

# MINIMAL CRITERIA REQUIRED TO PROVE PRIMA FACIE CASE OF TRAUMATIC ABORTION OR MISCARRIAGE\*

AN ANALYSIS OF 1000 SPONTANEOUS ABORTIONS

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FOR YEARS the problem of traumatic abortion and miscarriage has interested obstetricians, baffled lawyers and vexed insurance companies. These three groups are brought together in the courtroom to see that justice is served in those cases involving trauma, either physical or psychic, which is alleged to have caused the premature expulsion of a nonviable fetus. It is the consensus of opinion, of at least the average conscientious expert medical witness involved, that, all too often, justice is not served and that the plaintiff is awarded damages for an abortion or miscarriage in which the trauma was, at most, only coincidentally concerned. It is the purpose of the present communication to examine and put forth the factual relationship between trauma and abortion or miscarriage.

Medically speaking, abortion is defined as the premature expulsion of a nonviable fetus. Broadly speaking, however, the definition should substitute the word "ovum" for "fetus," since, as will be shown later, almost one-half of the abortuses in the author's series contained no fetus at all; the products of conception consisting either of an empty ovisac or one occasionally containing an unformed embryonic rudiment.

To the average layman, an abortion means the termination of a pregnancy by artificial means, either criminally or self-induced. A miscarriage or "miss" on the other hand, connotes a spontaneous termination of a previable pregnancy. To complicate the terminology still further, the average medical person regards an abortion as covering the period up to the sixteenth week of gestation and a miscarriage as covering the period from the sixteenth to the twenty-eighth week of gestation, the average period at which the fetus becomes, theoretically, viable. It is clear, therefore, that the term abortion, when used in the broadest medical sense, includes all previally delivered ova although in a more restricted sense refers to only the first 15 weeks of gestation. These factors of terminologic confusion must be kept in mind by all three of our interested groups when conferring, either with one another or with the lay public. Hereinafter the term abortion will be used in the broadest medical sense.

That there is a real relationship between trauma and abortion is ad-

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mitted by all qualified medical experts in the field (Taussig<sup>1</sup>). However, the number of *bona fide*, traumatically caused abortions is much rarer than is generally supposed by the average lay, legal and medical public. It is proposed to cite the evidence for this relationship by analyzing a series of abortuses examined in the Pathological Laboratory of the Boston Lying-in Hospital, either by or under the immediate supervision of the author.

#### MATERIAL AND METHODS

The period encompassed in the study is from February, 1936, to December, 1941. During this six-year period a total of 1416 consecutive abortuses were carefully examined from an embryologic as well as a pathologic point of view. Many of these 1416 cases have been submitted by physicians in Boston, although moderate numbers of specimens have been received from hospitals and physicians in other communities. Since a good many of the physicians on the staff of the Boston Lying-in Hospital submit every spontaneously aborted ovum from their private practices, it is felt that this material, with the specific exceptions of hydatidiform moles and criminal abortions, is representative of the variety of pathologic conditions associated with spontaneous abortion in general.

Of these 1416 abortuses, 1000 were selected as the basis of the present report. The criteria of selection are based merely on the completeness of both the clinical history and the pathologic material submitted. Obviously, an incomplete abortion, containing only a tiny bit of curetted decidua and a few chorionic villi is not sufficient material upon which to base valid conclusions for a study of this sort. Furthermore, a series of 63 hydatidiform moles examined in the laboratory during this period are excluded from the present study since they would seriously invalidate the statistical value of these data. Such moles are rare (approximately 1:2000 cases of pregnancy) but are prominent in the total series because the author is especially interested in that subject and has collected them from all over the country. The 1000 selected cases, therefore, represent a consecutive series of abortuses which are complete enough, both as to history and material, so that valid conclusions may be drawn from their study. The round number chosen also facilitates figuring percentage values. The general technic used in the examination of this material is detailed in Mall and Meyer's<sup>2</sup> classic work reporting the pathologic ova in the first 1000 accessions to the world-famous embryologic collection of the Carnegie Institution of Washington.\* In 1940, the author<sup>3</sup> published certain data from the first 1027 abortuses examined at the Boston Lying-in Hospital pertaining to the genesis of hydatidiform mole. Detailed notes on the technic of examining these abortuses are given in that paper.

