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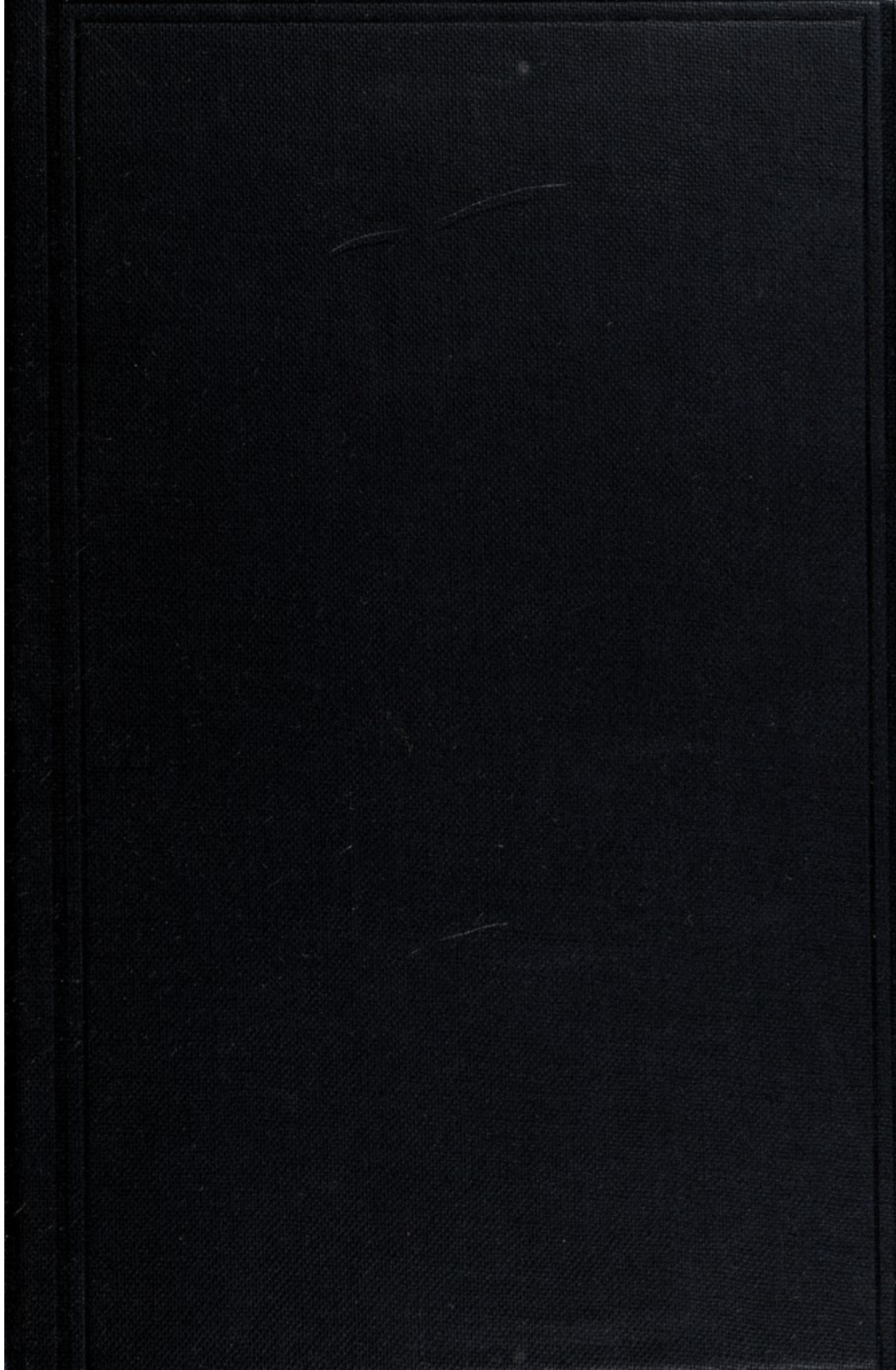
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ABORTION
SPONTANEOUS AND INDUCED
MEDICAL AND SOCIAL ASPECTS



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ABORTION
SPONTANEOUS AND INDUCED
MEDICAL AND SOCIAL ASPECTS

BY

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ILLUSTRATED

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DEALING WITH MEDICAL ASPECTS
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PREFACE

Abortion has become a world problem. From both a medical and a social viewpoint, largely as a result of the World War, this question is engaging the serious attention of every physician interested in the preservation of maternal health. Through the inspiration of Dr. R. L. Dickinson, chairman of the executive committee of the National Committee on Maternal Health, and with the assistance of members of that committee and its staff of workers, I have been enabled to complete the present volume from this broader viewpoint. Social aspects have been included in this volume intended for physicians because in preventive medicine underlying social conditions should always be taken into consideration.

While my debt is greatest to Dr. R. L. Dickinson and the members of his committee, thanks are also due to Professor Walter Gellhorn, of Columbia University Law School, for assistance in preparing the chapter on medicolegal aspects and to Dr. O. H. Schwarz for the use of material in the chapter on pathology.

An important contribution is the chapter on Abortion in Animals written by Professor W. L. Williams, of Cornell University. Based on a lifetime of personal observations, his review of this subject is authoritative. I was indeed fortunate to secure his cooperation.

F. J. T.

St. Louis.

FOREWORD

The scourges that science can conquer grow in number. Smallpox or typhoid or tuberculosis can be cut off whenever we care to pay the price. This should be true of abortion.

The scourges of the race are fought with success only by forcing them out of the zone of mystery and sentiment into the zone of fact. Of old, illness derived from evil spirits, madness from the gods. Within this ancient circle of emotional unreason and religious taboo we still strive to keep two master scourges, abortion and venereal disease, and thus threaten science and sense in all attempts to vanquish them. In both these matters the public pays dearly in long illness and high death rate for intimidating its doctors and silencing its social workers.

Therefore we welcome a volume which goes far to move into the zone of fact a universal human practice, a spreading scourge, a remediable evil. It is the first book covering the ground with any completeness. It speaks with authority.

For his task, Dr. Taussig is especially qualified by wide reading and extensive practical experience not alone in disorders of women and midwifery but also in the social implications of medicine. He wrote the first special monograph on abortion in the year 1910, and at that relatively early date—five years before any attempt to open a clinic—stressed the possibilities and value of control of conception in limiting undesirable pregnancies, mentioning some of the measures available at that time.

The author has devoted no small portion of his life to public health matters. He was active in the first organization of a national association for social hygiene in St. Louis, about 1909; he originally proposed an agency for control of cancer in 1904, and again in 1914; and has rendered to the birth control movement most important aid by counsel and encouragement.

In the White House Conference his part was the study of abortion in relation to fetal and maternal mortality. Gathering together all available data upon this subject, he analyzed the factors that have led

to the growing frequency of instrumental interruption of pregnancy with its resulting high puerperal mortality. The startling facts that were revealed in this survey have been the basis of extensive comment on the part of many lay journals and have served to awaken the conscience of the American public to the necessity of taking measures to combat this evil.

If the scourges that science conquers grow in number, the domain which surgery conquers widens in area. Among a multitude of surgical advances, one of the forward movements has been in the field of interruption of pregnancy, since in this quarter genuine aseptic procedure coupled with technical expertness yields a very high degree of safety. The natural sequel has been swift expansion of operative abortion to replace useless drugs and bungling methods, but at the same time with a woeful incidence of unclean, unskillful interference leading to alarming mortalities and multitudinouscripplings. The era of fewer and better abortions therefore awaits, among other issues, a sensible research in which interruption of pregnancy is treated as if it were concerned as much with the health of and consideration for the woman as it is with theological doctrine, as if, in its surgical aspects, it had to do with surgery.

A field survey is overdue. In all other kinds of surgery except this one, the medical profession avoids making sweeping criticisms or drawing conclusions without visits by surgeons of standing to the operating rooms of those with the most extensive experience, here and abroad—combining inspection with follow-up, with analysis, with publication of results, and a differentiation between skilled craftsmen and unclean and reckless and commercially minded individuals. No survey of operative abortion is known to have been undertaken, except in Russia where there are ample facilities but certain handicaps.

This is one of the reasons to welcome the author's assembly of all available and basic material and his assessment of method. This undertaking is preparation for the time when medicine will take on its share of one more inevitable responsibility, social as well as medical. In this particular matter law has a lag some decades behind public opinion, but law can hardly fail eventually to become humane, if only to permit medicine to become merciful. From the legal angle, quite as much as from the practical angle, one thing is too evident to need much empha-

sis. This is that the pivotal point in diminution of abortion is removal of statutory embargo on diffusion of knowledge of effective control of conception.

First and last this volume renders service that is fundamental. Learning the facts is the first step toward combating any evil, and by facing facts we may be forced effectively to develop what appears to be the only cure for this evil and its near relatives; namely, to foster sane sex life stayed on sound character and built in turn on fearless inquiry and wise education.

ROBERT L. DICKINSON.

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ABORTION
SPONTANEOUS AND INDUCED
MEDICAL AND SOCIAL ASPECTS

ABORTION

CHAPTER I

DEFINITION AND SCOPE

IN THE DEVELOPMENT of our language, it often happens that a word, the meaning of which was at one time clear and well-defined, takes on during the course of centuries a special connotation that tends to confuse the expression of our ideas. Such a change has taken place with the word abortion. In the days when Latin was the universal language of medicine, *abortus*, from the verb *aboriri*, signified something that had been detached from its site. Referring to the embryo, it meant that events had transpired to bring about its premature expulsion.

In 1547 Boorde, in the Breviarie of Health, wrote: "*abhorsion is when a woman is delyvered of her chylde before her tyme.*" Later, with the development of obstetrics in France and Germany in the seventeenth century under the guidance of women midwives, the vernacular forms began to be used in medical parlance, and we find in France the term, *fausse couche*; in Germany, *Fehlgeburt*; and in England, *miscarriage*, commonly used in the sense of abortion.

For a while the terms "miscarriage" and "abortion" were used interchangeably; then they began to take on differentiated meanings. At the end of the nineteenth century, many writers limited abortion to interruptions occurring in the first trimester of pregnancy, and miscarriage to interruptions occurring in the second trimester. Since many interruptions in the first three months were artificially induced, contrary to the law, the word abortion was further corrupted to designate criminal interference with pregnancy. Among the laity this unfortunate and restricted usage still exists, but in scientific medical literature a determined effort is being made to restore its original meaning to the word abortion. This is doubly important now that our ethical and legal attitude toward the interruption of pregnancy is undergoing radical modification.

Regardless of the cause, therefore, abortion should be defined as the "**detachment or expulsion of the previable ovum.**"

The term "previable" cannot be defined absolutely, since with improved methods of incubation and infant feeding we are able to save

babies at earlier stages of development, but for the present, and perhaps for some time to come, the lower limit of viability may be taken to range between the twenty-sixth and the twenty-eighth week of fetal life.

In this book we are limiting the discussion to *uterine* abortion, but it may properly be applied in cases of ectopic pregnancy to *tubal* abortion; and it is not limited to the human race, but can be used to express similar pathologic processes in animals. In this monograph therefore I have avoided entirely the use of the word miscarriage and given to it the title **Abortion**, with the subtitle **Spontaneous and Induced** to signify separate consideration of the two main etiologic groups. The definition of particular terms is discussed in some detail in Appendix C.

Outline of Contents

It will be noted that I have divided the book into four parts: (*One*) History and Background; (*Two*) Spontaneous Abortion; (*Three*) Induced Abortion; and (*Four*) Social Aspects of Abortion.

Part One.—In the **history and background of abortion**, I have first briefly reviewed the record of past ages with regard to the accidental and intentional interruption of pregnancy. Then follows a description of the ethnologic variations in the practice of abortion, demonstrating how wide is its spread among savages and civilized peoples of all corners of the world, regardless of race or religion. The final chapter in this section, contributed by Dr. Walter Long Williams, Professor Emeritus of Veterinary Science at Cornell University, deals with abortion among animals. Here we can see many points of similarity between spontaneous abortion in animals and in man, especially in the matter of cause and prevention.

Part Two.—Under **spontaneous abortion** are considered most of the fundamental medical questions involved, such as anatomy of early pregnancy, etiology, pathology, mechanism, symptoms, diagnosis, prevention, and the treatment of abortion and its complications. This section of necessity includes some consideration of *induced* as well as spontaneous abortions, since the course, the nature of the pathologic changes, and the manner of treatment are to a large degree similar in both forms, regardless of the cause. Perforation and infection, for example, may result in the handling of either spontaneous or induced abortion. To avoid duplication, therefore, I have considered all such matters in this section. For convenience, also, I have treated some of the less frequent conditions, such as "missed abortion" and mole pregnancy, in separate chapters.

Part Three.—Under the head of **induced abortion** will be found chapters dealing with the medical aspects of legally induced or therapeutic abortion, its indications and technique; preventive measures such as contraception and sterilization; and the methods and accidents of illegally induced abortion. These chapters together with portions of Part Two will, it is hoped, give to the practitioner of medicine the necessary information required for the management of abortion.

Part Four.—**Social aspects of abortion** are reserved for separate consideration in the concluding section. An initial chapter takes up in detail the statistical material on abortion, which has been gathered largely along medico-social lines such as age, multiparity, race, legitimacy, religious affiliations, place of residence and so forth. The social, economic and religious aspects of induced abortion are then discussed. This portion of the book should be of interest both to the socially minded physician and to the medical sociologist. As an outstanding example of an attempt to solve the abortion problem along socialistic lines, the Russian experiment in legalization has seemed worthy of separate consideration. In the concluding chapters on Legal Aspects and the Control of Abortion I have tried to summarize the methods of prevention and treatment that give promise of reducing the frequency of abortion and limitation of the disease and death that follows in its wake.

At the end of the volume will be found references to literature (especially that subsequent to 1923); a few longer statistical tables; the exact wording and analysis of our State abortion laws; and a glossary of terms, with discussion of definitions.

Scope of Problem

Since conditions in other countries, especially those of Western Europe, are similar to our own, the general scope of the abortion problem can perhaps be realized by considering the frequency of abortion, and the number of abortion deaths here in the United States, so far as these can now be determined.

If there are difficulties in the registration of births in this country and throughout the civilized world; if even with the development of a Federal service of vital statistics in the Census Bureau, we find that in many states the methods employed have been so inaccurate that these states could not, until recently, be included in the Birth-registration Area, how vastly more difficult does our problem become, when we seek to arrive at some fair estimate of the number of abortions and the maternal deaths that result therefrom!

All efforts to make compulsory the registration of abortions have met with failure. In the very nature of things, it is hardly possible to expect any other outcome. The desire to avoid any public record of an event that is so often tied up with the moral life of the individual is bound to result in failure to get accurate information. Innumerable are the abortions done by the patient or in the patient's home, where no record whatsoever is available for medical inspection. Even where the patient enters a hospital, we find that the admission record may specify such a diagnosis as "uterine bleeding" or "endometritis," and a curettage is then done with the connivance of the physician in charge. Many therapeutic abortions appear in the records as "dilatation and curettage."

The same lack of honesty appears in our mortality records, where we find cases of abortion death registered as pneumonia, kidney disease, or heart failure. The recent splendid statistical investigations of maternal mortality made in New York and Philadelphia show that in 25 to 30 per cent of abortion deaths a false diagnosis was put upon the death certificate. These errors were detected only by a meticulous follow-up of hospital records and personal interviews made by the physicians in charge of the survey.

If, in spite of all these difficulties, I venture upon an inquiry into the scope of the abortion problem, it is because there is available from various sources, information which, when put together will, I believe, give us a basis for an approximate answer.

This information is directed along three lines:

- (A) The *total number* of abortions;
- (B) The *death rate* from abortion; and
- (C) The *total abortion deaths*.

If we seek information on these three points independently, and if we find that

$$A \times B = C$$

then we may feel reassured as to the accuracy of our figures.

(A) *Total Abortions*.—Regarding the number of abortions, we find the most varied guesses made by various obstetricians. In Germany, for instance, estimates range from 300,000 to 1,000,000 annually. In this country, equally extravagant statements have been recorded, such as 100,000 annually in New York City. The number of abortions treated in hospitals is only a small proportion of the total, and cannot be used even as an approximate figure.

In 1910, in the first edition of my monograph, then called "The Prevention and Treatment of Abortion" I included a very meager report based on the histories obtained from 600 gynecological patients

regarding their previous conceptions. Following 1,241 conceptions, they reported 870 full-term confinements, and 371 abortions, or a ratio of one abortion to 2.3 confinements. The figures obtained similarly by Macomber in Boston, from the records of 250 married women, showed 128 abortions to 440 confinements, a ratio of 1:3.4.

These ratios are, of course, made on too small a basis to have more than a tentative value, but they coincide remarkably with the findings made on the very extensive data reported by Dr. Kopp in her monograph "Birth Control in Practice." In a study of 10,000 case histories in the New York clinic, she found a record of 11,172 abortions as compared with 27,813 confinements in a total of 38,985 pregnancies. This makes the ratio of one abortion to 2.5 confinements. The reason why figures obtained from clinical records are so much more reliable than those derived by other methods, is the simple psychological fact that people do not hesitate to tell the truth if they are no longer in danger of being punished or otherwise exposed to censure for their actions. Every practitioner has been impressed with the frankness with which patients will discuss past induced abortions, and with their subterfuges when an immediate one is under consideration. The truth can therefore be obtained only through such tabulations of past events.

That the material obtained through maternal health clinics gives a reasonably accurate picture of conditions in our large cities is hardly open to question. Whether the same figures apply to the provincial sections of the country is, however, more than doubtful. All our evidence, both in this country and abroad, points to a markedly lower incidence of abortion in rural and small-town practice. I wish there were available at present more data relating to this subject, but unfortunately there is only one report, that of Plass, from the rural districts of Iowa. His figures were obtained from 81 physicians with country practice who gave their estimate as to the proportion of abortions to confinements. This indicated a ratio of one abortion to five confinements in country practice, or about half the city ratio. Additional information, which I am now trying to collect from various other districts, cannot be utilized for this volume, but I do not believe that the results will differ materially.

Our next step is to figure out from the total annual number of births in this country, a reasonably accurate estimate of the number of abortions. With a population of 120,000,000, and a birth rate of approximately 20 per 1,000, we would get 2,400,000 births annually. This corresponds fairly to the figures now available from the Birth-registration Area in the United States. If we now divide these 2,400,000 births into 42 per cent urban, and 58 per cent rural, as indicated by

the Federal Census, and divide these figures by the respective ratios of one abortion to 2.5 births in urban districts, and one abortion to five births in rural districts, we get the following figures:

Urban: $42 \times 2,400,000 = 1,008,000 \div 2.5 = 403,200$ abortions

Rural: $58 \times 2,400,000 = 1,392,000 \div 5 = 278,400$ abortions

This would make a total of 681,600 abortions annually in the United States.

(B) *Death Rate*.—The abortion death rate, if we take only figures obtained from hospital sources, ranges from 2 to 4 per cent depending upon the country and the type of patient sent to the particular institutions reporting. From a collection of figures from a variety and number of places (not including Russia where legalized abortion is done under especially favorable conditions with a low mortality rate), I obtained an average of 2.1 per cent abortion mortality. I must, however, consider this figure somewhat too high. In increasing numbers, women, having learned the risks of abortion, are more careful that instrumental interference is done with as much asepsis as possible. The equipment of the average abortionist has also greatly improved, so that doubtless many abortions are successfully done in office or home without mortality. A larger proportion of the complicated, infected cases sooner or later are upon the records of the hospital or of coroners' inquests. Hence we must assume that the actual mortality of all types of abortions, simple as well as complicated, is somewhat less than 2 per cent. Freudenberg, from his very careful review of all abortion deaths in Germany, arrives at a figure of 1.2 per cent mortality, and this it would seem to me is probably very near the actual truth.

