.83            | 23 19.17     | 120   |
| ~45                                     | 37 21.51            | 17 9.89          | 73 42.44           | 6 3.49           | 5 2.91            | 34 19.77     | 172   |
| ~60                                     | 72 24.39            | 16 5.50          | 149 51.20          | 3 1.03           | 7 2.41            | 45 15.46     | 291   |
| ~75                                     | 54 31.95            | 11 6.51          | 63 37.28           | 6 3.55           | 4 2.37            | 31 18.34     | 169   |
| ~90                                     | 13 15.30            | 5 5.88           | 38 44.71           | 2 2.35           | 6 7.06            | 21 24.70     | 85    |
| >91                                     | 20 31.75            | 5 7.93           | 22 34.92           | 1 1.59           | 0 0               | 15 23.81     | 63    |
| ?                                       | 58 26.12            | 18 8.11          | 83 37.39           | 0 0              | 2 0.90            | 61 27.48     | 222   |
| Total                                   | 301 26.86           | 79 7.04          | 467 41.62          | 20 1.78          | 25 2.23           | 230 20.50    | 1,122 |
| Percent if<br>unknown group<br>Excluded | 33.74               | 8.86             | 52.36              | 2.24             | 2.80              |              |       |

Table 13. Arias-Stella's Phenomena and Duration (L. M. P.—Operation)

| Dura. (days) | Degree<br>Cases % | -<br>Cases % | +<br>Cases % | ++<br>Cases % | +++<br>Cases % | ?<br>Cases % | Total |
|--------------|-------------------|--------------|--------------|---------------|----------------|--------------|-------|
| <30          | 100 83.34         | 1 0.83       | 0 0          | 0 0           | 0 0            | 19 15.83     | 120   |
| ~45          | 125 72.67         | 10 5.81      | 3 1.74       | 0 0           | 0 0            | 34 19.77     | 172   |
| ~60          | 219 75.26         | 23 7.90      | 3 1.03       | 0 0           | 0 0            | 46 15.81     | 291   |
| ~75          | 129 76.33         | 8 4.74       | 1 0.59       | 0 0           | 0 0            | 31 18.34     | 169   |
| ~90          | 57 67.06          | 4 4.71       | 2 2.35       | 2 2.35        | 2 2.35         | 20 23.53     | 85    |
| >91          | 45 71.43          | 3 4.76       | 0 0          | 1 1.59        | 1 1.59         | 14 22.22     | 63    |
| ?            | 140 63.06         | 12 5.41      | 1 0.45       | 3 1.35        | 3 1.35         | 66 29.73     | 222   |
| Total        | 815 72.64         | 61 5.44      | 10 0.89      | 6 0.53        | 6 0.53         | 230 20.50    | 1,122 |



Table 14. Duration of Pregnancy and Size of Embryo

| Size of embryo | Days<br>Fetal age | <30<br>(cases) | ~45<br>(cases) | ~60<br>(cases) | ~75<br>(cases) | ~90<br>(cases) | >91<br>(cases) | ?<br>(cases) | Total<br>(cases) | %      |
|----------------|-------------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------|------------------|--------|
| < 6mm          | 2 wks             | 1              | 4              | 3              |                |                |                | 4            | 12               | 9.02   |
| 23mm           | 4 wks             | 5              | 5              | 10             | 5              | 8              | 3              | 12           | 48               | 36.09  |
| 40mm           | 6 wks             |                | 1              | 4              | 2              |                | 1              | 3            | 11               | 8.27   |
| 61mm           | 8 wks             |                | 1              | 2              |                | 2              | 3              | 1            | 9                | 6.77   |
| 142mm          | 10 wks            |                |                | 2              | 2              | 2              | 5              | 1            | 12               | 9.02   |
| ?              | ?                 | 5              | 5              | 9              | 10             | 4              | 2              | 6            | 41               | 30.83  |
| Total          |                   | 11             | 16             | 30             | 19             | 16             | 14             | 27           | 133              | 100.00 |

Per cent of embryo found 133/1,122=11.86%

Undergrowth embryo 46/71 =64.78%

Embryo size fittable to age 12/71 =16.91%

Overgrowth embryo 13/71 =18.31%

 $X^2=5.647$   $P(0.05)=3.841$   $P(0.02)=5.412$ 

measured in only 92 cases. If the fertilization of the ovum was supposed to take place 2 weeks after L. M. P., most (64.78%) of the embryos were smaller than they should be according to Streeter's formula. If undergrowth embryos and normal and overgrowth ones are compared, the difference is statistically significant. The probability is less than 0.02%.