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\* It was the privilege of the author to spend a year in the Department of Embryology of that Institution under the guidance of Dr. Franklin P. Mall's successor, Dr. George L. Streeter, to whom the author is greatly indebted for instruction in the methods of studying normal and abnormal human ova. For the past nine years, since the initial year of study there, the author has collaborated in the work of that laboratory, now under the direction of Dr. George W. Corner.

Since it is the consensus of medical opinion that at least ten per cent of all pregnancies terminate in spontaneous abortion, and that only rarely are such abortions caused by trauma, the main emphasis in this paper will be to point out the apparent primary etiology in 1000 abortions and to discuss in detail the relationships of trauma to abortion in the 13 cases of this series in which trauma of any sort antedated the abortion. It should be noted here that in only one of these 13 cases was external trauma, an automobile accident, responsible for the abortion. In view of the frequency of spontaneous abortion and the rarity of true traumatic abortions, it becomes of the greatest importance to evaluate mere coincidental trauma in spontaneous abortion. The thesis of this report, therefore, may be summed up by stating that, in the opinion of the author, the plaintiff in a case of alleged traumatic abortion must present proof of the presence of a normal pregnancy at the time of the trauma and that the abortus shows objective clinical, embryologic and pathologic evidence of the relationship to the trauma.

MAIN CLASSIFICATION OF MATERIAL

The classification followed in studying these abortuses is essentially the same as that devised by Mall (Mall and Meyer<sup>2</sup>). Pathologic ova in Mall's original classification are those in which the embryos are absent, very defective or macerated. The author has modified this classification by excluding the macerated embryos from the pathologic group since, broadly speaking, these embryos are anatomically normal but have died in utero for one reason or another. Hence, in this series many so-called normal ova contain macerated embryos although the ovisacs show various pathologic changes which account for the death of the embryo and subsequent abortion of the ovum.

The following figures are a crude breakdown of the 1000 cases with respect to the main embryologic and pathologic features shown in each specimen, although each subgroup will be subsequently discussed more in detail:

<i>I. OVULAR FACTORS:</i>		
1. Pathologic ova, with absent or defective embryos.....	489	
2. Embryos with localized anomalies.....	32	
3. Placental abnormalities.....	96	
	<hr/>	617
<i>II. MATERNAL FACTORS:</i>		
1. Criminal abortions.....	21	
2. Uterine abnormalities.....	64	
3. Febrile and inflammatory diseases.....	20	
4. Miscellaneous.....	12	
5. Anatomically normal ova (classified).....	265	
6. Trauma (automobile accident).....	1	383
	<hr/>	<hr/>
		1000

I. OVULAR FACTORS

1. *Pathologic Ova*

These specimens constitute the largest single group in the series (48.9 per cent) and are the typical "blighted ovum" of the clinician. They are classified in more detail as follows:

Group I.—*Villi Only*: This material contains only chorionic villi, whether normal or abnormal. Obviously, this group is one of convenience only, since it merely classifies the material submitted, which may or may not adequately represent the relationship between maternal and ovular tissues. This group, therefore, includes curettings from cases of incomplete abortions. Actually very few of the large number of such cases in the total series of 1416 abortions are included in this study because of the obvious incomplete nature of the material.

Group II.—*Empty Chorionic Vesicle*: This type of specimen when intact (as it often is) represents the most pathologic type of ovum with which the pathologist has to deal. There is no derivative of the inner cell mass; that is, of the portion of the fertilized ovum destined to form the embryo. If the chorion is ruptured, one might have reasonable doubt about the essential pathologic nature of the ovum; that is, the normal embryo with its surrounding amnion may have been lost during the abortion. However, if trauma has produced such an artefact in an otherwise normal ovum, one can usually see evidence of the torn stump of a normal umbilical cord with its radiating vessels.