(C) *Abortion Deaths*.—The number of deaths from abortion is only in part available from the Census Bureau. The interesting and accurate study of maternal mortality conducted by the Children's Bureau, and just issued in its complete form, comprises material in thirteen states for the year 1927, and for these same states and two others in 1928. There were 1,824 deaths in these two years due to abortion, or 912 a year. Since these states comprised 26 per cent of the Birth-registration Area of the United States, we have 3,508 abortion deaths annually in the United States. ($912 \div .26 = 3,508$.) This number must be corrected by the addition of abortion deaths reported to the coroner and classified as homicides (approximately 5 per cent); and by the fact that the area covered in the Children's Bureau survey is 36 per cent urban and 64 per cent rural compared with the general average for the United States of 42 per cent urban and 58

per cent rural. These two corrections would bring the *recorded* abortion deaths for the entire country to not less than 4,000.

In the search for *concealed* abortion deaths methods have recently been suggested by German statisticians. There is no question that every person dying of abortion has on file somewhere a death certificate. The question is: Under what disease was this death classified?

The extravagant statements concerning abortion deaths in Germany, running up to 50,000 deaths and 1,000,000 abortions, led the Prussian Bureau of Vital Statistics to analyse all deaths for the year 1927 to see what was the maximum possible that could be ascribed to abortion. Since the total number of women who died annually in the childbearing period was less than 60,000, it was evident that 50,000 deaths from abortion was a gross exaggeration. Consequently they sought to compare the deaths in females of ten to fifteen years of age with those in the childbearing period of fifteen to fifty years. Since the period of ten to fifteen years is that in which there is the lowest mortality, comparison is made with it under the various classifications for causes of death. Tuberculosis, cancer, influenza and other well-defined diseases could be eliminated. Of the remaining causes such as diseases of the heart, lungs, nervous system, digestive tract, urinary organs and "unknown" factors, it was assumed that if *one-half* of the *additional deaths* from these causes in the years between fifteen and fifty were attributed to secret abortion deaths, it could be considered a *maximum*. Such possibly concealed abortion deaths amounted to 3,500 for 1927 in the state of Prussia. The actual registered abortion deaths were 1,476. Including a few other sources, a maximum figure was finally estimated as 5,100 annual abortion deaths in Prussia, which would correspond to 8,300 for all of Germany.

A similar method of comparing vital statistics to detect abortion deaths was suggested by Freudenberg. He compared male and female deaths during the period of fertility (15-50 years) in Prussia for 1927. This analysis showed that the only places where appreciable difference between the sexes appeared that could be attributable to abortion deaths were under the heads of lung, cardiac, and genito-urinary diseases. Taking the total of these differences, he found only 1,508 deaths that could in any way be classified as possibly due to abortion. Freudenberg's maximum of concealed abortion deaths, adding the 1,476 *registered* deaths, amounted to only 3,000 for Prussia, or 5,000 for Germany as a whole, as compared with 8,300 by the other method.

This latter method of computation seems to me well worth following in this country. If we assume that the results would be similar,

the 4,000 abortion deaths *registered* annually would be about doubled by the addition of the *concealed* deaths, making an 8,000 total.

Let us see now how our original formula works out:

$$\begin{array}{ccccccc} \textit{Abortions} & \textit{times} & \textit{Mortality Rate} & \textit{equals} & \textit{Abortion Deaths} \\ 681,600 & \times & 1.2 \text{ per cent} & = & 8,179 \end{array}$$

With such a close similarity in the results obtained by different methods, we can assume, I believe, that we are not so far from the truth.

It will be noted that the number of abortion deaths is materially lower than the figure 15,000 that I gave in earlier reports, but I am convinced that my previous estimates were too high. *A maximum of 10,000 abortion deaths in this country is nearer the truth.* There is no need for exaggerating this number. It is sufficiently appalling that 8,000 to 10,000 young women lose their lives from this cause every year. Exaggeration merely weakens the plea of those who are seeking to find means to reduce this waste of life. If reinforcement is necessary, let the reader reflect that for every woman who dies as a direct result of abortion, several women are disabled, sometimes permanently, or are rendered sterile, or at a subsequent pregnancy suffer from the after effects of the abortion.

Purpose of This Book

From the analysis of the outline as given, it will be evident that I had in mind a monograph which should not merely help the practitioner and specialist in medicine in the diagnosis and treatment of the various forms of abortion and its sequelae, but which would also give to the sociologist and the student of public health, the facts necessary to understand the way in which abortion undermines the physical well-being and moral integrity of the community.

Twenty-five years ago my small volume entitled, "Prevention and Treatment of Abortion" was limited almost entirely to the medical phases of the question. I did, to be sure, briefly suggest at that time the possibility of exerting some control over the spread of induced abortion, by the prevention of conception, but this phase of the question was given scant consideration.

Since that time the frequency of induced criminal abortion has greatly increased. Hence from the standpoint of preventive medicine, we can no longer be content to take up merely the treatment of the pathologic conditions that have resulted from such abortions, but must give thought to the underlying social conditions that have made so many of our young mothers willing to resort to this dangerous

procedure. Only by looking at our problem from this broader angle can we as physicians be said fully to have done our duty. I know of no condition in medical practice in which the effort to limit its frequency is so intimately bound up with the social and moral life of the people. To some extent the spread of venereal diseases is influenced by these same factors but their control, owing to their bacterial origin, is relatively simple compared to the complexities that attend limitation of a procedure like abortion that may be practiced in any home at any time.

A further justification for this monograph lies in the fact that as far as I know no one has thus far attempted a comprehensive review of the entire subject. Textbooks on obstetrics have as a rule failed to give even the strictly medical phases sufficient attention. Although one out of every three or four pregnancies terminates in abortion, only about one-twentieth of the space in books on obstetrics is ordinarily devoted to its consideration. The same criticism would apply to the teaching in medical schools. There are numerous monographs published in Germany, England and this country, dealing with such special phases as therapeutic abortion, statistics of abortion, legalization of abortion, methods of induced abortion, etc., but I know of no volume that tries to embody the subject as a whole.

Finally, it has been my purpose to give without bias or exaggeration all the essential information on this subject that is at present available. There are many empty pages for future generations to fill in. An illustration of this was just given in discussing the frequency of abortion. Many important questions dealing with the causes of spontaneous abortion remain to be solved. The treatment of septic infections, especially those due to the streptococcus, is still in its infancy. The safest method of therapeutic abortion is a matter requiring additional study. Sociologic experiments such as the legalization of abortion in Russia, require further analysis before coming to conclusions. I trust I have been impartial in my discussion of the medical and sociologic suggestions that have been made. If at times my advice is somewhat dogmatic, especially regarding the medical treatment of abortion and its various complications, that has been for the purpose of presenting the subject more clearly to the general practitioner, for whom this book is primarily intended.

The needless wreckage of human lives that comes as a result of this scourge of abortion is a problem of the first magnitude and the chief responsibility for its correction lies at the door of the medical profession. If the ridiculous and contradictory laws at present on our statute books are to be corrected, if governmental agencies are to be made

to realize their failure properly to provide maternal care and suitable home conditions for poor mothers with large families, if a more humane attitude is to be taken regarding the limitation of offspring and the medical indications for abortion, it is the duty of the doctor to blaze the path of reform. Every day evidence of the misery and ill health that follows upon abortion comes to our attention. No other group is in a position to appreciate as we do the damage it inflicts upon the integrity of the family. If we as physicians wish to retain public confidence and respect, we must assume our obligations in this matter. The prevention and control of abortion vitally concerns the health of the community, and while the actual carrying out of the necessary changes must be left largely to governmental agencies, to law makers and to social workers, the direction and control should be placed in the hands of the medical profession. It is my hope therefore that by presenting the subject from its wider medical and social aspects this monograph may prove of some value in stimulating thought and furnishing data that may serve as a basis for a program of revision.

CHAPTER II

HISTORICAL AND RACIAL ASPECTS

AS FAR BACK as human records can be traced there is evidence of the desire of the race to maintain some control over the number of offspring. The interest in this problem was often acutely emphasized by some catastrophe that interfered with obtaining the necessary nutrition and shelter for the family. Anthropological accounts are replete with the abortifacient practices of primitive peoples. No one who has not surveyed these practices has any conception whatever of the gruesome, awful nature of the pain-inflicting processes by which the fetus was expelled, leading not infrequently to the ultimate death of the mother. Witkowski and Ploss-Bartels—to mention only two of the surveys and to omit hundreds of anthropological observers who have dealt with abortion among primitives—give graphic accounts of methods employed; Witkowski's record is fully illustrated.

While the physical means were more spectacular, the nostrums to be taken ineffectively by the mouth were more frequent and varied. The belief in their efficacy is often a result of the failure of the primitive mind to think scientifically; that is, in terms of cause and effect. Of course, the primitive did not have the advantage of our accumulated experience. As in the instance of early contraceptive ideas, abortive procedures were not infrequently based upon symbolic magic: if something slippery were eaten the fetus would slip out of the uterus. What could be simpler or more logical?

Himes has called attention, in his forthcoming "Medical History of Contraception," to what he believes to be the oldest abortifacient recipe still extant in writing. It is more than forty-six hundred years old, and dates from 2737-2696 B.C. In a famous Chinese herbal, "Chung Lsiu Chêng Ho chêng lei pen ts' ao," written by T'ang Shên-wei about A.D. 1108, reference is made to *shuh yin*, or mercury, as causing abortion. While this herbal dates from only A.D. 1108, it is of great significance that the recipe (for full text, see Himes) is quoted by T'ang Shên-wei from the "Shen-Nung pên ts' ao ching," the most ancient medical work in the Chinese language. It is attributed to the Emperor Shen Nung who, according to Chinese chronology, reigned in 2737-2696 B.C. If a recipe *in writing* is as old as this, how old must

the practice be? The answer is: nearly as old as the social life of man. This throws a flood of light upon the difficulties that must attend its social control in our times.

The age of abortion being what it is, we ought not to be surprised to find it mentioned in the literature of the ancient Hebrews, Egyptians, Greeks and Romans.

In old Babylonian scripts there was no interest in the induction of abortion, but mention is made of various factors that tend to bring on a premature interruption of pregnancy. This was said to be due to evil spirits, who could be driven from the body of the expectant mother by incantations and thus enable her to carry the child to term. In Egypt the famous Ebers Papyrus gives directions as to the manner of producing an abortion, an indication that this procedure was well known to the Egyptians.

The Jewish race from its earliest days stressed the importance of increasing its numbers so as to become more powerful. Evidence of this is manifest in Genesis (Ch. i, 22), where we find the command "Be fruitful and multiply," and later (Ch. xxii, 17) where the Lord speaks to Abraham, saying "That in blessing I will bless thee, and in multiplying I will multiply thy seed as the stars of the heaven, and as the sand which is upon the sea shore." Those who interfered with these commands were to be punished. According to Josephus, the Jewish law declared that all women were to be punished if they produced an abortion. If the child was killed at birth it was to be regarded as similar to murder. Where the Jewish race came in contact with the traditions and customs of the Greeks a greater laxity was observed in regulations restricting abortion.

Coming to Greek civilization, we find that Hippocrates mentions softening of the breasts as an indication of threatened abortion. In such cases he ordered parsley, which produced gas, and was therefore good for the pregnancy. Oppressive weather was supposed to have an unfavorable influence. During this epoch, the greatest intellects favored the limitation of offspring and, if necessary, advised the interruption of pregnancy in order to keep the race in the best social and economic condition. Plato and Aristotle clearly picture the moral standard of the time on these matters. Aristotle says: "If it should happen among married people that a woman, who already had the prescribed number of children, became pregnant, then before she felt life, the child should be driven from her." Each state should prescribe the suitable number of offspring, and see to it that thereafter abortions are induced.

Plato desired that his republic should not consist of more than "five thousand and forty" citizens, and, in order to maintain a balance of this number, he recommended the limitation of births. He wished to make obligatory the abortion of every woman who conceived after her fortieth year. According to both Plato and Aristotle an abortion could be effected before life was felt without punishment. The ancient Greeks in fact, were in their philosophy true Malthusians. Hesiod counselled that parents have but one son similar to the recommendations of Plato, Aristotle, Lycurgus and others. The attitude of the Greeks at this time is exemplified by the satirical epigram: "There is nothing more unfortunate than a father, unless it be another father who has more children than he."

When we compare the writings of the philosophers with those of Hippocrates and other physicians of that time we meet with a contrast that is not unlike that found between sociologists and physicians of the present day. Hippocrates in his medical practice saw much of the injury to life and health produced by efforts to produce an abortion. While on the one hand he was willing to permit and even to advise certain women as to a simple method of interrupting pregnancy, he was opposed to putting agents for this purpose into the hands of the laity.

Some contradiction is found between the Hippocratic oath according to which the use of abortifacient bougies and pessaries was denounced, and the instructions given by Hippocrates to a harp-player who desired to end her pregnancy. He advised this young lady to jump in the air, striking her heels against her hips. She followed his advice, and after the seventh (magical number) jump promptly aborted. Apparently Hippocrates considered abortion as a rather improper but necessary expedient in many cases. In the following century Aspasia gave a complete list of abortifacients, and also exact instructions as to the prevention of conception. Much stress was laid upon whether or not life had been felt. No one in Greece had any moral compunctions about committing an abortion during the first half of pregnancy.

As to the various causes of spontaneous abortion, Hippocrates in his Aphorisms cites many forms of external physical violence that may produce an abortion. Fever, vomiting and abdominal pains may bring on such an expulsion of the ovum. Excessive or too little nourishment, the ingestion of something bitter in the food may lead to an abortion. He warns against drastic purgatives and blames certain conditions of the uterus in which the opening is too large or the organ

itself too heavy and dense. Habitual abortion Hippocrates attributed to insufficient development of the uterus. Some of these factors are accepted even today as causes of abortion.

Some knowledge of pathological anatomy of early pregnancy was obtained by Hippocrates through the examination of embryos that were expelled by the public women of the city, in whom the practice of abortion was universal, owing to the necessity of maintaining their trade. Two of the embryos were preserved in the Hippocratic collection, and were described as resembling a raw egg whose outer membrane contained white and thick fibers. In the center of the jelly-like sac was something small which resembled an umbilical cord. As to the symptoms of abortion, Galen speaks of the pains and bleeding, while Hippocrates calls attention to the reduction in the size of the breasts as a sign of fetal death.

An interesting and complete monograph dealing with the subject of abortion in Greek antiquity was written by Dr. Moïssidès and published in 1922 in *Janus*. Here one can find twelve pages of various abortifacient drugs employed by the Greeks. The failure of such drugs and violent physical exercise as recommended by Hippocrates to produce results, led to the employment of various methods of instrumentation and intrauterine injections (Fig. 1). Two sorts of pessaries were mentioned, one resembling our modern suppository, which was inserted in the vagina, and the other resembling a tampon consisting of a sponge or cloth soaked in some suitable medicine with a string tied to it so that it could be removed more readily.

In the days of the Roman consuls abortion was rare, but in Imperial times it grew without restraint. No class was free from self-indulgence in this and other matters. History relates that Julia, the niece and concubine of the Emperor Domitian, having conceived as a result of her imperial love, induced an abortion, and lost her life in consequence. One of the frequent causes of abortion dating back to primitive times was the desire of the women to retain the beauty of their figures. For this reason Seneca praises his own mother as one who had never followed the customs of the day in trying to retain her shapeliness at the expense of killing her offspring, but rather as one who was proud of her fertility. To be sure, the father was alone permitted to set the indication for an abortion and if, as in the case mentioned by Cicero, a woman committed an abortion in order to get a larger share of her husband's property, she was punished by death as one who had willfully denied her lord the pleasure of parenthood.

Some indeed declaimed against the degeneracy of the times. Thus Gellius says "Dost thou believe that nature gave women breasts as graceful elevations intended to beautify the body rather than to



Fig. 1.—Greek abortion instruments.

nourish the child? The majority of these terrible women seem determined to dry out and extinguish these holy sources of human life. The same craze drives them to employ evil medicines to destroy the

offspring in their womb so that their abdomen may retain its smooth surface, unwrinkled and unchanged in form by pregnancy and labor." The dangers of criminal abortion were generally recognized, and many instances of resulting death are recorded in literature. The richer classes were particularly tainted with this vice so that Juvenal gives this advice to husbands: "Rarely does one see a woman confined upon a golden bed. Medicine and other measures bring this about. Be satisfied, unlucky one, and care not what drink it may be, hand it to the lady, for should she perchance become a mother, your son might prove dusky-skinned and a black would inherit your wealth."

The influence of the Christian disciples and of the Jewish teachers in the Talmud tended to combat the looseness of the family ties and the destruction of offspring. Lecky and Carr-Saunders have emphasized the important service of Christianity in correcting the tendency to abortion. The former says: "The practice of abortion was one to which few persons in antiquity attached any deep feeling of condemnation (p. 22). . . . The language of the Christians from the very beginning was very different. With unwavering consistency and with the strongest emphasis, they denounced the practice, not simply as inhuman, but as definitely murder. In the penitential discipline of the Church, abortion was placed in the same category as infanticide; and the stern sentence to which the guilty person was subject imprinted on the minds of the Christians, more deeply than any mere exhortations, a sense of the enormity of the crime (23, 24). . . . The moment, they taught, the fetus in the womb acquired animation it became an immortal being, destined, even if it died unborn, to be raised again in the last day, responsible for the sin of Adam, and doomed, if it perished without baptism, to be excluded forever from heaven and to be cast, as the Greeks taught, into a painless and joyless limbo, or, as the Latins taught, into the abyss of hell. . . . That which appealed so powerfully to the compassion of the early and medieval Christians, in the fate of the murdered infants, was not that they died, but that they commonly died unbaptised; and the criminality of abortion was immeasurably aggravated when it was believed to involve, not only the extinction of a transient life, but also the damnation of an immortal soul" (p. 25).

Apparently the Christian Church took over much of the morality and customs of the Jews regarding the limitation of offspring. St. Augustine leaves no question in his writings as to the classification of abortion as murder. The belief in the necessity of baptising the unborn child was an added reason for rigid denunciation of any abortifac-

cient. Yet among the powerful Church Emperors of Rome abortion was not only tolerated, but practiced almost as freely as in Pagan times.

An interesting observation comes to us from the writings of Priscianus, who toward the end of the fourth century declared: "No one has the right to prescribe any means for producing an abortion. A physician should not burden himself with this sin. Only where the uterus is diseased or where the mother is exposed for other reasons to danger through pregnancy, is an abortion permissible. . . . Just as it is sometimes of advantage to remove the dry twigs of a tree in order to save the whole tree or as a heavily laden ship may find it necessary in a storm to throw overboard some of its cargo in order to prevent a shipwreck."

The tribes from Northern Europe that overran the Roman Empire looked with disfavor on any diminution of their number through abortion. The Visigoths punished abortion by death of the responsible party. The Alamanni punished abortion before the sex was determined with a fine of 5 soldi; later if it was a male the fine was 12 soldi; if female, 24 soldi. On the other hand, the unwanted child was often gotten rid of by leaving it in the woods to starve and die.