#### 15. Location of Corpus Luteum and Side of Tubal Pregnancy

There were only 517 out of the 1,122 cases of tubal pregnancy in which one or both ovaries were resected for pathological examination. Of them, 280 cases or 54.16% showed the pregnancy corpus luteum at the

ovary on the same side of the tube which is proved to have ectopic pregnancy. The other 110 cases showed absence of the corpus luteum in the ovary on the same side of the tube or proved in the other side. Although there are 127 cases, in which no pregnant corpus luteum could be found in either ovary or both ovaries contained equal amounts of corpus luteum or no proof was available to show which of the two ovaries was dissected, this table may allow the presence of the external migration theory. The determination of the pregnancy corpus luteum is based upon the size (more than 0.8 cm.) and the activity of luteal cells.

Table 15. Location of Corpus Luteum and Side of Tubal Pregnancy

| C. luteum<br>Tube | Same side | Opposite side | ?     | Total  |
|-------------------|-----------|---------------|-------|--------|
| Right tube        | 148       | 48            | 65    | 261    |
| %                 | 56.70     | 18.40         | 24.90 | 100.00 |
| Left tube         | 123       | 58            | 54    | 235    |
| %                 | 52.34     | 24.68         | 22.98 | 100.00 |
| Side unknown      | 9         | 4             | 8     | 21     |
| %                 | 42.86     | 19.05         | 39.09 | 100.00 |
| Total             | 280       | 110           | 127   | 517    |
| %                 | 54.16     | 21.28         | 24.56 |        |

 $X^2=9.256$  $P(.01=6.635)$



### 16. Relation of Pregnancy Duration (L. M. P.—Operation) and the Results of Frog Test

The frog test was conducted for only 47 cases. Undoubtly the great majority of the remaining cases did not take frog tests or any other pregnancy examinations. An analysis of the 47 cases shows that the positive reactions were nearly equal in number. There is no evidence that a longer tubal pregnancy will show a positive reaction to the frog test.

### 17. Endometrial Changes in Tubal Pregnancy

Endometrial study was made on 102 cases or about 10% of the 1,122 cases of tubal pregnancy. In most of them (65 cases, 63.73

percent), the endometrium was obtained by curettage or hysterectomy during the operation for tubal pregnancy. In 34 cases (33.3%) the endometrium had been curetted before the tubal resection was made. In the other 3 cases, the endometrium spontaneously passed out after the tubal resection was performed. In the analysis of these 102 cases, decidual reaction was observed in nearly half of them. Only about one-third of them showed so-called "Arias-Stella's phenomena". The phase of the endometrium was also quite variable, although over half of them were at the secretory phase.

Table 16. Relation of Pregnancy Duration and the Results of Frog Test

| Day<br>Result | <30   | 45    | 60    | 75    | 90    | 91<   | ?     | Total |
|---------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Positive      | 3     | 4     | 7     | 3     | 3     |       | 4     | 24    |
| %             | 12.15 | 16.67 | 29.16 | 12.50 | 12.50 |       | 16.67 |       |
| Negative      | 3     | 2     | 9     | 3     | 1     | 3     | 2     | 23    |
| %             | 13.04 | 8.70  | 39.13 | 13.04 | 4.35  | 13.04 | 8.70  |       |
| Not made      | 116   | 167   | 277   | 161   | 81    | 57    | 216   | 1,075 |

Table 17. Endometrial Change in Cases of Tubal Pregnancy

| Time obtained            | Before Op. | Same day | After Op. | Total  |
|--------------------------|------------|----------|-----------|--------|
| Cases                    | 34         | 65       | 3         | 102    |
| (percentage)             | 33.33      | 63.73    | 2.94      | 100.00 |
| Decidual reaction        | 16/32      | 27/58    | 3/3       | 46/93  |
| (percentage)             | 50.00      | 46.55    | 100.00    | 49.46  |
| Arias-Stella's phenomena | 10/32      | 13/52    | 0/3       | 23/84  |
| (percentage)             | 31.25      | 25.00    |           | 27.38  |
| Phase of endometrium     |            |          |           |        |
| Proliferative            | 10/34      | 24/65    | 0/3       | 30/102 |
| (percentage)             | 29.41      | 30.76    |           | 29.41  |
| Secretory                | 19/34      | 33/65    | 3/3       | 55/102 |
| (percentage)             | 55.88      | 50.76    | 100.00    | 53.92  |
| Mixed                    | 3/34       | 3/65     | 0/3       | 6/102  |
| (percentage)             | 8.82       | 4.61     |           | 5.88   |
| Phase unknown            | 2/34       | 9/65     | 0/3       | 11/102 |
| (percentage)             | 5.88       | 13.84    |           | 10.78  |