Group III.—*Chorion Containing Empty Amnion*: This type of ovum is only slightly less pathologic than the previous one, there being no evidence of an embryo, although the amnion is present. Members of this group are, likewise, valid if intact—as they often are—although if ruptured, erstwhile normal ova with the embryos missing can usually be detected and differentiated from true Group II specimens.

Group IV.—*Chorion and Amnion Containing Nodular Embryo*: This type is truly pathologic, as the embryonic mass consists merely of a disorganized group of embryonic cells. Artefacts in this group would consist of the macerated remains of an otherwise normal umbilical cord within either a ruptured or intact amnion.

Group V.—*Chorion and Amnion Containing Cylindric Embryo*: If the head end of the embryo can be recognized, even though it does not possess any other features of an embryo, such a specimen is valid for this group. (It is quite rare in the author's experience.)

Group VI.—*Chorion and Amnion Containing Stunted Embryo*: It is possible to recognize the embryonic form, although it is much smaller than it should be for the menstrual age of the specimen. In addition, one or more portions of the embryo are atrophic, deformed or degenerated. These embryos are usually not macerated. This is a valid group whether the chorion and amnion are ruptured or not, since the embryo has to be recognized before the specimen may be placed in this category.

The vast majority of this large and important group, destined for abortion, whether there is associated external trauma or not, belongs in Groups II, III and IV. They tend to abort during the tenth week of gestation. Evidence recently accumulated by the author,<sup>4</sup> in collaboration with Dr. John Rock, show that these pathologic ova are deficient from the early stages of development before the patient has any knowledge that she is pregnant.

## 2. Embryos with Localized Anomalies

These specimens constituted 3.2 per cent of the total series. The congenital anomalies include many of the common deformities of the nervous system such as spina bifida, meningo-encephalocele, anencephaly, etc., which may go to term but are incompatible with continued extra-uterine existence. Other anomalies are also found in the group such as deformed extremities. That these particular anomalies are responsible for the death of the embryo and subsequent abortion of the ovum is not rigidly maintained. It is significant, however, that the incidence of congenital anomalies is 4.7 times greater in this series than in Murphy's<sup>5</sup> series of stillborn and living fetuses which went to term. Hence, the presence of a congenital anomaly in an aborted fetus must be *prima facie* evidence of some general ovular abnormality which is expressed by the presence of the localized anomaly seen in the specimen.

3. *Placental Abnormalities*

This relatively large group constitutes 9.6 per cent of the total. Its inclusion in the main group of abortions due to ovular factors may be questioned since the etiology of the single largest group, the circumvallate placenta, is not entirely clear. However, since the circumvallate placenta, which tends to separate prematurely and, hence, causes abortion and premature labor, is an abnormal placenta, whatever its cause, it is included here under the general heading of abortions due to ovular factors.

The general group of placental abnormalities, together with the number of cases of each variety are listed as follows:

a. Circumvallate placenta.....	45
b. Hypoplasia of the placenta.....	20
c. Placenta membranacea, partial.....	2
d. Velamentous insertion of umbilical cord.....	1
e. Hypoplasia of amnion.....	1
f. Rupture of marginal sinus.....	3
g. Premature senility of placenta.....	4
h. Berus' mole (intraplacental hematomata).....	19
i. Succenturiate lobe with total infarction.....	1
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Total.....	96

The common denominator with respect to the cause of the abortion in most of this group is death of the fetus and subsequent expulsion of the ovum. Some of the circumvallate placentae, when they separate prematurely at their margin, are associated with premature labor, in which case the embryo is still living when delivered.

II. MATERNAL FACTORS

1. *Criminal Abortions*

This group is necessarily small and constitutes 2.1 per cent of the total. It is expected that criminally induced abortions would not be numerous in a group of spontaneous abortions submitted to the pathologist in an attempt to discover the cause of the abortion. However, the author has been interested in the pathologic sequence of events in criminally induced abortions and has attempted to acquire material, thus accounting for the few cases of this type among the group of otherwise spontaneous abortions. The figure of incidence, therefore, is entirely erroneous and much lower than actually exists throughout the country. Suffice it to say that the pathologic picture is often one of artificial premature rupture of the membranes followed by acute bacterial inflammation of the chorion, amnion, placental villi and decidua.