From Arabian sources we learn that Avicenna (979-1037) in his "Canon of Medicine" advised against bathing during the first half of pregnancy, because it frequently caused an abortion. He discussed the propriety of inducing an abortion in cases of contracted pelvis. For this purpose he suggested lifting heavy objects, venesection, introduction of pieces of wood or rolls of paper into cervix, besides numerous medicines. He even devised a special instrument with a long nozzle for injecting substances into the uterus. In the following century Abulkasis, a Mohammedan physician living in Spain, denounced the tendency to criminal abortion on the part of the populace. If such an abortion should really be indicated, he advised calling in a skillful midwife for this purpose.

In the days of the Renaissance, the morality of the Church was certainly very loose; nevertheless, we find the Diet of Worms (1521) declaring murder and criminal abortion to be equally punishable. Kings were equally insistent upon severe punishment. Crucifixion was a common way of putting these women to death. In contrast to this cruel punishment of the poor, the wealthy man or woman responsible for such a deed would merely have to pay a sum of money for his absolution. During medieval times philosophers held that every fetus possessed an immortal soul, and hence an abortion was to be punished equally with murder. Only the Jesuits were inclined to hold

out against the harshness of this judgment. Pope Innocent XI in his Bull against the Jesuits accused them of inducing abortions in cases of illegitimate pregnancies.

Ethnological Aspects

Apparently there is to some degree a racial predisposition to spontaneous abortion. In some countries it appears that no amount of severe physical labor by pregnant women brings on interruptions of gestation, while in others abortions frequently result therefrom. Among the lower classes in China, women row for long periods of time upon the river, yet rarely do any of them abort. In Persia women ride long distances astride their horses without ill effects of this sort.

On the other hand, while in some Indian tribes women can apparently do heavy work without aborting, this is not true in others. We find that the women of New Zealand, parts of Australia and East India have abortions very readily. Particularly among races where it is customary to employ one form or another of massage during pregnancy do we find abortion or premature labor occurring very often. This is true of some Mexican tribes who employ a midwife to massage the abdomen from the seventh month on to bring about a favorable presentation of the child. In Java also the extremities are pulled and the abdomen squeezed in the course of massage.

In Tunis and Turkey the custom of taking very hot baths leads to an increased frequency of abortions. In Turkey we must also consider the rough management of confinements as predisposing to subsequent abortions. The wealthy women in China owing to the deformity of their feet lead a sedentary life and have but little resistance to an abortion. Hence it occurs among them very frequently in contrast to the poorer Chinese women. Countries where malaria and other tropical fevers are common show a much larger percentage of abortions than more northern countries. The most important cause of abortion among uncivilized as well as civilized races is that brought on by the individual directly or through some agent. Such artificial or criminal abortion will be taken up later on in this chapter.

Spontaneous Abortion

The ancient Roman women used to offer flowers to Juno, in her temple on the Esquiline Hill, to keep them from having a miscarriage. Most of the methods used nowadays by the uncivilized nations of the world to prevent an abortion have magic as their mainstay. Armlets of all kinds have been used for many generations. The Talmud speaks

of the eagle stone worn by pregnant women. In the Atharva-Veda of ancient India a magical incantation was spoken to the goddess Preniparni to drive away the demon, Kanva, who eats the embryo. In Borneo the natives fear a terrible little demon, KanKamiak who gets into the bodies of children still in their mother's womb. In the province of Anam (French Cochin-China) abortion is supposed to be due to the spirit Con Ranh. The form of incantation by which this evil spirit is driven away is thus described by Landes: Two dolls are made of straw, one to represent the mother, the other the child. Usually they are placed together in some natural position, such as the mother holding the child in her arms or nursing it. Then some person who will act as a medium is sought, and the priest begins to make passes and manipulations over him similar to those employed in hypnotism. The medium is supposed to be animated by the demon of the aborted children. The priest then questions the demon, demands that he cease to torment the family threatened by abortion, and asks that as a pledge for this he give his signature; that is, the mark of his fingers on a piece of paper. If the demon consents, the medium dips his hand in ink and presses it upon the paper. If he resists, he is threatened, long needles are thrust through the cheek of the medium (who is doubtless in a hypnotic trance) and almost invariably he yields at last. Then the two dolls are burnt, concluding the ceremony.

Another simpler but unscrupulous way of getting rid of the evil spirit is to take the bedding, clothes and utensils used at the time of an abortion and place them out somewhere on the highway. Here some poor woman in need will doubtless find them, and, taking them home, the evil spirit will go with them and the poor woman will be the next sufferer from abortion. The very mention of the name of the evil spirit, Con Ranh, is shunned in the presence of pregnant woman for fear that thereby he may be called to them and harm them.

In many countries women during pregnancy are given special care and even to some degree placed in isolation as taboo. In old Calabar they go to a quiet place away from noise and evil eyes until they are confined. Intercourse was absolutely prohibited at such times by some tribes, since this was known to be a factor in producing abortions.

Considerable interest attaches to the varying customs of past centuries and different nations in disposing of the products of abortion. In his excavations around Troy, Schliemann found the remains of three small human embryos placed in an urn. They were unburnt and the skeletons were complete. In view of the general custom of burning the dead in those times, the preservation of these embryos is

very interesting. Pliny says that it was not customary to burn any person until after teething. The urn in which these embryos were found is reproduced in the accompanying illustration (Fig. 2).

The Jews were accustomed to bury their abortion embryos, but, before doing so, careful examination was made to determine the sex for ritual purposes. In this way many interesting embryological and anatomical observations were made in past centuries. Among these should be mentioned the abortion ovum, from the third month of pregnancy, depicted by Ulysses Aldrovandi of Bologna (Fig. 3).

In the Murray Islands north of Australia it is customary to dry the aborted embryo, and hang it in the wind. Occasionally its body is painted. In Siam it was thought that evil magic might be done with



Fig. 2.—Urn used for preserving embryos found in excavations around Troy. (Ploss-Bartels.)

such an embryo, hence it was taken to a priest, who put it in a pot and carried it to the river into which it was thrown, after suitable incantation. This superstition of magic wrought by embryos we also find in European countries. Hungarians and Rumanians in the region of Siebenbuergens cut off the little finger of the left hand of the embryo and put it in the foundation of a new building to ward off lightning. Whoever cuts it off can see in the dark and he himself is made invisible. Hungarian gypsies used the blood of such embryos together with the sexual organs of a male and female dog, to make a salve. This salve, it was claimed, would if rubbed on their hands, make them successful in their robberies. If the gypsy wished to steal a horse, he rubbed the salve on the inner side of his thighs before mounting the animal.

Induced Abortion

In discussing the history of abortion it was shown that the practice of interrupting pregnancy dates back to the earliest times. It is equally true that the practice is to be found in every corner of the globe at the present time. Almost no tribe is so primitive as not to know some means of bringing on abortions.



Fig. 3.—Abortion ovum of three months' pregnancy, depicted by Ulysses Aldrovandi of Bologna. (Ploss-Bartels.)

Starting with the savage races on this side of the Atlantic we find in Paraguay that certain tribes have almost died out as a result of systematic abortions. Guaycuru women for generations refused to bear children until over thirty years of age, so that only four persons were left of this tribe early in the nineteenth century. Among the Mayas it was the custom to make the naked pregnant woman lie down

upon her back, and then have two old women beat upon her abdomen until blood began to flow from the vagina. Many lost their lives as a result of such procedure.

Along the Orinoco River, tribes have been greatly reduced in number, owing to the frequent use of abortifacient herbs. The Jesuit priest, Gili, who lived among these people for fifteen years, related that the women determined the number and time of their pregnancies in accordance with one of two systems. One set of women, the majority, believe that it is better to remain young and beautiful by postponing pregnancies until late in life. The others, on the contrary, think it best to become a mother as early as possible, since this added to health and happiness. Humboldt, on his visit to this country, describing these conditions, remarked that the ecboic drugs employed by the natives apparently were effective and did but little harm. He hoped that Europeans would not learn to employ them.

North American Indians do not have large families, but in some tribes, the Chippewas for instance, there is a strong feeling against abortion. The Dakotas, according to Schoolcraft, employed various herbs as ecboics that often resulted in the mother's death. One Crow Indian squaw at the age of forty-five had committed 33 abortions. In some districts the practice seems to be based largely on economic conditions. It seems questionable, however, if the small number of children among the Indians is not due more to natural abortion and to a high infant mortality rate than to induced or artificial abortions. Engelman claimed that the interruption of pregnancy among Indians was due to bad influence of the invading Caucasians. In the days of Columbus, however, Las Casas already found the Indians on the Island of Cuba using herbs as abortifacients.

Among the negro tribes in Africa many travelers found evidence of criminal practice. This was due, among the Abyssinians, to the law compelling fathers to kill their unmarried daughters, should the fact become known that they were pregnant. In Algeria we still find booths in the public squares where Jewesses sell abortifacient drugs and instruments. The dying out of the Hottentots seems to be largely due to the practice of criminal abortion. The Wabunis in East Africa did away with pregnancy in order not to interfere with their wanderings from one district to another. Among the Hereros abortion was effected usually by external means such as blows with fists and stones. Among the Senegalese, abortion was brought on by herbs, by mechanical means and by wild dances in which the extreme rotation of the pelvis and abdomen played an important rôle.

Coming to Asia we find the Turks employing abortion upon the slightest pretext. Practically no illegitimate children are to be found among them since unmarried women do not hesitate to resort to abortion when they become pregnant. Up to the fifth month, according to the Mohammedan religion, life does not exist in the fetus, and abortion is permitted by law. Midwives are employed for this purpose. In Mecca it is said midwives do not hesitate to interrupt a gestation at any stage of development. Stronger women are required to perform repeated somersaults. Women of more delicate constitution are given a combination of herbs, the exact proportions of which vary with different midwives and are kept secret.

In India the natives vary greatly in their attitude toward abortion. The low caste Hindoos often resort to it, but among the better classes abortion is looked at askance. The frequency of child marriages leads to early widowhood in many instances. Not a small number of these widows are compelled to take up prostitution as a means of earning a living, and these of course resort to abortion on every necessary occasion to conceal their irregular practices.

The Ceylonese are said at one time to have resorted to abortion on the occasion of any pregnancy occurring earlier than the thirty-sixth year of their life. According to De Moriez a similar custom exists among the natives of the Island of Formosa. The Chinese on the other hand are not addicted to abortion, and hence have a goodly number of full-term pregnancies, but because of their high death rate have a nearly stationary population. Among the islands of the Pacific and the Indian Oceans there are no such compunctions against interfering with pregnancy. The Japanese concubines of foreigners prevent the birth of offspring by whatever means seem necessary. A favorite method of abortion among them is the introduction of a wooden stick into the uterus similar to that employed by natives of the Hawaiian Islands (Fig. 4). In Burton's "Anatomy of Melancholy" (1621) we find a reference pointing to conditions in the Orient at this time: "In Japonia 'tis a common thing to stifle their children if they be poor, or to make an abort."

Among the women of New Caledonia a safer but less effective method is used. Stewed green bananas served hot are supplied the pregnant women, who are said to abort as a result of this concoction. On the Island of Formosa the abortions done upon all women up to 35 years were brought about by nuns who belabored the abdomen of such women with their feet. Among the Sandwich Islands a conjurer effected rupture of the membranes with resulting abortion

by means of a bamboo stick. Andrew found many childless families on these islands as a result of these abortions, the exact number being 23 out of 96, or 25 per cent.

In many instances civilization has led to the substitution of criminal abortion for infanticide. The Viti Islanders consider it a disgrace to have too many children, and, in order not to be ridiculed, often resort to an abortion. In Malacca, women who resorted to abortion could be severely punished. If caught, they were severely lashed and if they happened to die as a result of this beating, the husband was exonerated. In view of the custom among the primitive men of



Fig. 4.—Hawaiian abortion stick with godhead carved in one end. (Ploss-Bartels.)

Borneo to shelve any concubine after the arrival of her second child, the women resorted to abortion very often to retain favor with their husbands.

Among the more civilized races of men in modern times the practice of induced abortion is widespread. The teachings of the Catholic Church have doubtless had some effect in reducing the number in those countries where this faith predominates, but this reduction has been relatively slight, so that throughout the past fifty years there has been a steadily rising frequency of abortion throughout the civilized world. Detailed figures concerning this increase will be given in Chapter XXIII on Statistics. Economic and social factors have been largely responsible for the growing prevalence of abortions. The most important of these factors are:

(1) Increasing secularization of thought, increasing hedonism and pleasure philosophy of life, urbanization and the frantic desire to raise the economic standard of life by limiting offspring by any means, however desperate.

(2) Cultural lag: the resistance to change, responsible for the slowness in diffusing reliable scientific contraceptive knowledge.

From this brief review of the history and ethnology of abortion we can appreciate what a dominant factor has been the practice of abortion in the life and happiness of the human race. Many have tried to lay down formulae for the limitation of offspring, but have failed to recognize the inherent physical dangers and possible moral deterioration associated with measures that give unbridled rein to the interruption of pregnancy. On the other hand, we have ample evidence that where economic necessities in the form of the mother's occupation, the lack of proper nourishment, the constant wandering of a nomad life, have made it impracticable to carry through another pregnancy, or when false ideals of beauty have been prevalent, human beings have not hesitated to produce abortions.

In the last analysis, religion has helped to bring about an abatement of the unbridled practice of abortion rather through its efforts to hold high the ideals of maternity and the love of children than by its strict denunciation of those who, under special circumstances, seek abortion as a means of preserving the honor and health of the family. In the same way the State has gained but little by its strict efforts to punish abortion, particularly since the rich and powerful escaped scot-free while the poor were crucified. It is difficult to find positive evidence that the practice of abortion in the past centuries has led to a serious deterioration of the race, in spite of the many statements to that effect in books of history. Nor, many statements to the contrary notwithstanding, is there irrefragable evidence that any ancient civilizations "fell"—was their heritage not handed on to us?—because of frequency of resort to abortion. Such views are often the result of wishful thinking; they are too frequently an attempt to bolster up preconceived theological opinions by the use of limited and false interpretations of history.

CHAPTER III

ABORTION IN ANIMALS*

BY WALTER LONG WILLIAMS

IT IS DIFFICULT to define abortion in domestic animals in a wholly acceptable manner. Courts have held that an animal known to have in its organs *Bacillus abortus* (Bang) has a dangerous contagious disease, but the decision rests upon the presence of the bacillus, not upon the occurrence of abortion.

Herbivorous domestic animals are adeciduate. When an ovum dies in early gestation it lies free within the uterine cavity. In uniparae it may be resorbed or expelled unseen; in multiparae it is usually resorbed or undergoes papyraceous desiccation. It is only rarely that the expulsion of an equine or bovine fetus of one or a few centimeters in length is observed, because when the sac containing the fetus has appeared at the vulva, it is but a few minutes until its expulsion has been completed and the ovum has disappeared. There is no retention of the placenta, no hemorrhage, or other clinical evidence of disease. The failure is first recognized by the occurrence of estrus, and the phenomenon is designated sterility.

Apparently borrowing from human medicine, veterinarians sometimes include in their definition of abortion the expulsion of a living fetus not sufficiently mature to survive. I have not observed such a phenomenon. It may occur in multiparae when the death of some of the young occasions the expulsion of all, including living individuals, but the rule is that the dead fetuses are retained until all have died or some have matured, and all are expelled together. Non-viable young are common in all species, but their non-viability is dependent upon mortal disease of intrauterine origin. There is no uniformly accepted line of demarcation between physiologic and pathologic duration of gestation, especially in horses and cattle. The ideal duration of bovine gestation is usually placed at 275 to 285 days. Passing beyond these limits in either direction, the ratio of dead to living fetuses expelled increases and the viability, vigor and value of the living young decrease. Abbreviated gestation is very common, and prolonged pregnancy infrequent. The ideal duration of gestation of the mare is fixed by von Oettingen¹⁶ at 315 to 320 days with living foals born

*For references, see end of chapter.

at 300 to over 365 days. Abbreviated gestation, with 2 living foals, is quite rare, while prolonged gestation is very common, and the greater the prolongation, the higher the ratio of dead fetuses or non-viable living foals. Any effort to distinguish between abortion and stillbirth is without practical importance. The earlier a dead or mortally diseased fetus is expelled, the better for the subsequent sexual health of the female.

An acceptable definition of abortion is further complicated by the variation in parity. Domestic animals include the definitely uniparous mare and cow; the equally multiparous swine and carnivora; and the goat and ewe, somewhat suggestive of biparity. The ovaries of the pregnant sow commonly have more corpora lutea than there are fetuses in the uterus, and there are often present dead embryos in varying states of development, disseminated among living ova.

Under the conditions, abortion, as used in this chapter, will signify *the observed expulsion of a dead fetus, or fetuses, promptly following its, or their, death*. Under this definition, abortion is preeminently a phenomenon of uniparae. Once a uniparous fetus has died, abortion is the safest route toward the recovery of the affected female. The dead uniparous fetus is not always aborted. It may undergo maceration with great peril to the life of the mother, or if she survive, her breeding life is almost certainly closed. In the cow, but in no other domestic animals, a vast interplacental hemorrhage not infrequently occurs, completely enveloping the fetal sac in an immense blood coagulum. The mass does not undergo putrid decomposition; the blood serum, the fetal fluids, and the fluids of the fetal body are re-sorbed and a specific type of mummy remains indefinitely. There also occurs, so far as known, only in the cow, what I have described¹⁹ as a static fetal cadaver, in which the fetus dies and remains inert in the uterus for an indefinite period, without putrefaction or desiccation. Each of these is far more destructive to breeding life than abortion.

In sharp contrast, there is often observed in the sow one or several fetal cadavers which are retained and undergo a non-toxic and non-irritant papyraceous mummification, with retention of the cadavers until term, when they are expelled along with several or many viable young, thus conserving reproduction. Papyraceous mummification is also observed, though rarely, in twin pregnancy of uniparae, in cases where the chorionic sacs of the twins do not fuse. Hence, abortion, once the fetus has died, becomes a conservative process in uniparae, and a destructive phenomenon in multiparae.

The Basic Causes of Abortion

Artificial abortion is readily induced in the cow by means of the dislodgment of the corpus luteum by digital compression per rectum, the expulsion of the fetus following in two to three days; or it may be brought about by removal of the ovary. The corpus luteum of pregnancy of the cow persists, physiologically, for a considerable period postpartum, while in the mare, atrophy of the corpus luteum occurs at mid-term. If the ovary of the mare is removed during the first half of gestation, abortion regularly follows, while if removed during the second half, the pregnancy may continue. Apparently the abortion in the cow is associated with the abruptness of the removal of the corpus luteum. Pathologically, apparently as a result of cystic degeneration, the corpus luteum may be destroyed; estrus and coitus follow, but abortion does not usually occur, perhaps because of the gradual atrophy. Aside from such artificially induced abortions there are many fundamental factors which, according to clinical observations, underlie the act, regardless of the nature of the immediate exciting cause. Some of these merit definite consideration.

(1) Abortion Due to an Imperfect Ovum.—There is interesting evidence indicating that an ovum may be fertilizable although so imperfect or immature that it is incapable of independent embryological development. I have elsewhere presented evidence²⁰ which seems to indicate that the sexless free-martin of cattle is the progeny of an imperfect (immature) ovum, incapable of independent embryological development, but able to complete asexual fetal maturity as a parasite upon a sex-potent twin, owing to fusion of the allantois-chorions and the establishment of a communal circulation. Nature apparently abhors sexless progeny in mammals, and unless a communal blood supply can be established with a physiological ovum, sexless, and anidian ova perish. Bovine twins usually have a clinical history of genital disease prior to the twin ovulation; most notably the twin ovulation follows nymphomania, an ovarian disease characterized by cystic degeneration of ovisacs, commonly involving two or more ovisacs simultaneously or in rapid succession. As the cow approaches health, before ovarian stability has been fully established, she may discharge two ova in one estrus, one of which is immature but fertilizable. The chorions of ruminant twins regularly fuse, producing a common chorion. In the cow, not in the ewe and goat, the twins commonly have a communal circulation. In contrast, in the multiparous sow, fusion of the allantois-chorions of adjacent ova rarely, if ever, occurs, and free-martins and anidian monsters are well-nigh unknown.