### 18. Recurrence of Tubal Pregnancy

There were 34 cases of recurrent tubal pregnancy in this series. One of the 34 cases suffered two recurrences. (In January 1953,

a left partial salpingectomy with right tubal ligation was performed for a left tubal pregnancy. The first recurrence took place in August 1954, and a left adnexectomy plus



ligation of the right fallopian tube was carried out for the ectopic pregnancy of left tubal stump. The second recurrence happened at the ampullar portion of the right tube and a right adnexectomy with subtotal hysterectomy was done in June 1957. The side of recurrent tubal pregnancy was entirely contralateral side to the first tubal pregnancy, except for the one which had two recurrences. The intervals between the first and second operations were rather widely distributed but many of them were within the first year. The incidence of follicular salpingitis and that of tuberculosis in cases of recurrent tubal pregnancy were 50.00 per cent and 5.88 per cent respectively and were much higher than in first tubal pregnancy. In first tubal pregnancy cases, the incidence rates were 27.30 per cent and 0.2 per cent respectively. The endometriosis in tubes of recurrent cases was 29.12 per cent and was a little higher than that in first tubal pregnancy cases.

Table 18. Recurrent Tubal Pregnancy

|                        |                    |
|------------------------|--------------------|
| Total cases            | 34/1, 122=3.05%    |
| Twice recurrent        | 1 case             |
| Side of recurrence     | Same.....1 case    |
|                        | Other.....25 cases |
|                        | ?.....9 cases      |
| Interval of recurrence | Minimum...3 months |
|                        | Maximum..10 years  |

| Interval (Yr) | case |
|---------------|------|
| 1 year        | 12   |
| 1.1-3         | 0    |
| 3.1-5         | 3    |
| 5.1-7         | 4    |
| 7.19          | 3    |
| Over 9.1      | 1    |
| ?             | 1    |

Incidence of follicular salpingitis 17/34=50.00%

Incidence of endometriosis 10/34=29.12%

Incidence of tuberculosis 2/34= 5.88%

## II. ABDOMINAL PREGNANCY

Primary or secondary abdominal pregnancy was found in only twelve of the 1,148 cases. However, this author gives emphasis to the fact that there must have been more such cases. The reason is the fact that the file of Surgical Pathology, on which this study is based, included only 12 abdominal pregnancy cases. Several others in which the fetus was delivered alive were, of course, not included in this study. If the fetus died in a very late pregnancy month (near full-term), the cases were included in autopsy files and hence not included in this series. Most of the abdominal pregnancy cases were secondary in nature and located in the pelvic cavity, or attached on to the uterus, or the adnexal region. The incidence of follicular salpingitis in cases of abdominal pregnancy was 33.33 per cent, a little higher than that of tubal pregnancy. The incidence of endometriosis was 16.66%, a little lower than that of tubal pregnancy.

## III. OVARIAN PREGNANCY

Only 9 cases of ovarian pregnancy were found in this series. Most of them underwent an operation at a very early stage. The notable exception was one in which the ovary was resected 81 days after the last menstrual period. Unlike abdominal pregnancy, most of the ovarian pregnancy cases were primary in nature.

## IV. MISCELLANEOUS ECTOPIC PREGNANCY

There were 3 cases of combined pregnancy. Two of them were intrauterine-tubal pregnancy cases. The other was intrauterine-ovarian pregnancy. There was also a case of ectopic pregnancy in an accessory tube. Another was an ectopic pregnancy in a double uterus.



Table 19. Abdominal Pregnancy

|                                     |                              |
|-------------------------------------|------------------------------|
| Incidence of cases.....             | 12/1, 122=1.07%              |
| Duration, maximum.....              | 8 months                     |
| Type of abdominal pregnancy         | Primary.....3 cases          |
|                                     | Secondary.....8 cases        |
|                                     | Unknown.....1 cases          |
| Location of pregnancy               | Serosa of uterus.....2 cases |
|                                     | Adenexa.....3 cases          |
|                                     | Omentum.....3 cases          |
|                                     | Broad ligament.....2 cases   |
|                                     | Abdominal wall.....1 case    |
|                                     | Unknown.....1 case           |
| Incidence of follicular salpingitis | 2/6=33.33%                   |
| Indicence of endometriosis          | 1/6=16.66%                   |

Table 20. Ovarian Pregnancy

|                        |                             |
|------------------------|-----------------------------|
| Incidence of case..... | 9/1, 122=0.80%              |
| Duration, maximum..... | 81 days                     |
| Type of pregnancy      | Primary.....7 cases         |
|                        | Secondary.....2 cases       |
| Location of pregnancy  | Intraluteal.....3 cases     |
|                        | Deep interstitial...2 cases |
|                        | Intrafollicular.....1 case  |
|                        | Unknown.....3 cases         |