2. *Uterine Abnormalities*

This is a distinct group constituting 6.4 per cent of the total. The various subdivisions of this group, together with the number of cases of each are as follows:

a. Low implantation of placenta.....	56
b. Placenta accreta.....	2
c. Bicornuate uterus.....	2
d. Multiple leiomyomata of uterus.....	1
e. Retroversion of uterus, fixed.....	3
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Total.....	64

It may be questioned as to why the low-implanted placentae (including five definite cases of placenta previa) should be considered as due to any maternal factor. The reason for assuming this, as yet unproved, relationship is because of the high incidence of placenta previa in multiparae. It seems unlikely that the fertilized ovum of a multigravida is any different from that of a primigravida although the postpartum uterus of the former never quite involutes back to its nulliparous state.

TRAUMATIC ABORTION

3. *Febrile and Inflammatory Diseases*

This small but important group constitutes 2 per cent of the total series and includes local bacterial inflammation of the endometrium, both acute and chronic as well as febrile states from various causes. The cases are listed as follows:

a. Bacterial inflammation of decidua, acute.....	12
b. Small pox.....	1
c. Pyelitis with horseshoe kidney.....	1
d. Fever of unknown etiology.....	5
e. Chronic endometritis.....	1
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Total.....	20

It is worthy of comment that local inflammation plays a relatively small part in the etiology of spontaneous abortion. This is in contrast to the views advanced by Mall and Meyer,<sup>1</sup> who ascribed to inflammation a prominent rôle in the causation of abortion. It would appear that they misinterpreted the leukocytic response to sterile decidual necrosis following thrombosis of sinusoids—a universal finding in all spontaneous abortions of whatever etiology.

4. *Miscellaneous*

This small and heterogeneous group (1.2 per cent, is formed as a matter of convenience only. There is no relationship between any of the following group of cases:

a. Radiation effect on ovaries.....	2
b. Erythroblastosis fetalis.....	3
c. Surgical removal of corpus luteum.....	4
d. Blood dyscrasia.....	1
e. Interference with circulation of cord.....	2
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Total.....	12

5. *Anatomically Normal Ova (classified)*

This is the next largest group in the series and constitutes 26.5 per cent of the total. These abortuses all have one factor in common; namely, an anatomically normal ovum to which various things have happened *in utero*. The following tabulation gives the main subdivisions of this large and, in general, unsatisfactory group:

a. Anatomically normal ova without disease.....	227
Fetus, macerated.....	146
Fetus, nonmacerated.....	74
Fetus, by history only.....	7
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	227
b. Acute chorionitis, consistent with spontaneous premature rupture of membranes (fetus macerated in 9 and normal in 5).....	14
c. Positive Hinton and Wassermann tests.....	3
(The syphilis was probably not responsible for the abortion)	
d. Infarction of placenta, extensive.....	13
(All fetuses were macerated)	
e. Toxemia of pregnancy.....	5
(Fetus macerated in 3 and normal in 2 cases)	
f. Trauma (internal).....	1
(Two successive biopsies on sterility patient not known to be pregnant)	
Exploratory celiotomy.....	1
Intrauterine lipoidal injection, 7 weeks prior to last menstrual period.....	1
	—
Total.....	265

It is obvious that the large number of cases (227) in group "a" show no satisfactory

cause for their abortion. That the placenta prematurely separated in some of the cases (27) and that the patient then went into premature labor is only begging the issue. Of course, nearly two-thirds of this group showed macerated fetuses, a perfectly adequate cause for the abortion but the cause of the intra-uterine fetal death is still obscure.

Those cases in group "b" who prematurely rupture their membranes with subsequent infection of the ovisac and expulsion of either a dead or living fetus are, in the last analysis, unexplained. What causes the membranes to rupture prematurely is unknown, although it is the impression of the author that the ovisac is too small in many cases as compared to the size of the growing fetus.