(2) **Abortion Due to Imperfect Spermatozoa.**—As early as 1923 I submitted clinical evidence²¹ that the male not infrequently begets pregnancies which are destined to be aborted owing to some basic defect in the semen. Later, W. W. Williams and A. Savage^{15, 24} showed that such abortions were associated with a prevalence of definite morphological defects in the spermatozoa. Recently Lagerlöf¹⁰ (Fig. 5) has carried the investigation one important step further and shown that the pathologic character of the spermatozoa is basic and referable to pathological changes in the epithelium of the seminiferous tubules. Although the workers in the field are few, the evidence seems conclusive that the male, through morphologically defective spermatozoa, is frequently responsible for abortion (Fig. 6).

(3) **Twin Abortion.**—Identical twins are not positively known to occur in domestic mammals. Twin pregnancy in the mare is almost always terminated by abortion. Data submitted by Errington and myself⁷ indicate that twin pregnancy in the mare generally has a clinical background of pathological ovulation. When twin pregnancy becomes established, there is a grossly defective power of placental adjustment. The physiological single ovum, through its allantois-chorion, contacts the entire endometrium. So far as known, equine twins are always bicornual. The ovum regularly becomes located near the base of the cornu. In twins, the two ova apparently grow unequally, the more vigorous of the two projecting into the uterine body and occupying its lumen before the lesser has emerged from the base of the horn in which it is located. The lesser ovum, upon its emergence from the cornu, abuts against the greater one, pushes the body allantois-chorion of the greater fetus before it and becomes invaginated within the greater sac. The lesser ovum is thus deprived of any contact with the endometrium of the uterine body, is denied adequate nutrition and perishes. It may undergo some degree of papyraceous mummification, but the other ovum soon perishes also and the two are aborted, grossly unequal in size.

Bovine twins generally have a pathologic background. About 75 per cent are bicornual and 25 per cent unicornual. In almost all cases the two or more chorions fuse and have a communal allantoic circulation; the twins enjoy parallel nutrition, their growth is equal and when one dies, the other also perishes. In rare exceptions the chorions may remain distinct, one fetus may die and become papyraceous. In sheep twins and triplets the chorions fuse, as a rule, but the allantoic circulations remain distinct. Consequently the twins may vary in size. They are far more frequently aborted than are singles and

limited data indicate that a majority of triplets are aborted (Fig. 7). One twin or triplet is frequently born non-viable, in which case, as a rule, it is the smaller lamb, which had access to the restricted placental area.

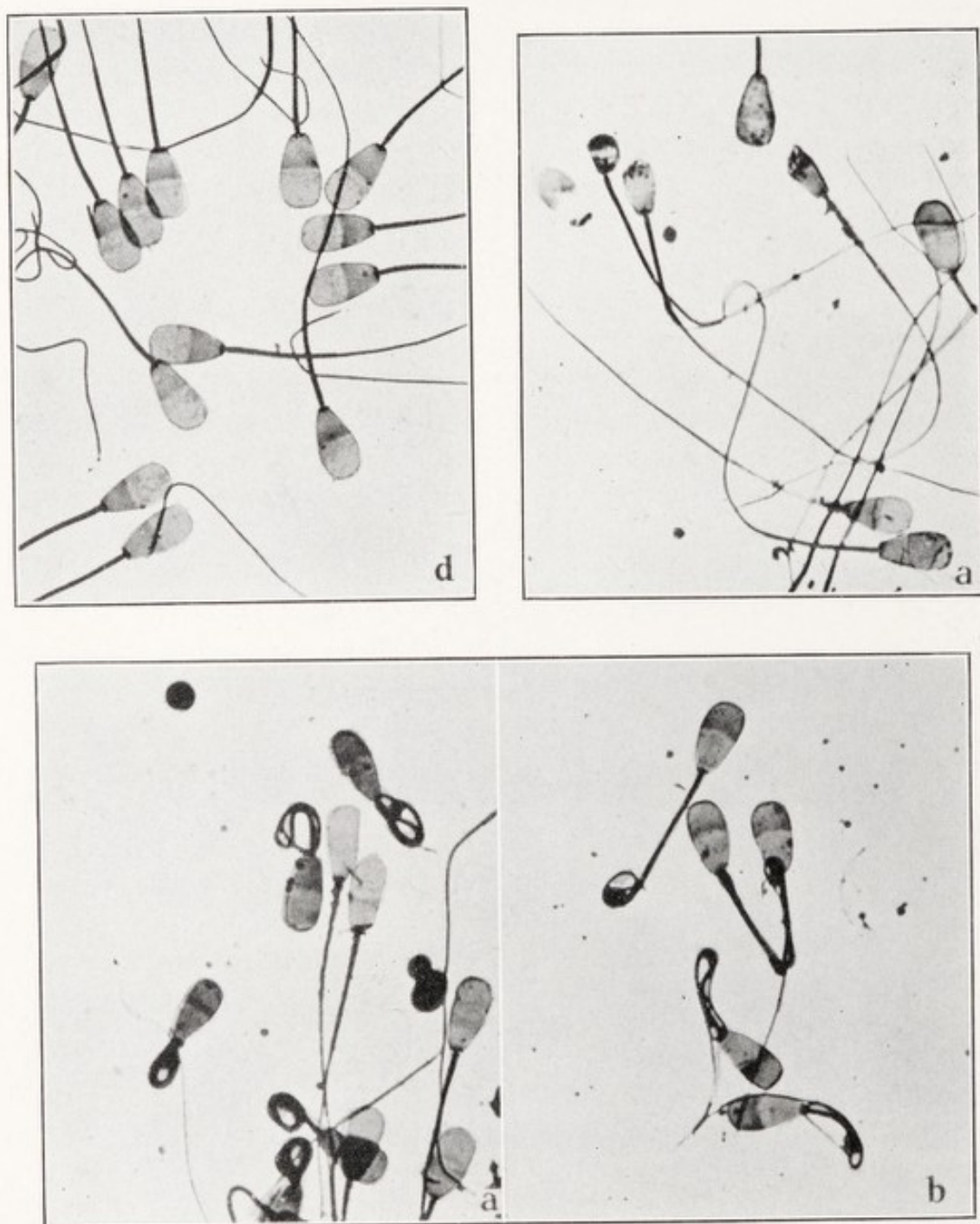


Fig. 5.—Spermatozoa from genitally sound and diseased bulls. *d*, Spermatozoa from a highly fertile bull. *A* (upper right) sperm from a bull of low fertility; *a* and *b*, sperm from sterile bull.

Note variations in the morphology of the head and protoplasmic drops on the neck, considered as evidence of unripe, or premature sperms in *a* (right). In the sterile bull the tails of the spermatozoa form a dense coil. (Lagerlöf: *Acta Path. Scand.*, XIX, 1934.)

Veterinary writers have ascribed twin abortion to overdistention of the uterus, apparently upon the hypothesis that through overdistention the walls contract and expel the uterine contents. Clinically this is untrue; in dropsy of the amnion and allantois, common in dairy cows, with 100 liters or more of fluid, abortion does not occur, birth is impossible and obstetric relief is usually not satisfactory. Viewed clinically, twin abortion is referable to pathologic ovulation, placental maladjustment and inadequate nutrition.

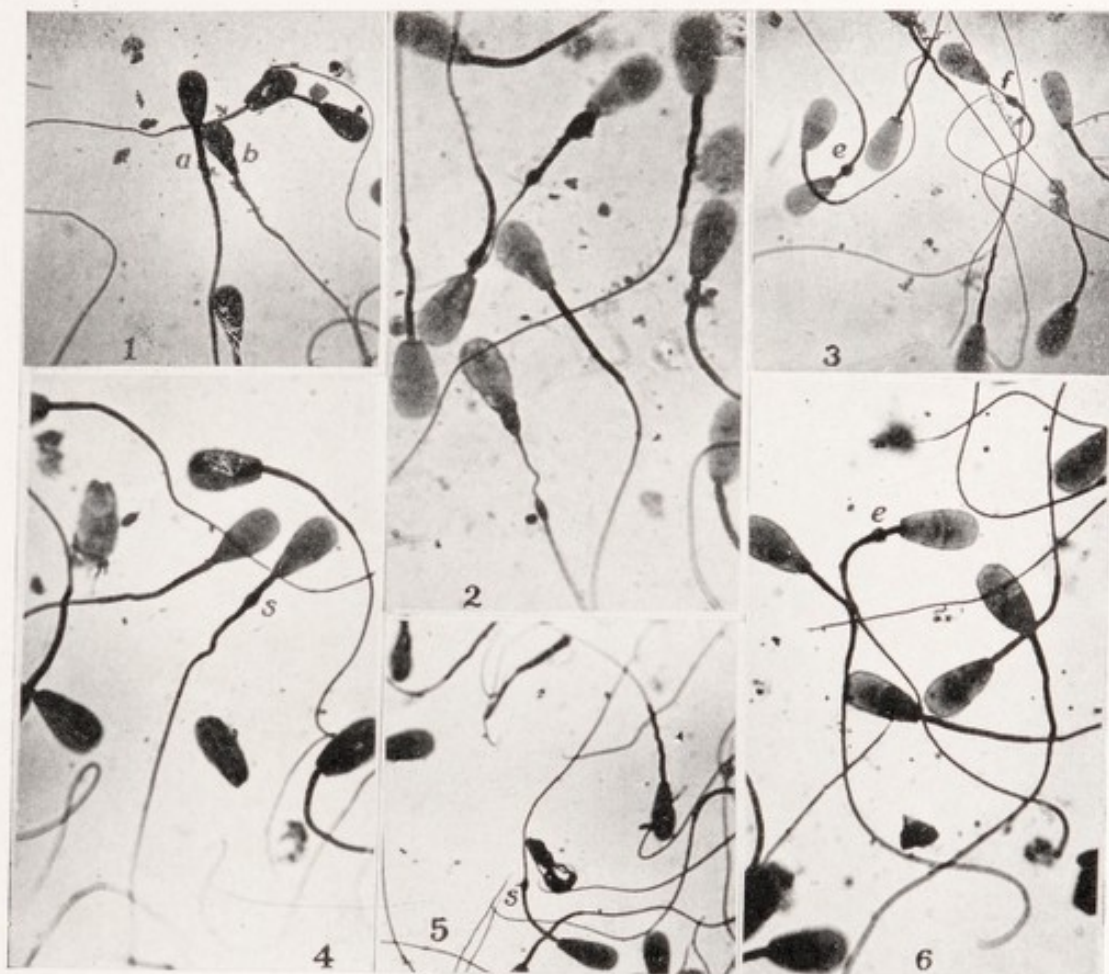


Fig. 6.—Spermatozoa from an 18 months old bull, with hypoplasia of genital organs. He had been used for 6 months upon about 20 cows, all of which had either failed of recognized conception, or had aborted.

1. *a*, thickened middle-piece; *b*, head with narrow nucleus. 2. Enlarged, fused anterior and posterior end knobs and end ring. Filiform middle-piece. 3. *f*, filiform middle-piece with spheroid swelling at middle of middle-piece; *e*, eosinophilic body surrounding anterior end of middle-piece. 4. *s*, spheroid swelling at middle of middle-piece, within the sheath. 5. *s*, spheroid swelling of end ring. 6. *e*, acidophile body attached to middle of middle-piece. (Williams and Savage: Cornell Veterinarian, 1925.)

(4) **Hypoplasia of the Reproductive System.**—Not rarely there may occur, almost wholly in dairy heifers, cases of genital hypoplasia or juvenile genital organs. These animals are slow to conceive, largely abort, and those which go to term suffer severely from dystocia, usu-

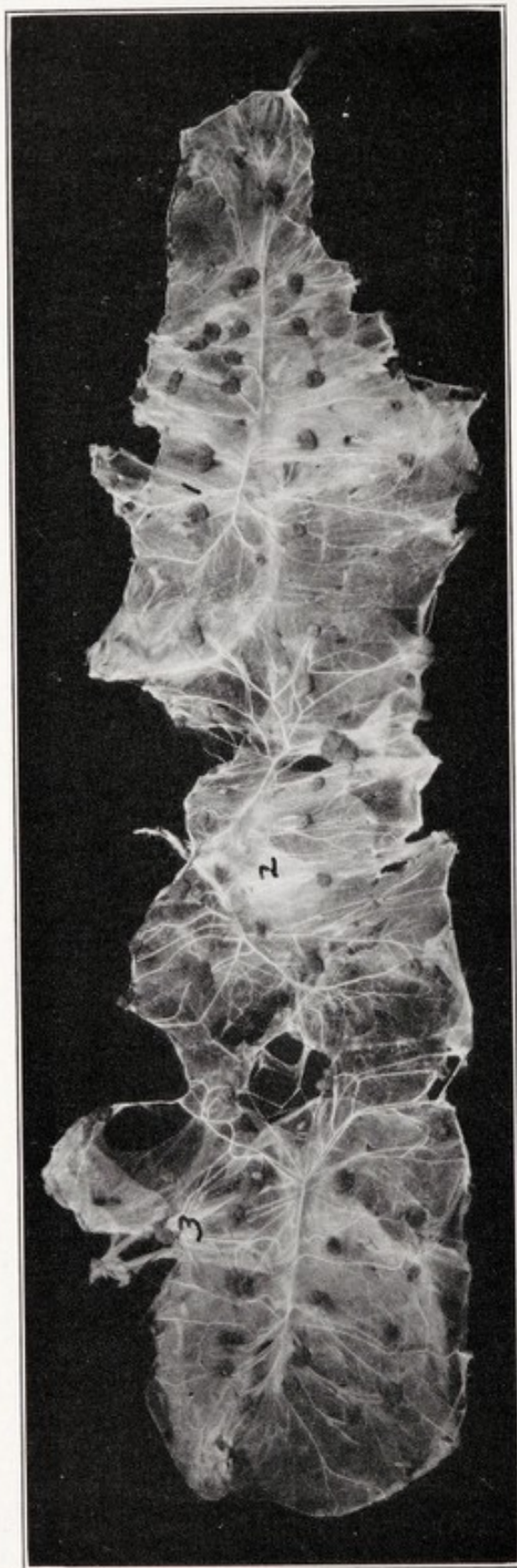


Fig. 7.—Fused chorions of ovine triplets, illustrating the influence of available placental area upon the well-being of the fetus. 1, Chorion of 5.8 lb. lamb; 2, chorion of 3.3 lb., non-viable lamb; 3, chorion of 7.0 lb. lamb. The allantoic circulation of each fetus is separate, the blood vessels not crossing the fusion line. The size and vigor of the young is parallel to the placental area available to each, causing death of the smallest fetus through inanition. (Cornell Veterinarian, XXIX, 1934.)

ally associated with stillbirth, retained afterbirth and other pathologic phenomena. Solitary cases afford no evident solution of the phenomena. In a large herd elsewhere described²² I have reliably shown that the hypoplasia is due to malnutrition of the calf during the milk-feeding period, and that the cause lies in the method of the artificial feeding of dairy calves. Several hundred calves were involved, accurate data are available for 14 years, and the genital hypoplasia, difficult conception, abortion, dystocia, etc., have been brought under satisfactory control chiefly through modifications in the volume of milk and the method of feeding and handling. While the genital hypoplasia was more evident at first in the females, when an opportunity came to compare the fertility of the males grown under the original and the modified plan, it became clinically clear that the sexual development was also repressed in the bull calves.

The evidence in these observations indicates that during the first six months of the life of the calves, while being fed on milk, the malnutrition compelled precedence to be given to the maintenance of physical life, and the maturation of the reproductive system was held in abeyance. At about the end of the milk-feeding period the heifers commenced to ovulate and spermatogenesis became established in the bulls; the period for the proper development of the reproductive system had expired, and the hypoplasia became permanently fixed.

(5) Abortion from the Breeding of Immature Animals.—The keen desire of dairymen for early profits has led to the custom of breeding dairy heifers when fourteen to sixteen months of age, at which time they have attained but one-third to one-half their adult size, in order that they may calve at two years of age. The ratio of abortion in dairy cattle is about four or five times as great as in beef cattle under normal conditions. In dairy cattle the abortion rate is far greater in primiparae, reaching 25 to 50 per cent of the total abortions in most herds. While the abortion rate in primiparae may range between 25 and 75 per cent or higher, the rate for pluriparae in the same herd drops to perhaps 5 to 10 per cent. No clear line of demarcation can be readily drawn between abortions in dairy primiparae due to genital hypoplasia and those referable to breeding while yet immature. The problem is best approached indirectly. McCampbell¹³ in an experiment with 80 beef heifers, bred 40 to calve at 2, and 40 to calve at 3 years. The presence of juvenile genital organs was apparently excluded. The abortion rate was not stated. Later, the superintendent of the experiment station stated in a personal communication "We had a great number of abortions among these heifers (i.e., the group bred to calve at 2 years) and the calves which they did produce were

undersized and the heifers did not produce sufficient milk to take care of them properly. . . . The heifers never did grow out to their full size and during the last few years we have been culling out all of these heifers from the herd."

A client permitted a colt, supposedly too young to copulate, to consort with a group of yearling draft fillies, practically all of which became pregnant and subsequently aborted. Clinical data, so far as available, distinctly indicate that immature animals abort at a far higher rate than those that do not start to breed until of adult stature. Those bred too early largely fail to breed again, their average reproductive life is abbreviated, and their progeny are small and weak.

(6) Coitus During Pregnancy as a Cause of Abortion.—Sexually healthy domestic mammals do not copulate while pregnant. Males that regularly consort with pregnant females make no sexual advances. Some pregnant uniparae develop estrus and copulate. In at least some cases, probably all, the estrus is due to pathologic atrophy of the corpus luteum of pregnancy, owing, it is suspected, to cystic degeneration. In cases observed in the cow the new ovum matures in the opposite ovary to that from which the pregnancy was derived. Apparently the coitus does little or no harm. In rare cases abortion follows closely upon the coitus, but so far as may be determined the estrus and coitus are subsequent to fetal death and the uterine contractions associated with estrus cause the expulsion of the fetal cadaver.

(7) Abortion Due to Excessive Coitus.—In the mating of the most highly valued domestic animals, hand breeding prevails, and usually but one, sometimes two, copulations are allowed during a given estrus. When highly fertile mares and cows are mated with equally fertile males, conception occurs with a single service, thus limiting coitus to once a year. In pasture breeding, where the male consorts freely with his harem of females, coitus ordinarily occurs a number of times during the estrual period, which in the cow continues for 12 to 24 hours and in the mare for several days.

Excessive coitus in domestic animals is restricted to the male, except in rare cases of genital disease, such as nymphomania. Economic considerations dictate that a valuable sire should serve the maximum number of females consistent with the maintenance of reproductive power. The reproductive strength of a sire cannot be definitely computed in advance, but there exist certain standards by which a reasonable estimate may be made. A very common, and highly dangerous basis of computation is the hypothesis that a stated male is competent to serve successfully as many females as some

famous sire of history. Thus some highly influential authorities advise that an adult bull may serve successfully 100 cows. In the present state of health of dairy cattle, a bull makes usually 2 or 3 copulations per conception, which means, with a harem of 100 cows, 200 to 300 copulations per annum, a sexual load rarely, if ever, carried safely.