Table 21. Miscellaneous Ectopic Pregnancy

|                                                |         |
|------------------------------------------------|---------|
| Combined pregnancy.....                        | 3 cases |
| Intrauterine+tubal preg.....                   | 2 cases |
| Intrauterine+ovarian preg.....                 | 1 cases |
| Pregnancy in accessory tube.....               | 1 case  |
| Pregnancy in one horn of<br>double uterus..... | 1 case  |

### DISCUSSION

Because the materials collected in this series were chiefly supplied by the pathological departments, no attempt was made to study the related social and public health problems, such as (1) the ratio of ectopic pregnancy cases to the population, (2) relations between ectopic

pregnancy and (a) income and or (b) social status, and/or (c) habits and customs, especially (d) sexual habits. Many clinical problems—including the past history, chief complaints, racial difference, diagnostic methods, laboratory data and mortality rate of the patients etc—were not considered in this study, although they tend to appear in the literature dealing with this topic.<sup>(1,9,10,11,12,13,14,15,16,17,18,19,20,21)</sup>

The age distribution of the ectopic pregnancy patients shows that in treating a woman for abnormal vaginal bleeding and/or abdominal pain, even if she were actually in the menopause age, the possibility of ectopic pregnancy could not be ruled out. The oldest victim of tubal pregnancy appeared in Bone and Greene's<sup>(11)</sup> was 52 years old. In this series, she was a 48-year-old housewife.

Before discussing the seasonal variation in tubal pregnancy, this researcher will like to mention that the average interval between the last menstrual period to the operation for tubal pregnancy was 63.4 days. The reason for the highest incidence of tubal pregnancy in spring and summer is probably due to the high fertilization rate of the ovum or to the increased sexual contact in this season. For the same reason, autumn shows the lowest incidence because the July, August and



September are the quarter when the temperature is highest in northern Taiwan. This assumption may or may not be valid.

The pregnancy history before tubal pregnancy happened indicated the majority of the victims had experienced normal delivery but most of them were oligoparous. The other topics of clinical interest in this series were studied just for the record. The high incidence of abortion before tubal pregnancy probably indicates it is one of the etiologic factors leading to tubal pregnancy as some authors have already stated.<sup>(11,13)</sup>

The analysis of the location and side of tubal pregnancy disclosed that: 1) incidence of ectopic pregnancy in the right tube is a little higher than in the left tube with significance of this difference showing a probability of near 0.02, though there is no convincing reason, 2) the ampullar portion is the part where ectopic pregnancy is most likely to take place, while the cornual and the fimbria regions are the least likely places. The reason probably is that when implantation takes place in the fimbria, the embryos would quickly abort into the abdominal cavity or that the fertilized eggs were too young to be firmly implanted. The condition of the tubal wall for fertilization does not appear to be an important factor in explaining the rarity of tubal pregnancy in the fimbria region, because the decidual reaction happened in this segment (Table 9-A) and such interfering factors as endometriosis are more likely to exist in this region (Table 11) than any of the other regions. The rarity of the incidence of cornual pregnancy cannot be explained in the same manner, because cornual pregnancy when it occurred tends to rupture the tube rather than abort into the uterus (Table 6). The factors interfering or trapping the passage of the fertilized ovum would be the same as in the other portions if they aren't greater than the others. This portion was also the narrowest part ana-

tomically and most rigid part physiologically. According to Sweeney,<sup>(22)</sup> and others<sup>(23)</sup> the tubal course in this portion was tortuous and the frequency of endometriosis was highest (Table 11). Decidual reaction of this segment was also very high (Table 9-A). The only explanation probably is that the fertilized eggs would be trapped in the other part before they were promoted into the cornual region. This fact was also an impediment for Iffey's late ovulation theory,<sup>(15)</sup> the theory of endometrial back flow, internal migration theory, external migration theory,<sup>(24)</sup> etc.

So far as perforation is concerned, the cornual part was the place where the highest percentage of perforation (Table 6) exists, followed by the isthmus segment. The most reasonable explanation probably is that these portions were the narrowest pathway of the tube and they have the least elasticity to expand when a growing embryo was implanted.