It is interesting to note the relative paucity of cases complicated by syphilis. In older dissertations on abortion, syphilis was prominently mentioned as a cause but at the present time it would seem to play no etiologic rôle in spontaneous abortion.

Toxemia of pregnancy is uncommon during the period of gestation concerned in the cases in this study. It may kill the fetus directly, by means as yet unknown, or it may cause fetal death by toxic premature separation of the placenta.

The one case of internal uterine trauma, aside from those in the criminally induced group, is of interest from a medicolegal point of view. It illustrates that extreme care must be exercised in doing endometrial biopsies on sterility patients, especially after the period of implantation of the ovum. Since most, if not all sterility patients may theoretically be pregnant during the last half of the menstrual cycle, it is possible that a biopsy performed after the 19th to the 22nd day may mechanically interrupt a pregnancy which, as yet, necessarily, gives no evidence of its presence.

The second case in group "f," the abortion following an exploratory celiotomy, is of interest. The patient had been widowed for three years (a factor of probable importance in this case). Since the last menstrual period was not known, or admitted by the patient, and because the periods were alleged to have been regular but scanty, the enlarged uterus was thought, clinically, to have been a fibroid uterus. The patient was flowing at the time of the exploratory celiotomy, which revealed a normal pregnant uterus of approximately 3½ to 4 months gestational age. A week following the operation the patient miscarried a normal but macerated fetus of 16 weeks gestational age. The cord was about the neck twice, although this was probably not of etiological significance in the death of the fetus since a dead fetus may move about passively in the uterus due to uterine contractions and general activity on the part of the patient. Whether the operation caused the abortion cannot be proven. There are no data by which this factor can be judged since the menstrual age of the pregnancy could not be accurately ascertained. In view of an atypical story by a widow of three years standing, who was bleeding at the time of operation, it is justifiable to wonder, at least, if this is not a traumatic abortion of the self-induced or criminal type rather than due to the operation.

The final case in group "f" is also of medicolegal significance in that the sterility patient had a lipiodol injection into the uterus and tubes seven weeks prior to the last menstrual period before she became pregnant. She aborted a normal but macerated eight weeks fetus and chorion at ten weeks and five days after the last menstrual period. It is difficult to see what relationship, if any, the lipiodol uterotubogram had on the subsequent abortion unless one postulates that the oily substance, which is known to persist for some time in the tubes, affected the fertilized ovum on its passage through the latter. However, the fertilized ovum was of such vitality that it developed to the stage of a normal eight weeks pregnancy at which time the embryo died. It seems unreasonable to assume that the theoretically unfavorable environment created by the lipiodol persisting for seven weeks in the tubes, could have had a delayed effect on the ovum. It is well recognized among teratologists that the developing ovum is affected relatively soon after its exposure to unfavorable environments. However, one cannot absolutely rule out the delayed effect of lipiodol and so the case is included in this general group.

## TRAUMATIC ABORTION

### 6. Trauma (automobile accident)

This single case of a normal twin pregnancy which aborted following, and because of the patient's involvement in, an automobile accident is a classic example of a *bona fide* traumatic abortion. It satisfies the criteria reserved for such cases by the conscientious medical expert and is, therefore, deserving of a detailed history.

This patient was a 22-year-old gravida I, para O, whose last menstrual period occurred on November 24, 1937, 12 weeks and two days prior to her involvement in an automobile accident. This occurred while sitting in a stationary automobile which was struck from the rear by another car. The patient was excited and emotionally upset, although there was no mention in the clinical history of definite bodily injury. Seven hours after the accident the patient began to have painful uterine cramps followed in five hours by slight vaginal bleeding. Morphine, grains  $\frac{1}{2}$ , given in two divided doses one hour apart, failed to alleviate the uterine pain which, after six hours, became steady and was localized in the right lower quadrant. The patient experienced a chill at this time but had no elevation of temperature. She vomited once. The pulse was 82 and the blood pressure 120/60. Physical examination, performed by an obstetrical consultant, showed a nontender pregnant uterus of approximately four months gestational age. The uterus was, therefore, somewhat larger than the menstrual history would indicate. (This was later shown to be due to an excess amount of amniotic fluid and normal twin fetuses, each of which was normal in size and development for the stated duration of pregnancy)

The patient was admitted to the hospital 11 hours after the onset of uterine pains (labor). She soon ruptured her membranes spontaneously and delivered normal twins an hour later; 19 hours after the accident and 12 hours after the onset of labor.