So far as known, the most common and inescapable effect of excessive coitus is a decrease in the number, motility and morphologic soundness of the spermatozoa, factors which not only decrease the ratio of pregnancies, but place in peril those conceptions which occur. Clinicians conversant with large dairy herds, such as that described by Lothe,¹¹ where two or more bulls are used, are quite familiar with examples in which a large percentage of the pregnancies by one bull are aborted while those of another sire, mated with the same quality of cows, are conspicuously safe. So far as researches have progressed, with the one exception of trichomonas infection (to be discussed later), the comparative abortion rate of two bulls in one herd, runs approximately parallel with the ratio of morphologically imperfect spermatozoa in the semen of each.

(8) Abortion Caused by Too Early Postpartum Conception.—The corpus luteum of the mare atrophies at mid-term and she is regularly in estrus at 7 to 10 days postpartum. According to tradition, this is the most favorable time for re-breeding. In concentrated horse-breeding districts, where reproduction is pushed to the limit, both sexes grossly overloaded and the basic laws of sex hygiene flouted, endometritis commonly follows foaling; the disease fulminates during the first estrus, there is a profuse mucopurulent genital discharge, and the nursing foal often suffers from acute diarrhea. According to the limited data available, mares which recognizably become pregnant from breeding at this period, abort three or four times as frequently as those which do not conceive but become pregnant at a later estrual period, despite the obvious fact that the former group are healthier than the latter.

The corpus luteum of pregnancy of the cow does not atrophy until after calving and she is not usually in estrus until 20 to 40 days postpartum. Here, also, adequate data are wanting. My personal observations indicate emphatically that the same principles apply as in the mare and that early postpartum conception, before the reproductive system has completed its involution and stabilization, is fraught with increased danger of abortion. I have elsewhere pointed out²⁰ that when a cow conceives during a very early estrus after calving, there is a well-defined tendency toward twin ovulation, with increased danger of abortion.

(9) **Starvation. Malnutrition.**—When a large area suffers severely from drought, when the grown crops are destroyed, or when adverse weather causes widespread deterioration of the crops, and an adequate food supply cannot be imported, abortion becomes highly prevalent. In the United States of America, probably the most illuminating examples are to be found in the great grazing areas of the Rocky Mountain region, where the rainfall is scant and erratic, with now and then a long-continued drought. The cattlemen compute the capacity of their range upon the basis of an average rainfall, and when that drops far below normal, famine results and with it comes pestilence. Abortion then becomes disastrous in beef cattle, which as a rule suffer far less than dairy cows.

It has been experimentally shown, and is not disputed by clinical observation, that when a food ration, ample in other respects, is deficient in certain mineral constituents, or in vitamins, reproduction is profoundly disturbed, with frequent abortions. In early veterinary literature, great outbreaks of abortion in a country were referred to food contaminated with *secale cornutum*. In modern times, experiments indicate that ergot possesses very limited, if any, power to cause a domestic animal to abort. Their forage is usually polluted in some measure by ergot or similar fungi. However, ergot is most abundant in seasons of adverse weather associated with general deterioration of food and an inevitable lowering of the inherent power of resistance in the pregnant animal. Therefore, while dismissing *secale cornutum* as an important direct cause of abortion, its influence as an abortifacient must be accepted.

The Immediate or Exciting Causes of Abortion

In 1924, Williams, Udall, Frost, *et al.*²³ after an extensive study of clinical material, held that abortion in cattle and horses, except when precipitated by the removal of the corpus luteum, is uniformly associated with important utero-fetal lesions. It is not known, nor believed, that any one of the above discussed factors, alone or in combination, can produce any of the lesions described. From the clinical viewpoint the lesions need be ascribed to the destructive action of bacteria, protozoa or filter-passers. This conclusion, however, does not detract in the least from the importance of the factors above described as the basic causes of abortion. They so undermine the strength of the animal and lower its intrinsic resistance, that pathogenic organisms, some type of which seem omnipresent, may destructively attack the reproductive system.

Until within recent years, much stress was laid upon accidental abortion, involving an endless catalog of mechanical injuries, strains, falls, fright, etc. These are rarely mentioned now in veterinary literature. In the studies of Williams *et al.*, cited above, no lesions were found which might by any stretch of the imagination, be credited to

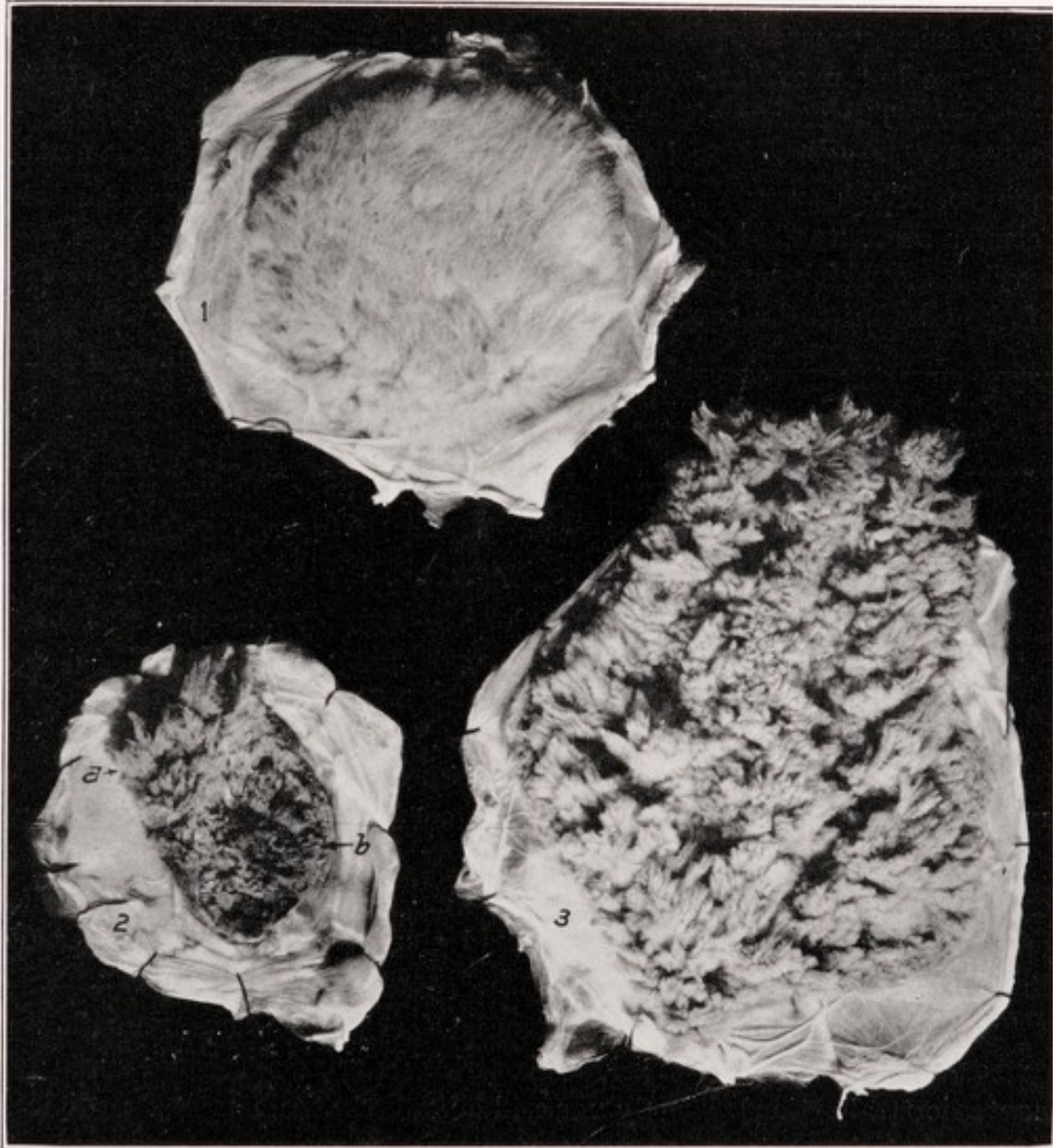


Fig. 8.—Fetal cotyledons from healthy and diseased cows. 1, A typically healthy cotyledon with closely packed, very fine chorionic tufts or villi, indicating that the corresponding uterine caruncle was ideally healthy; 2, dwarfed cotyledon from a diseased cow. Almost all the villi have been destroyed by necrosis. A few coarse tufts remain at *a*, while at *b* the necrosis is complete; 3, a gigantic cotyledon from the same cow as 2, showing very coarse clumpy tufts with extensive naked areas. The uterine caruncle had suffered epithelial damage in a prior gestation, rendering healthy placentation, as in 1, impossible. (Cornell Veterinarian, XIX, 1929.)

physical injury, nor has any veterinary writer, so far as known, described an abortion associated with lesions attributable to physical injury. It is not to be inferred, however, that these accidents do not

lower the intrinsic resistance of the animal and enable other forces to destroy the life of the fetus and cause the expulsion of the cadaver.

The lesions associated with abortion are of infinite variety, largely referable to chronic inflammatory processes. The addeciduous placentae of domestic herbivora afford a highly favorable opportunity for accurate clinical study. Not only does the placental surface of the chorion, unmasked by decidua, reveal clearly all lesions of that structure but provides a detailed replica of the lesions of the endometrium. The uterus of the cow contains about 140 caruncles or specialized placental areas already permanently fixed in the very small embryo. Each caruncle, with its cotyledonous growths of gestation, forms a separate field for detailed study. There occur necroses of the cotyledons, which in succeeding pregnancies cause the placental tufts of the chorion to be coarse and clumpy (Figs. 8 and 9). Sometimes



Fig. 9.—Magnified villi from 1 (left) and 3, of preceding figure. (Cornell Veterinarian, XIX, 1929.)

calcification of the placental tissue occurs; in other instances the entire caruncle undergoes necrosis and sloughs away at the base of its pedicle, leaving behind, when it heals, a permanent cicatrix.

The inter-caruncular endometrium is frequently covered with an extremely adhesive, yellowish or brownish exudate (the exudate of contagious abortion) largely massed about the caruncular pedicles. Areas of calcification are common. Associated usually with the necrotic destruction of the caruncles, the inter-caruncular endometrium frequently shows frail adventitious placental new formations which serve in a measure as substitutes for the specialized areas upon the summits of the caruncles.

The chorion is frequently edematous, indurated or calcified. In cattle and sheep the abort usually suffers from fetal diarrhea prior to its death and expulsion. Fetal diarrhea is extremely common in pregnant dairy cows discarded for slaughter. The diarrhea runs ap-

proximately parallel with the extent of the utero-chorionic lesions, and appears at any time after mid-term. Occasionally calves are born, thickly smeared over with diarrheic meconium. Such calves are rarely viable.

Here arise two antagonistic hypotheses. One group contends that the bacteria most frequently associated with abortion, such as *Bacillus abortus*, possess such exalted powers of invasion that they readily overleap any barrier which a healthy animal may erect, and cause dangerous contagious diseases demanding for their control, artificial immunization, quarantine or slaughter of the affected animals. The other group believes that abortion in domestic animals is primarily due to an abnormally low intrinsic power of resistance, caused by one, or several of the basic factors already discussed, which serve to open the way for destructive invasion by bacteria not ordinarily competent to induce abortion in a definitely healthy individual.

The first group, e.g. Fitch and Bishop⁸ insist that the healthy uterus is essentially always bacteria-free, while the second group, e.g. Beller³ and Wagner¹⁷ contend that it may contain an infinite variety of organisms, few in number and destitute of pathogenic power in a clinically healthy animal.

The conflict is perhaps one of definition rather than of fact. Numerous clinicians regard a dairy cow as healthy when year after year she conceives promptly, does not abort, calves at term and milks faultlessly, but according to the first group, should the cow have in her uterus at calving time a few Bang's bacilli, she would be classed as diseased. Some of the first believe that the findings of the second group are due to faulty technic and in support of their contention plead guilty to faulty technic themselves. When Fitch and Bishop find swarms of *B. abortus* in an aborting cow their technic is above question, but when they recover a few bacteria, without high repute as abortion-producers, these are attributed to contaminations through faulty technic. White, Johnson, Rettger and McAlpine¹⁸ record that a certain Ayrshire cow in the Connecticut Experimental Station herd, carrying abortion bacilli, bred ideally, calved physiologically and stood first in the herd for milk production. Clinically she was the healthiest cow in the herd while legally she was infected with a highly dangerous contagious disease.

Reproduction is a *luxus* function and constitutes a burden beyond the physical needs of the parent. From the union of two microscopic cells there is hurriedly created a new individual, complete in organization and ready to assume an independent existence at birth. The fetal membranes, which constitute the contact system between the

fetus and mother, are very hastily constructed and are later abruptly discarded at birth. The uterus grows in size and function at a phenomenal rate. Logically, the hastily developed placental and fetal tissues should not be expected to be so resistant as old established structures. The thought is well supported by the virtually universal declaration of bacteriologists that the abortion bacillus regularly disappears from the uterus 2 to 3 weeks post-abortion, i.e., as soon as uterine involution has been accomplished and the hastily formed new tissues have been removed. Pursuant to this inference, the intra-uterine mortality in domestic mammals is many times as great as during any unit of time in postnatal life. The clinician observes that when the vigor of a pregnant female is greatly lowered, through one of the causes mentioned, or other similar agencies, evidences of the invasion of the reproductive system by destructive organisms are abundant, amongst which abortion constitutes the most spectacular phenomenon. The list of organisms which have been found in association with abortion is endless. A few of them have been subjected to extensive study.

(a) **Bacillus Abortus (Bang).**—In 1897 Bruce discovered *Micrococcus melitensis* in the blood of men suffering from Malta fever and in the milk of goats being used by the men. In 1906 Bang² discovered *Bacillus abortus* in the uterine contents of an aborting cow. Later the supposedly different organisms were found to be essentially identical.

Far back in veterinary history the belief became firmly established that cattle abortions were separable into two primary classes, contagious and accidental. It was taught that there was but one contagion, a highly virulent malady which defied all natural barriers and raged as a pestilence like rinderpest or foot-and-mouth disease. The belief became a deeply rooted tradition. When bacteriology became established as a science, the quest for the bacterium of contagious abortion became one of the great adventures in veterinary science. Several investigators recovered various bacteria from the uteri of aborting cows, but each failed to convince the veterinary profession that the organism identified was the cause of the traditional pestilence. Finally Bang succeeded in culturing the bacillus which he had found, injected the cultures into pregnant cows and some of them aborted. He thereupon announced the discovery of THE bacterium of contagious abortion and the conclusion was generally accepted.

Bacillus abortus occupies a unique position in veterinary medicine. Next to *Bacillus tuberculosis*, if it does not surpass it, it is credited with being the most widely disseminated bacterium associated with the diseases of domestic animals, and is linked with the most varied

category of clinical phenomena of any pathogenic organism. Besides being incriminated as the cause of most abortions in cattle, it is held responsible, directly or indirectly, for the vast losses from retained placenta and sterility, is charged with being the cause of carpal hygroma in stanchioned cattle, of fistulous withers in horses, and of undulant fever in man, and is much in evidence in association with abortion in goats, sheep and swine. Under the natural mode of transmission of *B. abortus* infection, it is extremely rare to observe clinical manifestations of bacteremia in cattle or other domestic animals. Experimentally, when large doses of highly virulent cultures are injected hypodermically into susceptible dairy heifers, there frequently follow extensive abscesses at the point of injection, associated with prolonged malaise and marked loss of weight (undulant fever?), but no accurate studies of the phenomena have been recorded.

Many other bacteria and protozoa have been recovered from the uterine contents of aborting cows. In other instances there are clinical evidences of the presence of a filterable virus. The suspected organisms have been used to expose other pregnant cattle, some of which have aborted, and the organism recovered from the uterine contents. This should be expected if the exposure is equal and the intrinsic power of resistance parallel. A very large proportion of abortions in cattle are bacteria-free according to accepted standards of diagnosis. In cases of abortion, attributed to Bang's bacillus, in those in which other bacteria are found in the absence of Bang's bacillus, and in those very numerous cases in which no bacteria, or protozoa are found, and in which no clinical evidences of disease due to filter-passers are present, always we find the same symptoms.

Some authorities contend that the lesions in abortions where *B. abortus* is present, differ somewhat from those observed where that bacillus is absent and other bacteria are present, or the examination for organisms is negative. Other authorities of equal standing, e.g. Beller³ are quite as certain that no such differences exist. Those abortions in which *B. abortus* is present, however, are classed as due to a specific disease, those in which other bacteria appear, as non-specific, and those which are negative to bacteriologic search, to unknown causes.

In the United States of America most states have established rules barring the importation of breeding cattle unless they are officially certified by the exporting state as free of infectious abortion. No quarantine is established to bar the introduction of men, horses, goats, sheep, swine or other carriers of Bang's bacillus. The diagnosis for purposes of interstate shipment is commonly based upon the aggluti-

nation test, but no universal titre has been adopted. Some authorities advocate 1:20, others 1:200, with numerous intervening standards. A newborn, vigorous calf is usually negative at 1:10.

Numerous experiments have been recorded in which pregnant heifers have been variously exposed, have largely aborted, and *B. abortus* have been recovered. Other experimental exposures, in which abortion failed to follow, have not received great publicity. As a rule, though not prominently mentioned, the experiments are conducted upon dairy heifers which largely abort whether artificially exposed to Bang's bacillus or not and in many cases no bacteria are recoverable from the abort. For example, Cotton, Buck and Smith⁵ in an experiment, selected 8 heifers as controls, 6 of which proved sterile. In their places 6 other heifers of inferentially parallel sexual health were substituted. Each received 3 drops of abortion culture in the conjunctival sac and all 8 aborted. Clinical observation reliably teaches that in a fairly uniform group of dairy heifers, 75 per cent of which are sterile, the 25 per cent which conceive may be confidently expected to abort at a ratio of at least 75 per cent, and no surprise should be caused by 100 per cent of abortion without artificial exposure.

When experimenters select animals for abortion exposure, the factors discussed above as basic causes of abortion are not considered. Among the great number of experiments designed to establish the abortifacient power of Bang's bacillus, no record is found of an instance in which healthy beef heifers of mature age have been selected. It is not known what would occur if a group of healthy beef heifers, grown naturally upon the open range with ample forage, and mated with healthy bulls at a time to first calve at three years of age, were exposed to contagious abortion by placing three drops of a culture into the conjunctival sac. There are ample clinical reasons for the suspicion that the exposure would be without visible effect.

(b) Spirilla or Vibrios Associated with Abortion.—A spirillum or vibrio is occasionally found in abortions of cattle in which Bang's bacillus is not recognizable. Rarely the vibrio and Bang's bacillus are both present. The symptoms and lesions differ in no known respect from those associated with *B. abortus*. A similar organism is frequently found in association with ovine abortion.