To diagnose tubal pregnancy, a pathologist in most instances searches for chorionic villi in the submitted materials. Are chorionic villi increased or decreased in number or even absent; when the environment was favorable for the embryos to keep growing and when not? What will be the change when the embryo dies? When do that chorionic villi grow most abundantly and when do they begin to show degeneration or completely disappear after the embryo dies? The results of these analyses (Tables 7-A, 7-B, 7-C and 7-D) show the site of implantation can neither determine the earlier growth of chorionic villi, nor that of the embryo. This is also a drawback to Allen's profound nutritional defect theory. The relation of the number of chorionic villi to the age of the fertilized ovum (Table 7-A) indicated that the number of the chorionic villi steadily increased during the first month (that is approximately equal to the first 45 days amenorrhea) but after that period, the number of chorionic villi



remained at about the same level. This fact also suggests that: 1) at a very early stage of tubal pregnancy, the possibility that only trophoblasts rather than chorionic villi develop is quite high, and 2) the growth of the embryos in tubal pregnancy seemed to stop when they were one month old, or in the other words, at this time the growth of the embryo and the reserve power to supply the nutritions for the ectopic embryo in the tube reaches a balance. The number of chorionic villi was not reduced after ectopic gestation discontinued (table 7-C). After the gestation stopped, degenerative change of the villi immediately started and the degree of the degeneration subsequently increased (table 8-D), and finally only ghost villi were found. The fact that the chorionic villi could be demonstrable even in very old tubal pregnancy will encourage the pathologist to make a diagnosis of chronic hemosalpinx without hesitation when no villus can be demonstrated in his specimen.

The proliferation of trophoblasts bears no relation to the site of pregnancy but the tendency to infiltrate deeply into the muscle layer of the tubal wall is present when the fertilized eggs implant in the cornual and isthmic regions (table 8-A). This is easy to understand and also proves what this author has stated in the earlier paragraph because the lumen of the tube in these regions is narrower and the wall more rigid than other parts of the tube, even though the protective mechanism against the invasion of trophoblasts or chorionic villi—decidual tissue—was most powerful in these regions. The state of proliferation and activity of the trophoblasts bear close relation to the aging of the embryos. During the first one and half months they keep on increasing and then drop rapidly (table 8-C). After ectopic gestation stopped, the trophoblasts reduced rapidly and then remained stationary (table 8-B).

The problem of decidual reaction in ectopic tubal pregnancy is an interesting

thing. Some authors<sup>(64)</sup> considered that the decidual reaction of aberrant endometrial tissue in the tube is the most important etiologic factor in the group of cornual pregnancy. In this series of study, decidual reaction also develops most strongly in the cornual region, although in most of the cases of this study, the decidual cells do not come from endometrial stromal cells but from the stroma cells of tubal mucosa.

This author is of the opinion that the decidual reaction of the fallopian tubes is caused by the direct stimulation of implantation of fertilized eggs in the neighborhood rather than the general progesteron influence like that in the endometrium, because the decidual tissue observed in tubal pregnancy is always surrounding the implanted chorionic villi or in the region where trophoblasts are present. However, more study is necessary to prove its cause and effect relationship because no control material is available in this series.

Another astonishing finding was the degree of the decidual reaction did not increase steadily as the gestation continues (table 9-B). This suggests that the potency of tubal mucosal tissue to transform decidual tissue is very much limited. Hence, those mislogged embryos can not grow normally and/or the tubal wall will rupture easily due to the invasion by the trophoblasts.

Like the chorionic villi and the trophoblasts, the decidual tissue developed in tubal mucosa in tubal pregnancy is reduced rapidly after symptoms of tubal pregnancy were recognized.

It is generally accepted that chronic inflammation and its residues may be one of the causes of tubal pregnancy. Gonorrheal, tuberculous, puerperal, postabortive and postoperative infections will lead to chronic salpingitis. These infections play their etiological roles probably in two ways. One is to produce mechanical obstruction such as



forming a trapping pocket in the tubal mucosa, and the other to impair the propulsive forces of the tube. The latter may be caused by either desquamation or reduction of the activity of cilia of tubal mucosal epithelium or by the reduction of the propulsive mechanism of the tubal muscular layer by the residual fibrosis or scar. Bone and Greene<sup>(11)</sup> have been interested in this problem and in their microscopic analysis they found 46 cases (38 per cent) of the 121 cases showing mild or marked follicular salpingitis and concluded that chronic inflammation of the tube plays the major role in tubal pregnancy but without making any efforts to rule out follicular salpingitis as the cause but not the result of the tubal pregnancy. In this study, follicular salpingitis was found in 32.41% of 990 cases; more than enough to supply adequate specimens for this purpose. A check-up on the distribution of follicular salpingitis in relation to the duration of pregnancy and to the symptom-operation (Table 10-A, 10-B) shows that follicular salpingitis already existed before ectopic pregnancy and its intensity was not increased by the influence of ectopic pregnancy or the death of embryo.