Pathologic examination revealed an anatomically normal twin pregnancy whose fetuses each showed the expected degree of development for their menstrual age (12 weeks and three days). The menstrual age of aborted embryos is determined by reference to tables of embryonic development compiled by Dr. George L. Streeter,<sup>6</sup> recently retired director of the Carnegie Institution of Washington's Department of Embryology.

There is no reasonable doubt but what the accident initiated labor. Whether it did so by means of direct trauma or the psychic shock incident thereunto is impossible to say. It is quite possible that the increased distention of the uterus due to the twin pregnancy, made the organ more irritable and hence more susceptible to the factor or factors which initiate labor. Be that as it may, it would appear that this is a case of *bona fide* traumatic abortion for which the patient should, with justice, be compensated. It is of interest that as the result of this accident the patient received \$700 to \$800 in addition to having her hospital bill paid.

### ABORTUSES WITH A HISTORY OF ANTECEDENT TRAUMA

In the entire series of 1000 abortions concerned in this study, there are nine cases in which external trauma of some variety was recorded prior to the expulsion of the ovum. Five cases proved, on pathologic and embryologic examination, to have passed pathologic or defective ova which would undoubtedly have aborted irrespective of any trauma, while four cases showed placental defects which caused the abortion.

Four of the patients who passed pathologic ova had taken long automobile rides a week or ten days prior to the abortion. Inasmuch as patients are warned against this practice, it is of some interest to note that, at least in these four cases, the automobile ride bore no causal relationship to the



abortion; none of the ova contained any embryo (except a nodular one in one case) and, hence, all were destined to abort.

The fifth case, involving a pathologic ovum, is deserving of special comment because the patient experienced a back strain, a fall and a death within the family prior to her passage of a typical blighted or pathologic ovum. The latter consisted of the most pathologic variety encountered—the empty chorionic shell without vestige of amnion or embryo. Embryologically, this ovum had been abnormal prior to the ninth or tenth day of its development, at which time the amnion begins to form. It is obvious that none of these various forms of trauma, including the psychic shock of the death in the patient's family, had anything to do with the subsequent abortion.

The four remaining cases in which the abortuses showed placental defects can be discussed as a group. The traumata associated with these cases are as follows: a long automobile ride just before abortion, psychic shock or trauma suffered as the result of being near an automobile accident two days prior to abortion, involvement in an automobile accident six weeks prior to abortion and a severe fall at home two days prior to abortion. All pregnancies progressed normally until the 19th to 20th weeks. All patients passed normal fetuses, two of which were macerated, one was normal and one was not submitted although it was said to be normal. The placentae all showed varying degrees of circumvallate formation; a developmental defect of the placenta, probably associated with too shallow implantation of the ovum in the endometrium. This defect of implantation, with its resulting poor maternal blood supply, allows only a relatively small area of the chorion, or external shell of the ovum to form a placenta. In order for this small patch of placental tissue thus formed to supply the fetus with sufficient food and oxygen, the lateral margin of the placenta grows radially and in so doing causes premature separation of the placenta itself.

Inasmuch as implantation of the fertilized ovum occurs on the nineteenth to the twenty-second day of the menstrual cycle,<sup>4,7</sup> or about a week prior to the patient's knowledge of her pregnancy, it is obvious that trauma occurring after pregnancy has been established cannot be responsible for abnormalities of the placenta due to faulty implantation of the ovum.

#### DISCUSSION

From the foregoing data it is clear that antecedent external trauma or psychic shock may appear in the history of a case of abortion. That trauma is only rarely etiologically related to the abortion is also evident from an analysis of the 13 cases in which antecedent trauma is recorded; only one of these abortions was caused by external trauma. When trauma is an etiologic factor in an abortion it must immediately precede, by a matter of hours, the onset of the sequence of events that results in an expulsion of a normal ovum.