(c) Bovine Abortion Associated with the Vesicular Venereal Disease or Coital Exanthem.—Reisinger¹⁴ has described a very extensive and destructive outbreak of abortion and sterility of cattle in Southern Austria in which he presents highly interesting clinical, and some experimental, evidence that it was due to the vesicular venereal disease, presumably, like most vesicular diseases, referable to a filter-

passer. A similar disease appears in horses. They are extremely contagious. In my observation 100 per cent of exposures terminate in disease. The disease is interesting, clinically, in that it appears in a manner possibly best expressed as "spontaneous" in so far as clinical observations lead. Usually it suddenly appears without known introduction from without, and before the caretakers have noted its presence, each female served by the affected male shows a notable abundance of vesicles about the vulva, the male showing corresponding lesions of the penis. In harmony with suggestions previously made, the inference is allowable that the causative virus may be widely disseminated but in so avirulent a state that it does not produce clinically recognizable disease until some depressing factor (excessive coitus by the male?) serves suddenly to awaken the virus. Then it develops into the most spectacular venereal disease of domestic animals. The power of this disease to cause abortion is not completely established. In Reisinger's observations the most prominent phenomenon was maceration of the fetus with chronic pyometra. In some cases, however, the fetal cadaver was expelled promptly following death. The death and maceration of the fetus, and extensive pyometra are also described as characteristic of the trichomonas disease, to be discussed below. The differentiation between the two is not clear.

(d) The Trichomonas Disease.—Since 1900 there have appeared occasional reports of abortion, maceration of the fetus and extensive pyometra in which trichomonas were obtained from the uterine contents, in the absence of abortion bacilli or other organisms readily incriminated. Abelein¹ presented an extensive report in 1932, with bibliography, which may be cited as representative. Until 1932 reports came only from Continental Europe. Recently the disease has been reported in several areas of the United States of America and a wide dissemination seems to exist. Probably the disease has existed in this country for a long time unrecognized. As early as 1929 Lothe¹¹ described an outbreak of abortion in Wisconsin with a clinical picture of trichomonas disease, but the underlying cause was undetermined.

(e) Miscellaneous Infections Associated with Abortion. Abortions Without Recognizable Infections.—An endless list of bacteria and other organisms are occasionally found in association with abortion in cattle and other animals. They ordinarily are apparent in but few cases in a given area. They include various pyogenic types. Somewhat rarely the bacillus and lesions of bovine and avian tuberculosis are found in cattle abortions. In one instance I observed uterine actinomycosis.

In all countries there are many abortions in both horses and cattle not yet attributable to any form of bacteria, protozoa, or filter-passer. The lesions present cannot be attributed to physical violence, *Secale cornutum*, or other traditional factors. The lesions indicate the presence of infection, but they differ faintly, if at all, from those assigned to *B. abortus*. One of the unsolved enigmas in abortion in domestic animals is the vast number, often reaching 50 per cent of the total in a considerable territory, in which no biologic cause can be discovered, yet the lesions impress the clinician as bacterial. These negative cases serve to obscure the diagnosis, where an abundance of bacteria are present which have an established reputation as abortion-producers, because no means are available by which, in the presence of such bacteria, the unknown cause may be excluded. Under the possibility, or even probability, of the filtrable virus of the vesicular venereal disease to produce abortion has been discussed. It is not impossible that this virus may cause abortion without the visible presence of the vesicular eruptions. Dimock⁶ confronted with disastrous outbreaks of equine abortion in connection with which no bacteria with an abortifacient power could be recognized, and in which no bacteria were found, resorts to the hypothesis of a filter-passer as the cause. He produces interesting evidence in support of his suspicion. Should the suspicion prove correct, Dimock would face the problem, when *Salmonella abortivo-equinus* is present, of determining if the abortion were due to the bacillus or the filter-passer.

(f) **Dourine.**—There occurs in horses the highly destructive venereal disease known as dourine, due to *Trypanosomum equiperdum*. Influential writers state that it causes abortion. In a large outbreak of the disease, the first reported in North America, the control of which fell to my lot, no case of abortion was observed, nor do I recall the existence of pregnancy in an affected mare. The available statements regarding abortion in dourine are apparently based upon categorical assertion alone. According to my observations it appears that fertilization fails or the fertilized ovum perishes before pregnancy is recognizable.

(g) **Bacterium Paratyphus Abortus Equi. (Salmonella Abortivo-Equinus.)**—Paratyphoid bacteria are frequently found associated with abortion in all herbivorous domestic animals. It is commonly assumed that a separate species or variety of bacterium occurs in each species of animal. In other animals than the mare this type of organism is not regarded by American veterinary writers as causing a "dangerous contagious disease," calling for quarantine or slaughter of the aborting females. In equine abortion the paratyphoid bacillus is by far

the most frequently recognized bacterium, comprising, according to the extensive data of Lütje,¹² 41.7 per cent of all abortions, or deducting 48.3 per cent of the equine abortions investigated, which were negative to bacterial search, Lütje found the paratyphoid organism in over 80 per cent of all bacteria-positive examinations. The paratyphoid bacterium has been accorded a place in equine abortion analogous to that occupied by Bang's bacillus in bovine abortion. It is regarded by many as a highly dangerous contagious disease, but no official regulations of quarantine or slaughter have been enacted.

The symptoms and lesions of paratyphoid abortions in mares are not known to differ specifically from those equine abortions attributed to any one of numerous other bacteria, nor do they differ, so far as known, from those of the 48.3 per cent of the total in which the bacteriologic search is negative.

The Control of Abortion in Domestic Animals

It has already been stated that there exist two antagonistic views of the causes of abortion in domestic animals. One is that abortions are fundamentally due, at least in most cases, to the invasion by contagions so virulent that they ignore any and all intrinsic powers of resistance to disease. The other belief is that abortion is primarily due to a subnormal power of resistance in the individual, caused by malnutrition, excessive sexual load or other depressing agencies which invite destructive action by organisms otherwise devoid of material pathogenic power.

This conflict of view leads inevitably to two irreconcilable conceptions of the principles of control. Since the discovery of *B. abortus* the control of cattle abortion, as advocated by the first group mentioned, has been centered upon the one organism. While many bovine abortions are admittedly not due to Bang's bacillus, they are dismissed as immaterial or because the cause is unknown and hence beyond remedy. In the original communication of Bang² it was confidently predicted that abortion would be controlled either by artificial immunization or by quarantine. It has not yet been clearly established that a chronic infectious disease, which is chronic largely because it does not itself produce immunity, can be effectively controlled by artificial immunization. Many highly favorable reports are published advocating the use of the living bacilli as an immunizing agent. The experimental evidence is not without important defects. The clinician who applies the method in privately owned herds generally observes silence unless the apparent benefits are spectacular. Reports are not available from publicly owned herds observed

over a series of years, and the incidence of sterility, retained placenta and other allied phenomena is not stated. In the extensive experiments of Bland⁴ the abortion rate was materially reduced and counterbalanced by an increase in sterility. It must be admitted that artificial immunization cannot transform such grossly hypoplastic genital organs as I have described²² into a physiologic reproductive system, nor abrogate any one of the basic causes of abortion above discussed.

Quarantine was already in vogue prior to the dawn of bacteriology as a science. The elimination of Bang-positive cattle from a herd cannot prevent the re-introduction of the bacillus by men, horses, goats, sheep, swine and other animals known to be carriers. A serious economic problem in quarantine is vividly presented by Hicks.⁹ In the Dominion Experimental Farm at Agassiz, B. C., the mature cows in the herd in 1927 were almost all Bang-positive and were breeding and milking excellently. The heifers and young cows were virtually all Bang-negative, and sterility and abortion were highly prevalent. All animals were in immediate contact and the sterile and aborting heifers obstinately refused to become affected with contagious abortion. The elimination of the Bang-positives would remove most of the highly fertile cows and leave in the herd the sterile heifers and aborters. I have elsewhere described a free-martin,²⁰ from a highly fashionable, Bang-negative herd in which the abortion rate, from unknown cause, was 50 per cent. Since the cause was unknown, there was no remedy. A second free-martin mentioned in the same article came from a dairy herd of satisfactory fertility until it was desired to introduce a new bull from a famous herd in another state. He was admitted upon an official certificate of freedom from contagious abortion. Some of his cows failed to conceive and other bulls were substituted. After several bulls and numerous cows had been irretrievably ruined, it was observed that the clinical picture in the herd was suggestive of that drawn by Abelein¹ in connection with trichomonas disease, and a search quickly revealed the presence of the protozoon. The third free-martin in the article cited came from a Bang-free herd in which the fertility was high. In addition to the isolation of Bang-positive animals, the attending veterinarian had largely applied measures aimed to obviate what have been described above as the basic causes of abortion. Opinions will naturally differ regarding the cause of the fertility, whether it was due to quarantine, or to sex hygiene.

In contrast I have elsewhere recorded²² extensive observations in a large Holstein herd, destructively affected with abortion and other genital diseases. The period covered was 14 years and the herd in-

creased from 60 animals to over 300. It was separated only by a wire fence from thousands of Hereford cows of high fertility. The measures adopted for control were directed toward the elimination of those agencies described above as the basic causes of abortion, without artificial immunization or quarantine. The chief emphasis was laid upon the correction of malnutrition of the young calves, thereby controlling the gross hypoplasia of the reproductive system. The results proved highly satisfactory. These and other observations justify the conclusion that abortion in domestic animals is best controlled by the rigid application of the laws of hygiene, including especially the avoidance of malnutrition from the beginning to the end of life, and the conservative adjustment of the burden of reproduction to the strength of the individual.

Abortion leaves behind important lesions of the endometrium, which heal by cicatrization, not by renewal of the destroyed tissues. The available placental area is decreased and the cicatrized portion is weakened. Many aborters die, especially cows with retained placenta; many more become permanently sterile. Numerous animals that have aborted, so far recover that they breed well. Animals that abort early in gestation, and expel the ovum intact within its membranes, usually make a fair recovery, while those that abort late and retain the placenta (cow), commonly breed poorly or not at all. The damaged bovine uterus has two methods of compensation for destroyed placental tissues, the hypertrophy of intact caruncles and the formation of adventitious placental structures in the intercaruncular endometrium. They aid materially in the nutrition of the ovum but inevitably fall below the natural organs in their efficiency.

Abortion in Captive Wild Animals

Nothing is found recorded regarding abortion in wild animals under normal environment. Reproduction in captive wild animals is low. Fox^{8-a} states that abortion is occasionally observed in zoological parks in monkeys, rodents and ungulates, and attributes it to annoyances by other animals, immaturity of the pregnant female and osteomalacia.

Noback^{13-a} has observed abortions in marmosets and attributes the disease to malnutrition, associated with rickets.

Hartman and Tinklepaugh^{8-b} state that intrauterine mortality in rhesus monkeys reaches, in their research colony, 30 per cent, without including those abortions occurring just after the pregnant animals have arrived from the dealer. They attribute the abortions to funda-

mentally defective ova or to general ill health of the mother. A considerable number of the aborting females were of subnormal weight.

Professor Yerkes²⁵ has observed 30 per cent of miscarriage in a colony of Chimpanzees and concludes that the primary determinants of the outcome of gestation are the general health of the animals and the character of the diet.

None of the observers have seen indications of accident or contagion as a fundamental cause of abortion.

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CHAPTER IV

ANATOMY AND PHYSIOLOGY OF EARLY PREGNANCY

IN ORDER properly to appreciate the underlying factors in the etiology, pathology and treatment of abortion, it is well to review briefly the anatomical and physiological changes that occur during the first six months of pregnancy. We shall confine ourselves in the main to those facts that bear directly or indirectly upon clinical aspects of abortion.

The process of implantation is one of gradual change and adjustment during which certain characteristics develop in the relation of the ovum to its host that permit the division of the pregnancy into three anatomical stages:

One, the decidual stage: first six weeks.

Two, the attachment stage: seventh through the twelfth week.

Three, the placental stage: thirteenth week to termination of pregnancy.

(1) The Decidual Stage

(FIRST SIX WEEKS FROM FERTILIZATION)

Fertilization.—The human ovum is usually fertilized in or near the fimbriated end of the tube. As it pursues its course downward through the tube, the impregnated ovum passes through the early stages of cell division. Its progress is somewhat slower as it approaches the uterus, and it reaches the cavity within approximately a week. During this time the ovum has progressed to a cleavage cluster not much larger than the single cell, though greatly subdivided, and still surrounded by the *zona pellucida*. In three days more, or in about ten days from fertilization, the ovum is ready for implantation.

The stages from eruption of the ovum from the ovary, through fertilization, early cleavage, and travel along tube and in the uterine cavity, through implantation in the mucosa, are shown in Fig. 10. This diagram by Dickinson was adapted from the chart of the great teacher, Sellheim, and has been brought up to date by careful checking with the latest discoveries and observations recorded by Streeter and Hartman in the Department of Embryology of the Carnegie Institution at Johns Hopkins.

Implantation.—The *uterine mucosa* has undergone marked changes during this week that the ovum has been traveling through the tube. Its thickness has increased three or four times, the glands have taken

on a markedly convoluted character; and the connective tissue cells already have begun to assume the characteristics of decidual cells. In

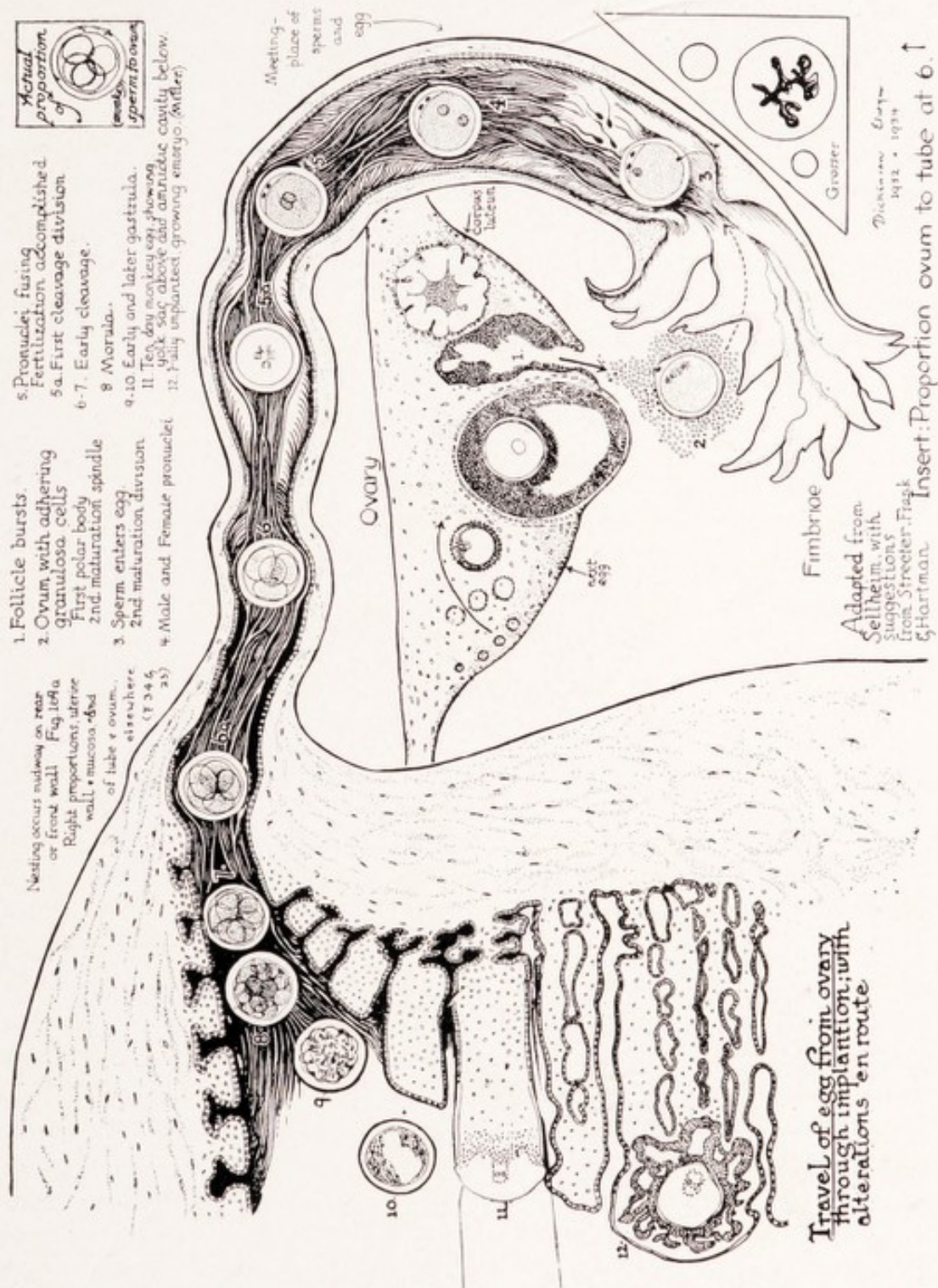


Fig. 10.—Passage of impregnated ovum through the Fallopian tube and implantation in the uterus.

gross appearance the uterine mucosa has multiple folds, upon whose top or sides the ovum is usually implanted.

Site.—We know but little as yet concerning the factors that predispose to a particular site for implantation. Dickinson has made a careful study of the sites of the ovum in 56 very early pregnancies, and in nine-tenths of these the point of implantation was in the mid-line on either the front or rear wall of the uterine cavity. In only three instances was the implantation in the fundus, and twice it was near the tubal openings (see Fig. 11). At this stage the ovum will be recognized with the greatest difficulty in the gross specimen. It will appear as a minute vesicle upon the top or side of a mucous fold with slight injection of the surrounding blood vessels (Fig. 12).

Trophoblast.—Presumably implantation is accomplished through the presence of enzymes in the external trophoblast cells of the ovum by which the maternal tissues in contact with them are digested, the

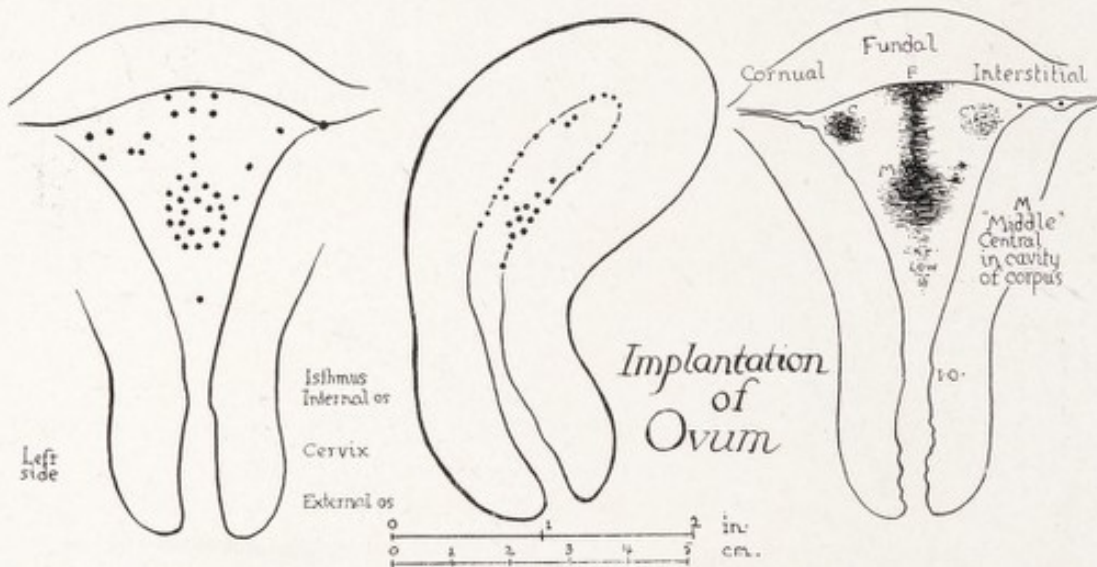


Fig. 11.—Common sites of implantation of the ovum from the study of 56 early pregnancies. (Dickinson.)

endometrium is opened and the trophoblast permitted to grow into the mucosa. The point of penetration in the mucosa is usually microscopic and after the ovum has become entirely imbedded, a small cap of fibrinous blood clot marks the point of entry. The local irritation produced by the trophoblast greatly increases the size of the capillaries in this region and by a process of liquefaction necrosis, the trophoblast now opens into these capillaries so that numerous small lacunae of maternal blood surround the growing embryo. These spaces are filled with an emulsion of blood and cellular debris known as embryotroph which serves as food for the embryo until the nutritive mechanism is more fully developed through the formation of the embryonal blood vessels. The process of implantation probably takes not over twenty-four hours.