Endometriosis of the tube is thought by some authors<sup>(25)</sup> to be the cause of tubal pregnancy. Rubin et al.<sup>(26)</sup> demonstrated endometrium in tubal lumen in 19 of 200 cases (9.5%). In this series, 244 cases (21.75%) possess aberrant endometrial tissue in the resected tubes. The isthmic segment and cornual segment showed the highest incidence.

The changes of tubal epithelium and stroma in relationship with the menstrual cycle have been reviewed by Lowi<sup>(27)</sup> and others<sup>(28, 29)</sup>, but this author could not find any literature which concerns the tubal phase in tubal pregnancy. The results regarding the tubal phase in tubal pregnancy reported in this paper showed about half (52.36%) of the tubes at the secretory phase and about one-third (33.74%) at the proliferative phase.

Only 25 cases (2.80%) show the pregnancy phase. However a small number of cases represented both the proliferative and secretory phase (8.85%) or the menstrual phase, etc. This unreasonable distribution puzzled the author very much. There was also no rhythmical changes of the tubal phase when the cases were divided into half-month groups after the last menstrual period.

Arias-Stella's phenomena (atypical nuclear and cytoplasmic changes of endometrium associated with pregnancy) of the tubal epithelium in tubal pregnancy were 8.63% in this study (Table 13). The result is much lower than Birsh's<sup>(30)</sup> 16.9%. The Arias-Stella's phenomena in tubal epithelium seem to need a certain interval (one month to one and a half months) after the fertilization of the eggs take place (Table 11). Birch and Collins,<sup>(30)</sup> Tweeddale and Hoffman<sup>(41)</sup> were able to find Arias-Stella's phenomena in endometriosis of tubes in ectopic pregnancy. However in this series, no cases of tubal endometriosis show this phenomena.

Iffy<sup>(15)</sup> after reviewing the literature, developed the late ovulation theory. He believed that the retarded maturation of the embryo was due to late ovulation and it cannot prevent the occurrence of the next menstrual period. The flow of the menstrual blood washes away the fertilized eggs not firmly implanted. In this manner some of them were also expelled into the tube again, thereby causing tubal pregnancy. To prove his opinion, he pointed out the discrepancy of the age of the fetus and the duration of amenorrhea and that stated that fetuses found at operation are usually older than the menstrual data may suggest. This researcher, however, found 18.78% of cases showed older fetuses but most of the fetuses (64.78%) are underdeveloped (Table 14). The reason for the underdevelopment of the fetus in tubal pregnancy is probably the unsuitable conditions of the tube for an embryo, such



as decidual reaction, but for the overdeveloped cases, Iffy's theory can be applied perfectly. However tubal pregnancies caused by this mechanism were only a few, and therefore, this theory is not applicable to all ectopic pregnancy cases.

Tubal pregnancies which happened in the fallopian tube opposite to the side of the ovary bearing the corpus luteum, numbered 110 (21.28%) out of the 517 cases which supplied one or more than one ovaries to the Pathological Departments. The data on this subject in related literature range from Speert's<sup>(32)</sup> 14 in 110 cases (12.7%) to Berlin's<sup>(33)</sup> 24 in 48 cases (51.0%). The high percentage supports the migration theory. However, these data alone could not make clear whether the fertilized egg has migrated to opposite tube transperitoneally—external migration—or transuterusly—internal migration.

In this series, the frog test was conducted on 47 cases. The results were not satisfactory. Not only are the cases showing positive and negative results nearly the same in number but there is also no evidence indicating that a longer pregnancy period will lead to a positive result when Friedmann's test is conducted. The results concerning this subject which appear in literatures<sup>(9,18)</sup> were almost the same. For this reason, the diagnosis for ectopic pregnancy must be based on the obstetric history and clinical manifestations rather than on the biological test.

Speert<sup>(34)</sup> in 1958 has made an intensive analysis of decidual reaction in the endometrium in cases of extrauterine pregnancy. Based on 12 uteri removed without prior curettage, he concluded as follows: the integrity of the decidua has been correlated with the histologic appearance of the trophoblasts. The decidual reaction reflected the influence of pregnancy but the decidua were dissociated by the chemical action of the trophoblast. The thickness of endo-