It is obvious, furthermore, that in the case of a *bona fide* traumatic abortion, the ovum must be shown to be developing normally up to the time at which

the trauma occurred, since there are many other factors independent of trauma which can and do cause abortion. Since true traumatic abortion is such a rarity and spontaneous abortion such a common occurrence, even though antecedent trauma may be recorded in proven spontaneous abortions, it is mandatory that the normality of the pregnancy be proven in cases of alleged traumatic abortion. In the light of the findings in this series of abortions, it becomes obvious that the normality of a given pregnancy cannot be determined by clinical examination alone. The normality of the ovum can be proven only by embryologic and pathologic examination of the abortus by someone expert in this special field of pathology. Finally, it would seem to the author that the burden of proof of the relationship between any given trauma and the subsequent abortion be upon the person who alleges that the particular trauma caused the resulting abortion.

To verify the relationship of trauma to abortion the author consulted seven obstetrical specialists in Boston, all of whom are members or emeritus members of the Obstetrical Society of Boston. They were questioned as to the number of *bona fide* cases of traumatic abortion encountered in their obstetrical experience. The number of cases and their years in practice are as follows:

- 1 case in 38 years (the case reported here)
- 3 cases in 28 years
- 2 cases in 27 years
- 0 cases in 25 years
- 0 cases in 22 years
- 0 cases in 10 years
- 0 cases in 7 years

The specialists who had taken care of such traumatic abortion cases were in unanimous agreement that the onset of signs or symptoms leading to abortion followed the causative trauma within minutes to hours. The initial sign may have been either rupture of the membranes or vaginal bleeding followed by uterine cramps and expulsion of the normal ovum. The etiologic trauma took such diverse forms as extreme exertion during a severe thunder storm (1 case), automobile accidents (3 cases), climbing the mast of a sailboat during a race in order to fix a broken halyard (1 case), and a severe paroxysm of coughing due to whooping cough (1 case).

The history of one additional case has come to the author's attention recently. The patient was thrown clear of an automobile, sustaining lacerations of the right thigh and vulva together with a fractured skull. When picked up soon after the accident she was bleeding profusely from the vagina due to an inevitable abortion which was completed in the hospital. The ovum was normal.

#### SUMMARY

The analysis of 1000 cases of abortion, selected as to the completeness of their clinical history and pathologic material, shows that external trauma and/or the psychic shock associated with it did, in one case, initiate the

sequence of events resulting in the abortion of a normal twin ovum. Careful pathologic and embryologic examination of 11 abortuses from patients who gave a history of antecedent trauma showed adequate natural causes for the abortions—the trauma in such cases being purely coincidental. The remaining 988 abortions showed no etiologic relationship to external trauma although 21 of them were criminally induced, and one normal ovum aborted as the result of two endometrial biopsies done on a sterility patient prior to her first missed period.

#### CONCLUSIONS

1. A series of 1000 abortions are reported and their etiology determined by clinical history, embryologic and pathologic examination.

2. One case of a normal twin pregnancy aborted at 12 weeks and three days as the result of external trauma and/or the resulting psychic shock resulting from an automobile accident.

3. Eleven cases of abortion preceded by various external traumata are analyzed and shown to be due to natural causes.

4. The remaining 988 abortions (including 22 induced by internal uterine trauma) were due to a variety of naturally occurring ovular and maternal factors.

5. The collective experience of a representative group of Boston obstetrical specialists is reported with respect to abortions occurring as the result of external trauma and/or psychic shock.

6. A *bona fide* traumatic abortion is one in which the abortus was anatomically normal in development up to the time at which the external trauma and/or psychic shock occurred. If this predicate cannot be proven, we must regard the evidence of traumatic causation as conjectural and speculative, and suspect that the abortion was a spontaneous one due to pathologic causes.

7. Minutes to hours is the time interval between the occurrence of the external trauma and/or psychic shock which initiates the sequence of events resulting in the expulsion of a normal ovum.

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