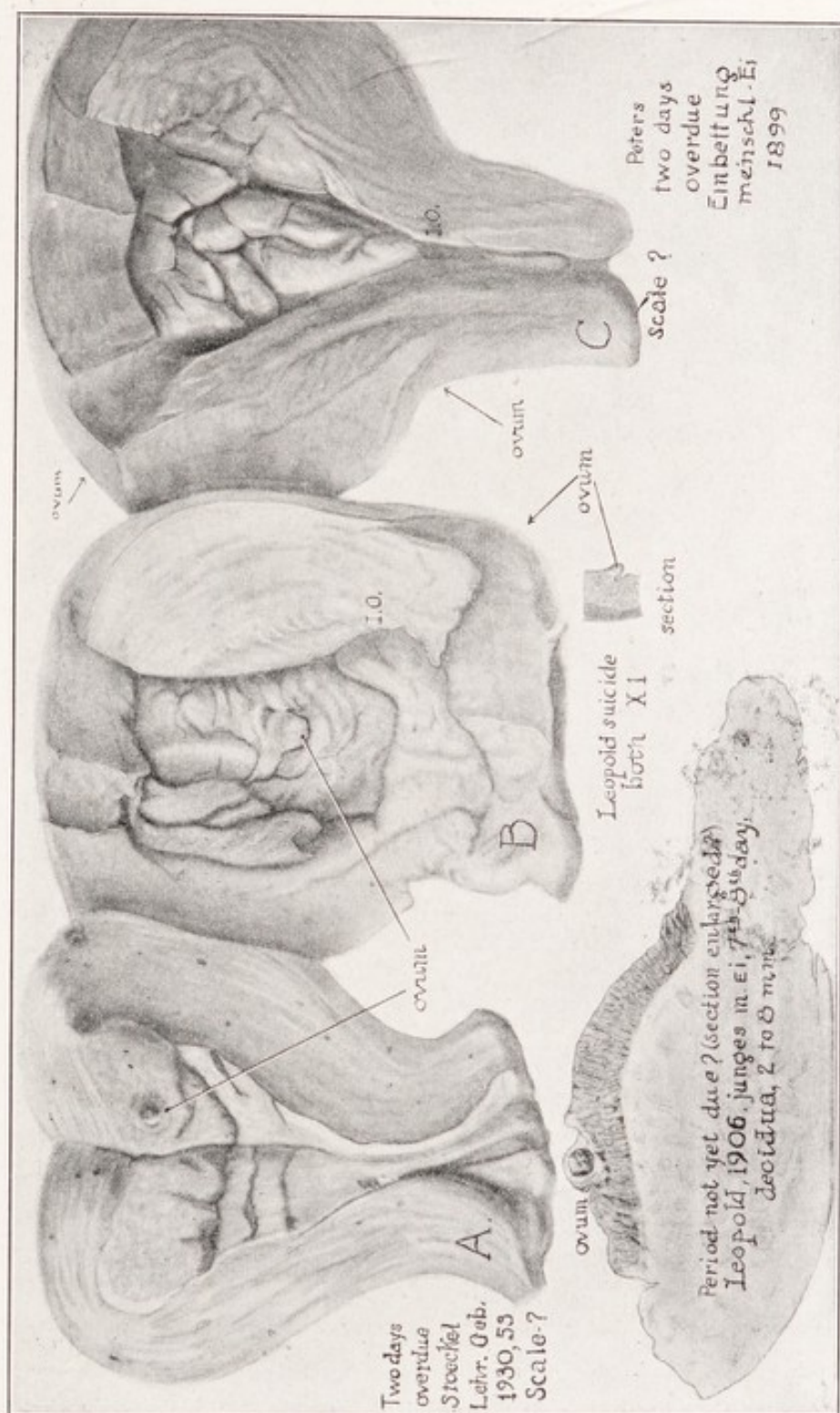


Fig. 12.—Three very early pregnant uteri (Stoeckel, Leopold, Peters.) (Redrawn by Dickinson.)

Syncytium.—The first development of trophoblast epithelium is in the form of a web-like growth known as syncytium as seen in the twelve to fourteen day ova of Miller and Von Moellendorf (Fig. 13). In the

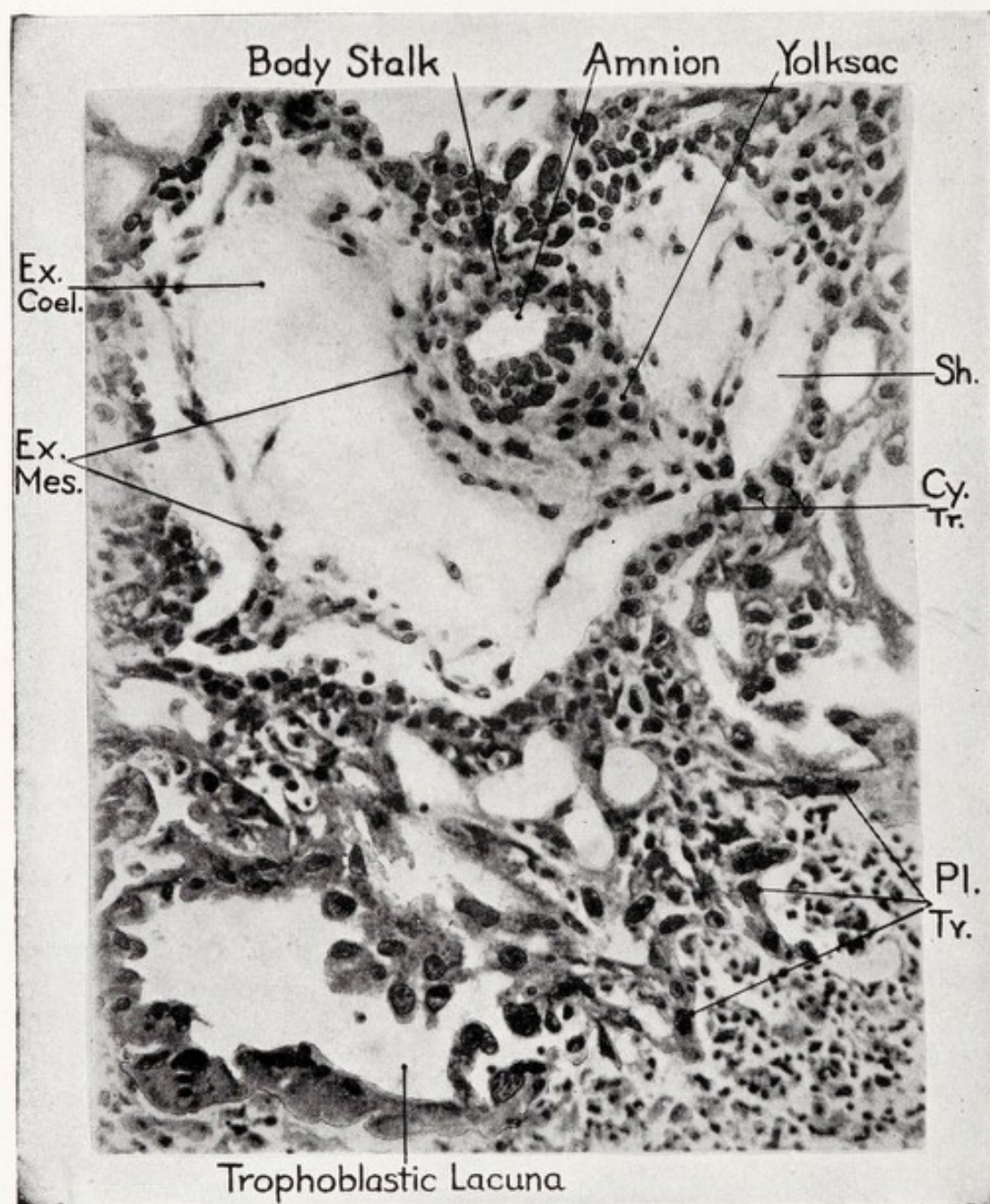


Fig. 13.—Human embryo of about ten days' fertilization age. Photomicrograph of a section of the Miller embryo. *Cy. Tr.*, Cytotrophoblast; *Ex. Coel.*, extra-embryonic coelom; *Ex. Mes.*, extra-embryonic mesoderm; *Pl. Tr.*, plasmotrophoblast; *Sh.*, space between extra-embryonic mesoderm and trophoblast due to shrinkage in fixation. (After Streeter, from Arey in Curtis: *Obstetrics and Gynecology*, courtesy of W. B. Saunders Co.)

famous Peters ovum (15 to 17 days old), a second trophoblast proliferation of large cells has occurred with the development of trabecu-

lae that represent the primary chorionic villi. Additional areas of maternal tissue surrounding the ovum are now attacked and larger pools of maternal blood are opened up. In the Mateer ovum of 19 days there is already evidence of the down-growth of mesodermal tissue into the primary chorionic villi with a differentiation of trophoblast into an outer syncytial and an inner Langhans layer. In the embryo of three weeks, minute capillaries seen in these chorionic villi give evidence of the formation of a fetal circulation. Blood vessels pass from the embryo through the body stalk into the villous stems (Fig. 14).

Embryo.—While these changes are occurring in the trophoblast area, the embryo itself first progresses from a disc to the stage of primitive streak with formation of the mesodermal somites. The yolk

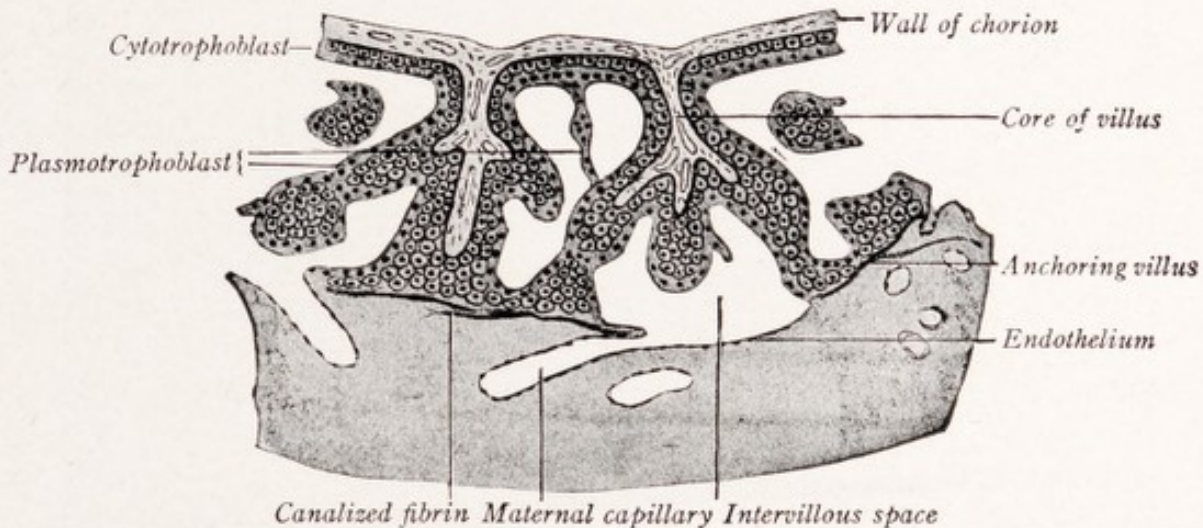


Fig. 14.—Diagram of the early development of chorionic villi and placenta. (After Peters, from Arey: *Developmental Anatomy*, courtesy of W. B. Saunders Co.)

sac which plays such a prominent part in lower animals, has become reduced in size and forms a small vesicle lined with a single layer of entoderm and surrounded by mesoderm. The amniotic cavity, noticeable as a small flat sac in embryos from 13 to 14 days, quickly enlarges in the following week with the development of fluid in which the embryo floats, attached to its trophoblast by a short thick stalk that later becomes the umbilical cord. The 4 to 6 week embryo is characterized by a relatively large over-arching head, with protruding eyes, gill slits, a thick bulbous neck, protuberant abdomen, and short stump-like extremities (Fig. 15).

Decidua.—Of special interest and importance is the development of the maternal mucosa into decidual layers (Fig. 16). That portion of

the uterine mucosa which covers the ovum, is subjected to considerable stretching by the growth of the ovum so that the decidua that develops in this area is attenuated and the uterine glands in this encapsulating mucous membrane are flattened out and tend to run

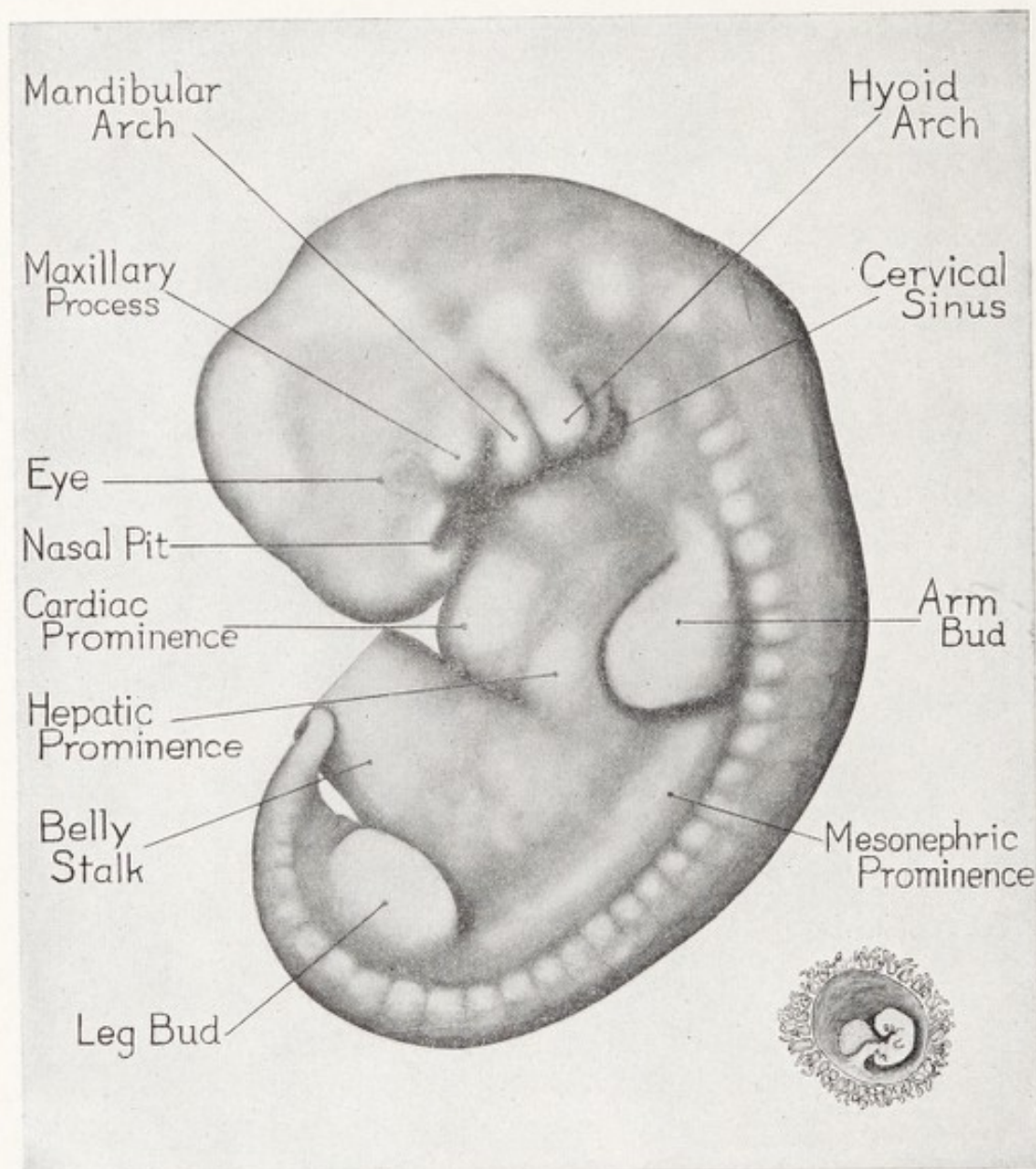


Fig. 15.—Human embryo of about five weeks' fertilization age. Sketch, lower right, shows actual size of embryo and its chorionic vesicle. (Patten and Hartman in Curtis: *Obstetrics and Gynecology*, courtesy of W. B. Saunders Co.)

parallel with the circumference of the ovum. We speak of this portion of the embryonal covering as the *decidua capsularis*. Beneath the point where the ovum is implanted, the decidual reaction is most pronounced (*decidua basalis*). This area can be divided into a thicker

compact layer (*decidua compacta*) directly in contact with the trophoblast of the embryo, and a deeper situated layer containing numerous tortuous glands (*decidua spongiosa*). This *decidua basalis* is differen-

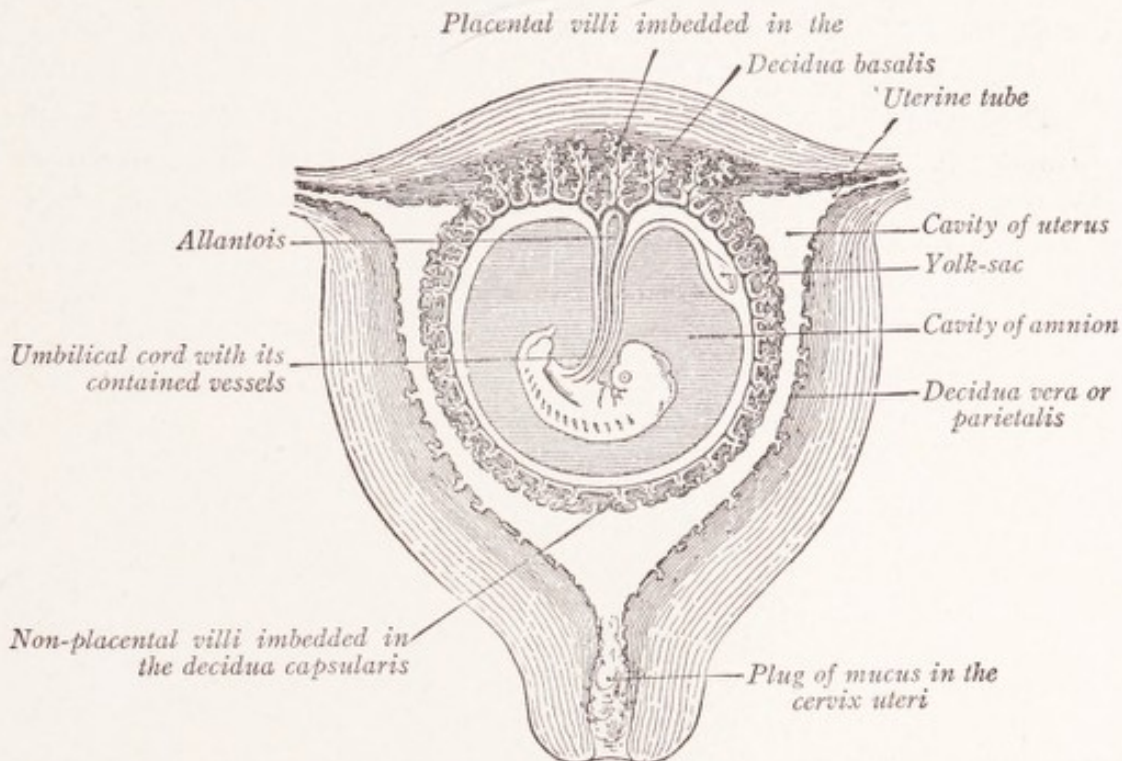


Fig. 16.—Sectional plan of the gravid uterus at three months. (After Wagner, from Arey: *Developmental Anatomy*, courtesy of W. B. Saunders Co.)