metrium varied greatly but it did not bear any relation to the stage of pregnancy or viability of trophoblasts. After the embryos died, the decidua would be quickly replaced by non-pregnant cycling endometrium. The pronounced dilation of the superficial veins of the compact layer indicated the early stage of pregnancy. By the 12th week most of the endometrial glands went through secretory exhaustion. The decidua consisted chiefly of a broad sheet of formed stroma. They were maintained through to the term but dissociated through leukocyte infiltration, interstitial hemorrhage, vascular thrombosis, autolysis and sloughing. Pildes and Wheeler<sup>(35)</sup> Romney et al<sup>(36)</sup> and Kuhl<sup>(37)</sup> also studied the endometrial phase in cases of ectopic pregnancy. Their results and conclusions are roughly the same as this author has obtained. From 1957 to 1961 many papers concerning so-called "Arias-Stella's phenomena" in the endometrium of ectopic pregnancy cases were presented<sup>(9, 30, 35, 37, 38, 39, 40)</sup>. They found from 2.9%<sup>(38)</sup> to 60%<sup>(30)</sup> of these phenomena, but the majority showed 20% to 40%. As yet there is no reliable diagnostic laboratory procedure to confirm tubal pregnancy. However, when an endometrium of a woman in the child-bearing age who is suffering from abdominal pain or vaginal bleeding shows so-called "Arias-Stella's phenomena" with or without decidual reaction and when neither chorionic villi nor trophoblasts are demonstrable, the possibility of ectopic pregnancy can not be ruled out.

There are also many papers concerning the conceptability after the resection for tubal pregnancy<sup>(41-43)</sup>. They concluded that about 20% to 60% cases who had operations for tubal pregnancy conceived again if plastic surgery were performed. However, other literatures reports the incidence of recurrent ectopic pregnancy to be very high<sup>(41-49)</sup> ranging from 2 to 10 per cent. Based on a study of 305 case of ectopic pregnancy, Bender<sup>(47)</sup> concluded that if a patient conceives after an



ectopic pregnancy the chance of having another ectopic gestation increases fiftyfold. The rate as obtained by this author was 3.5%. However the recurrence of tubal pregnancy on the same side is rare<sup>(45,46,48,50)</sup>. But in 1959, Fulsher<sup>(48)</sup> was able to collect 67 cases and added his own 4 cases. Their discussions seemed to center around the conclusion that ectopic pregnancy may recur even after a homolateral salpingectomy because there may be recanalization of the tubal remnant. They then advised for the treatment of tubal pregnancy, a total tubal resection with removal of a wedge of the uterine horn be the first choice in cases where the second tube is intact. But when there has been destruction of both tubes total abdominal hysterectomy may be in order. Only when there is an extreme desire for pregnancy and a malfunctioning second tube is the conservative treatment allowed.

Abdominal pregnancy is a rare and an extremely dangerous condition.<sup>(51)</sup> Hellmand and Simon<sup>(52)</sup> reviewing the literature and found 316 abdominal pregnancy cases.—Probably only the advanced cases—, 158 fetuses born alive; in 212 cases the mother survived; and in another 50 cases both mother and fetus survived. Still other papers<sup>(52-60)</sup> reported a smaller number of such cases. Some were dead and some were alive, but many of them showed a high percentage of anomalies in those dead fetuses implanted in the abdominal cavity. McNulty<sup>(61)</sup> has reported a case of abdominal pregnancy with hemothorax as its presenting symptom. Many papers on this problem stress that only the study of early cases can differentiate the exact site of nidation and therefore its pathogenesis. The exact site of implantation cannot be determined when abdominal pregnancy is drawing near to its fullterm. Studdiford<sup>(62)</sup> is of the opinion that a primary abdominal pregnancy must possess the following criteria; 1) both tubes and ovaries should be completely normal; 2) absence of uteroperitoneal fistula; and 3) the

presence of pregnancy related exclusively to the peritoneal surface with the fetus young enough to eliminate the possibility of secondary reimplantation following a primary nidation in the tube. Unfortunately, the cases collected in this series are not large enough nor is this study intensive enough to cover the related problems.

Primary ovarian pregnancy is also a very rare occurrence and the relevant literature cover this topic scantily.<sup>(20,63,64,65,66)</sup> The incidence of ovarian pregnancy, according to Ellis<sup>(66)</sup>, was from 0.2% to 4.7% in total ectopic pregnancy cases. In 1956, Bobrow and Winkelstein<sup>(67)</sup> reviewed the literature which was published during 1942-1953 and were able to find 155 cases which corresponded to the following criteria: 1) the tube, including the fimbria should be intact and clearly separated from the ovary; 2) the gestation sac should definitely be in the normal position of the ovary; 3) the sac should be connected with the uterus by the ovarian ligament; and 4) the unquestionable ovarian tissue should be demonstrated in the wall of the sac. This author found 7 cases of primary ovarian pregnancy in 1,122 cases of tubal pregnancy. The rate is about 0.62%, but undoubtedly several other cases were missed because of the inadequate tissue examination and of the misdiagnosis as corpus luteum cysts or chocolate cysts<sup>(68)</sup>. Taber and Crossett<sup>(69)</sup> have mentioned that possible causes of ovarian pregnancy are 1) intrafollicular pregnancy; 2) fertilization within an endometrial implant; 3) development within a Wolffian remnant; and 4) perioophoritis causing a thickening of the ovarian capsule and preventing the escape of the ovum.

Other miscellaneous ectopic pregnancy—cervical pregnancy,<sup>(70,71)</sup> rudimental horn pregnancy<sup>(82)</sup>, combined uterine-extrauterine pregnancy<sup>(73-76)</sup> and ectopic twin pregnancy<sup>(77,82)</sup> are also interesting subjects relevant to ectopic pregnancy. In this study 5 such cases are presented (Table 21).



### SUMMARY

Pathological and analytical studies were made, using the operative specimens obtained from 1,148 cases of ectopic pregnancy from July 1949 to June 1964.

I. Tubal pregnancy: In 1,122 cases of tubal pregnancy, age was varying from 17 to 48. There were no significant seasonal variations but in Autumn the incidence seemed to be somewhat lower. 79.34% were multipara and 20.66% primigravida. 13.37% had a history of abortion. The shortest interval between the last abortion and tubal pregnancy was one month. Right and left tube had approximately the same incidence. Pregnancy in the ampullar portion was 51.69%, in the isthmic portion 18.80%, in fimbria 4.28% and in cornual region 3.48%. In 61.39% perforation had already taken place before operation. There was a definite tendency to perforation in the cornual (96.87%) and isthmic (78.28%) pregnancy. Trophoblasts and decidua in the tube were most abundant in the first month of gestation and then tended to decrease after discontinuation of gestation. The villi showed the same tendency but the number of the villi did not diminish even 3 months after gestation was interrupted, although there was degeneration. Hormonal phase of endosalpinx was varying, 41.62% being secretory phase and 26.86% proliferative. In 8.63%, mild Arias Stella's phenomenon was seen in the tubal mucosa. 67.78% of the 133 embryos found in tubes were smaller than the expected size calculated from Streeter's formula and 18.31% of the embryos larger than the expected size. With regard to the endometrium of the uterus, decidua reaction was found in 49.46%. The hormonal phase of the endometrium was also variable but 53.92% fell in secretory phase. Arias-stella's phenomenon was found in 27.38%. In 54.16% corpus luteum was present in the collateral ovary and in 21.28% in the contralateral ovary. Frog test

was done only in 47 cases. There was no relation between positive frog test and the age of the fetus. Follicular salpingitis was observed in 32.41%. Its degree and incidence were not related to the duration of gestation nor to the interval between the onset of clinical signs and operation. Therefore follicular salpingitis seems to be the possible cause of tubal pregnancy but not the result. Endometriosis was found in 21.75%. Most of them were very mild but only those associated with cornual gestation were considerably pronounced. In 34 cases tubal pregnancy was recurrent.

II. Abdominal pregnancy was found in 12 cases. 8 were secondary and 3 primary. Adnexa, omentum and the surface of the uterus served as the common sites of implantation.

III. Ovarian pregnancy was found in 9 cases. Most of them were primary and underwent operation at very early stage. One third of them implanted in corpus luteum.

IV. 5 cases of miscellaneous ectopic pregnancy consisted of 3 cases of combined pregnancy (two cases of concomitant intra-uterine and tubal pregnancy and one concomitant intrauterine and ovarian pregnancy), one case of tubal pregnancy in accessory tube and one case of pregnancy in a horn of double uterus.

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## 外 孕 妊 娠 之 研 究

私立臺北醫學院病理科

黃 德 修

自1949年7月至1964年6月間，在臺大，省立基隆醫院，臺北醫學院等三所病理科裏所有登記的子宮外孕之病例中，有輸卵管外孕 1,122 例，腹腔內外孕 12 例，卵巢外孕 9 例及其他外孕 5 例。

著者曾集中所有其臨床記錄，病理報告及病理切片作過有系統的分析，如發生年齡，發生季節，流產，性病，腹部開刀，已往分娩之有無，卵管各解剖部位間外孕之頻率與其破裂，絨毛，脫落膜，滋養細胞之多寡之關係，脫膜滋養層細胞，絨毛之消長及無經

期之長短，外孕停止至開刀時間之長短的關係。外孕卵管內發現膿泡性卵管炎，子宮內膜異位，結核病等足够引起卵管阻塞疾病之頻率，外孕卵管裏所發現胎兒大小與其預期大小（從其無經期長短計算胎兒年齡）之比較，外孕時之妊娠反應的正負問題，外孕時子宮內膜之組織學上的變化，及外孕手術之再發問題……等作過統計，並就其統計結果與已有外孕學說略加討論。