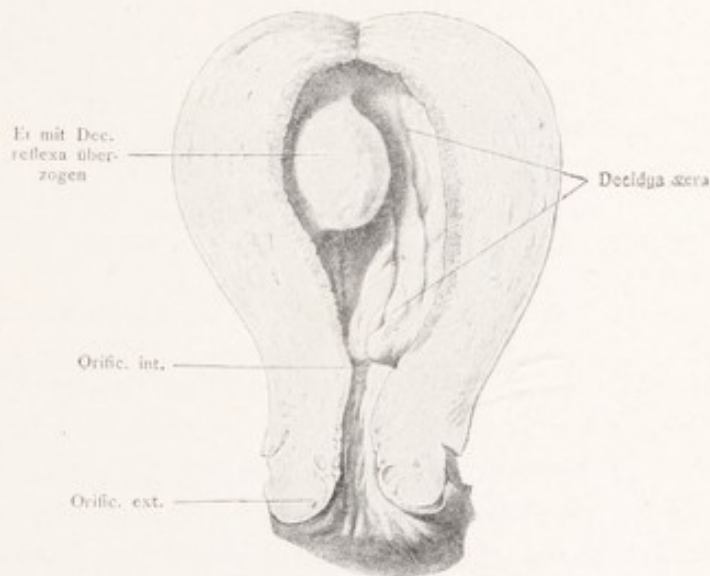


Fig. 17.—Ovum in situ of about four weeks' development, showing the formation of the decidua vera, with the reflexa covering the ovum. (Bumm.)

tiated from the remaining uterine mucosa filled with decidua cells to which the term *decidua parietalis* (formerly *decidua vera*) is applied.

The pregnant uterus with embryo, shown in Fig. 17, demonstrates the anatomic conditions near the conclusion of the first six weeks of gestation.

(2) The Attachment Stage

(SEVENTH TO TWELFTH WEEK)

The second six weeks of fetal development are characterized by the gradual formation of the placental site and the more firm attachment of the ovum to the uterine wall. It is not until the conclusion of this



Fig. 18-A.—Two months pregnant uterus in normal position in pelvis.

period, at the end of the twelfth week, that a relatively firm attachment has been effected and it is therefore evident that up to this point the detachment of the ovum may more readily be brought about. The more important steps in the development of this process of uterine attachment consist in the prolongation through the basilar decidua of large villous stems. At first the chorionic villi cover the entire surface of the chorion evenly but at the seventh week they are definitely shorter and fewer over the capsule of the ovum. At the base of the ovum these villi represent bush-like tufts with but few branches, and between them the maternal blood vessels form larger spaces (inter-

villous spaces) through which the maternal blood slowly circulates, bringing nourishment to the ovum and carrying from it certain waste products. Week by week this basilar region becomes thicker and more deeply invades the maternal tissues. At the same time the growth of the embryo and the increase in the amniotic fluid gradually produces complete occlusion of the remaining uterine cavity (Fig. 18)

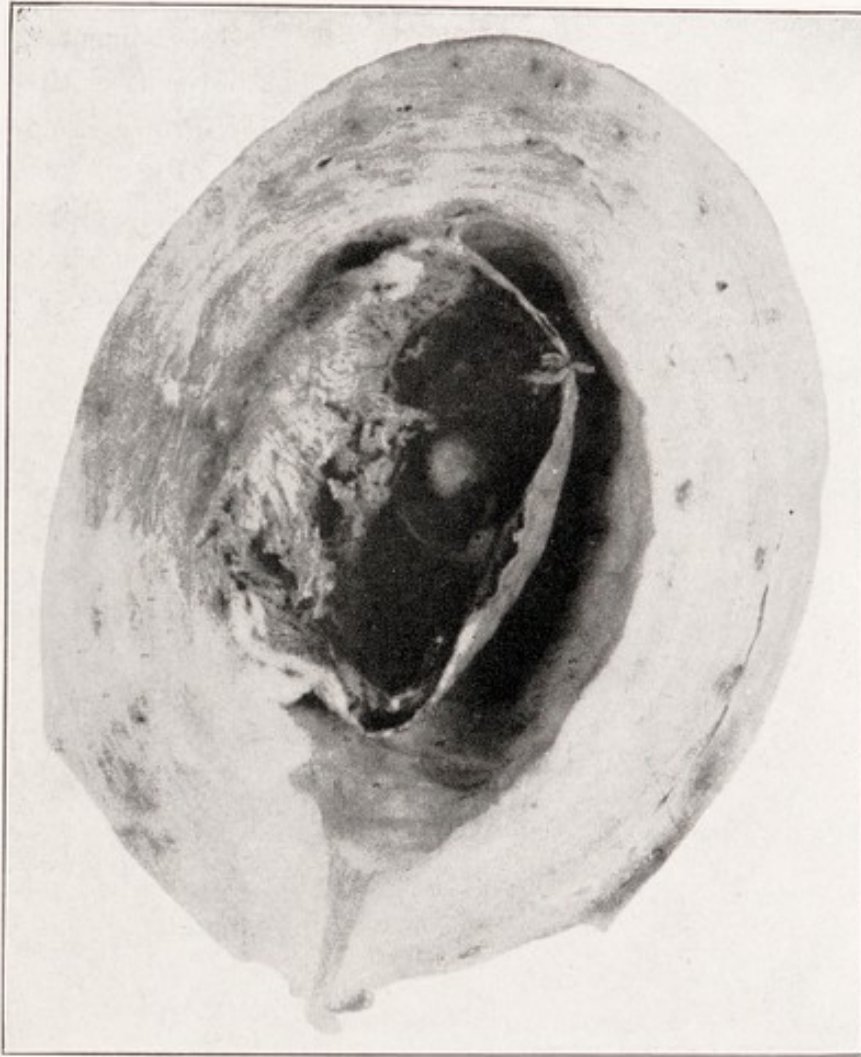


Fig. 18-B.—Eight weeks pregnant uterus, showing incomplete obliteration of the uterine cavity. (Specimen from Washington University Department of Obstetrics.)

so that at the end of twelve weeks the capsular decidua lies in contact with the parietal decidua with which it then becomes fused.

Changes occur in the size and shape of the embryo in the six weeks of the attachment stage. The body assumes a less bent attitude, the head is relatively large with a shorter, better defined neck. Thorax and abdomen are differentiated, fingers and toes are visible upon the jointed extremities, and the external genitals show beginning sexual differentiation.

(3) Placental Stage**(THIRTEENTH WEEK TO TERMINATION OF PREGNANCY)**

After the twelfth week of gestation the mass of tissue at the base of the fetal attachment forms a thick round pancake and can now properly be termed placenta. The remainder of the uterine cavity is lined by parietal decidua, capsular decidua and chorio-amnion. These fuse into a layer which with the growth of the fetus becomes greatly thinned and is known as the membranes. From the twelfth week onward the parietal decidua through increasing pressure is so reduced in size that it can only be recognized microscopically. At the end of the twelfth week the placenta occupies only about one-third the surface of the uterine cavity, whereas at the twentieth week it extends over one-half of this surface. At this time its diameter is 12 to 13 centimeters and its thickness about 2 centimeters (Fig. 19).

Usually fairly near the center of the placental cake is the attachment of the umbilical cord, through the vessels of which the fetus gets its nourishment. The capillaries of this fetal blood system enter into the chorionic villi to which the term *chorion frondosum*, or bushy chorion, is applied in differentiation from the *chorion laeve*, or smooth chorion, situated in the membranous wall. Of some interest is the separation of the chorionic villi of the placenta with their surrounding masses of maternal decidua into definite lobes. This lobulated appearance of the placenta comes about through the development of larger septa, after the fourth month, presumably due to the faster rate of horizontal growth of the uterine wall in comparison to the placenta. This results in the production of decidual folds between the rapidly enlarging villous trees with the formation of cotyledons. Each cotyledon has a main villous stem with separate blood vessels.

Age and Length. Details of the development of the fetus during these months can be found in textbooks on embryology. For identifying the age of an abortion fetus the old formula should be remembered according to which the length of the fetus is equal in centimeters to the square of the number of months for the first five lunar months and that five centimeters are added for each lunar month thereafter:

<i>Lunar month</i>	<i>cms.</i>	<i>Lunar month</i>	<i>cms.</i>
1st	1	6th	30
2nd	4	7th	35
3rd	9	8th	40
4th	16	9th	45
5th	25	10th	50

With the growth of the fetus the relative size of the head becomes less marked. The soft lanugo hairs are found upon the skin; the sex of the child is readily determined after the third month by inspection of the genitals; and the mouth, anus, nostrils, and eyelids gradually open up. The amniotic fluid increases in amount and becomes slightly turbid after the fifth month from the presence of desquamated material.

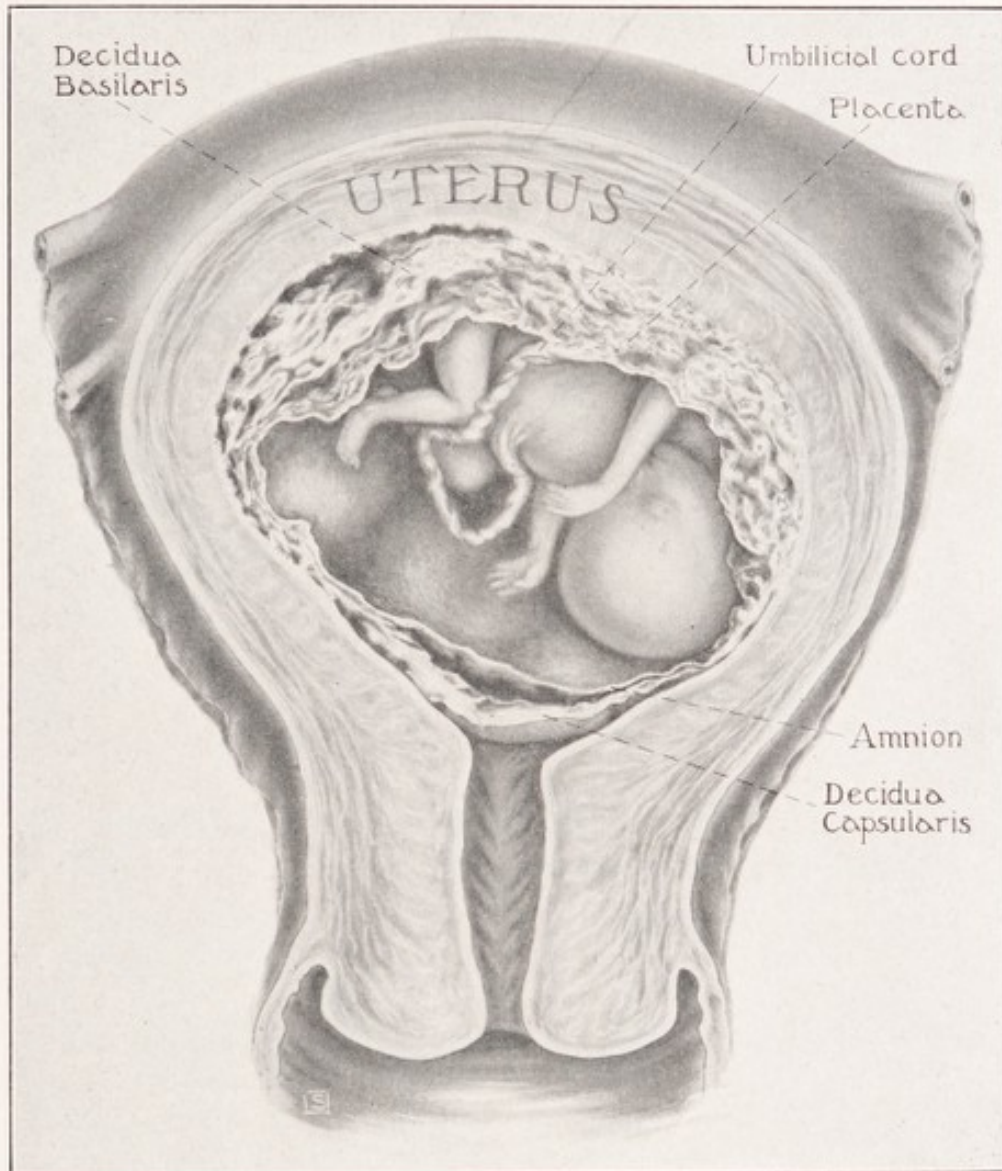


Fig. 19.—Pregnant uterus of four months' gestation. (Redrawn from specimen in Washington University Anatomical Museum.)

Physiology

Only a few essential facts need be recalled concerning the physiology of the previable stage of pregnancy. One of these is the marked change that takes place in the maternal endocrine system. Almost at once upon the impregnation of the ovum there begin to develop

in the *pituitary* gland and in *ovary* and *uterus*, changes of so marked a character that even before the expected time of the next menstruation there is evidence of a formation of hormones so excessive in amount that large quantities of them are daily excreted through the urine, making possible the recognition of the pregnancy by means of characteristic tests upon lower animals. Together with the *anterior pituitary hormone* there is an outpouring of *follicular sex hormone*, the former decreasing and the latter increasing with the advance of pregnancy. In the ovary we find the development of a *corpus luteum of pregnancy* which secretes a special hormone, *lutein*, that has a definite influence upon the embedding of the ovum in the uterus. Occasionally, as will be discussed in the chapter on etiology, conditions arise that interfere with the physiological development of these internal secretions and thereby lead to fetal death and abortion.

CHAPTER V

PATHOLOGY OF ABORTION

THE PREVIABLE INTERRUPTION of a pregnancy must be regarded as in itself abnormal and pathological, but the gross and microscopic changes involved can be considered under two heads:

(1) Those in which the abortion is completed without complication followed by a return of the uterus to normal conditions within a few weeks;

(2) Those in which portions of the ovisac are retained for some time associated with tissue changes in the retained material and alterations in the structure of the uterus.

Uncomplicated Abortion

Certain changes may show in the ovisac depending upon the underlying causes, but these will be considered more fully elsewhere. If abortion is complete, we are primarily concerned with the rapidity and extent of regeneration of the uterine mucosa. Interesting studies have recently been made on this subject especially by Russian investigators. Jakowleff made a study of the uterine mucosa in 40 patients three to twenty-nine days after abortion. This showed that after a pregnancy was terminated by curettement, regeneration was rather slow.

Epithelialization of the wound surface begins about the eighth or ninth and is not completed until the twentieth day. Remnants of decidua compacta and spongiosa were found up to the sixteenth day. They play no part in the regeneration and for the first six or seven days are found to contain glycogen. Krupennikow and Leitschuk made some auxiliary investigations after such an operative abortion with a second curettement up to 20 days later. They found full regeneration at the end of the third week. The stroma of the endometrium developed partly from the decidua and partly from the interstitial tissue of the glands. The surface epithelium regenerating from its remnants usually covered the entire uterine cavity in seven to ten days. Belgajeva and Golubein report that in 42 cases of curettage after operative abortion necrotic decidual tissue was sometimes removed as late as the twelfth day. Portions of the decidua may be used to rebuild the endometrium. Regeneration of the uterine glands begins on the fifth day but is sometimes retarded by the more slowly regenerating endometrial stroma.

Retained or Incomplete Abortion

Under the head of missed abortion and molar pregnancy will be found a more detailed description of the special pathologic changes involved in these conditions. At this point we will consider only the changes that occur in fetal, placental and uterine pathology when portions of the ovisac are retained.

The Fetus.—Where abortion occurs in the earlier months of pregnancy, changes in the fetus are not frequently found except in the case of blighted ova. From the third to the sixth month, however, we may note certain pathological variations. Rigor mortis has been observed in this period. It sets in within two hours after fetal death but is already over in about ten to twelve hours while in the adult this change is most pronounced twenty-four to thirty-six hours after death. This is probably due to the difference in the surrounding temperature.

Maceration presents a peculiar non-bacterial softening of the tissues. It is more pronounced and frequent in fetuses of the last half of pregnancy, and may be divided into three stages. In the first stage the epithelium is raised in larger or smaller blisters containing a yellowish or blood-tinged fluid. In the second stage of maceration the blisters have opened and the skin is denuded in areas. In the third stage of maceration the deeper connective tissue is edematous and infiltrated with blood pigment so that the fetus has a dirty brown-red color (*fetus sanguinolentus*). The internal viscera at this period of maceration show marked liquefaction and the contours of the various organs are less well defined. The umbilical cord at an early stage shows thickening through edema and bloody infiltration (Fig. 20).

Mummification is a condition in marked contrast to maceration, since here the body fluids are not added to but on the contrary, are dried up, leaving the fetal structures shriveled, reduced in size and often flattened out. This change occurs in younger embryos between the third and fifth month. If associated with a twin pregnancy, such a mummified fetus may be retained until normal birth, when it is expelled as a flattened fetus (*fetus compressus*) (Fig. 21).

Over a longer period of time through the process of liquefaction of the softer tissues in fetuses between the third and sixth month, all but the bones of the skeleton may be absorbed and such bones may be retained within the uterus for long periods of time. They may even work their way into the wall of this organ and become embedded there for years. It occasionally happens that in the evacuation of the uterus in the middle months of pregnancy, particularly if the cervix is not well dilated, the head of the fetus may tear off and be retained for many months.

Sometimes in fetuses of 20 to 28 weeks' gestation, the entire body becomes infiltrated with calcium salts so that a lithopedion is formed. Nürnberger cites six such cases. This process is, however, more common in tubal pregnancy.

Finally there is described so-called spontaneous decapitation of the fetus with intact membranes, due, according to Streeter, to defects in the germ-plasm. Many of these embryonal defects and amputations were formerly attributed to amniotic adhesions or bands. Streeter has definitely shown that the change is primarily in the germ-plasm of the fetus and that the adhesions and bands are due to agglutination of the degenerated areas of germ-plasm with the amnion itself.

The Placenta.—Where portions of the placenta have been retained we find considerable variation in the histologic picture. The epi-



Fig. 20.—Fetus sanguinolentus. (Redrawn from Mall.)

Fig. 21.—Fetus compressus. (Redrawn from Halban-Seitz.)

thelial covering of the chorionic villi frequently shows almost a proliferating tendency (Fig. 22). While the Langhans cells are usually completely absorbed, the syncytium may form buds of considerable size that show normal staining qualities and a tendency to remain attached to and even slightly embedded in the mucosa. Occasionally the layer of Langhans cells remain alive and form small islands of ectoderm.

Quite characteristic of retained placental villi is the appearance of connective tissue surrounded by a layer of fibrinous blood clot (Fig. 23). The epithelial covering may be completely absorbed, while the connective tissue, although losing all nuclear elements, can be recognized by its different staining qualities and retains its irregular, ovoid or sausage-shaped form within the blood clot. This hyaline degenera-



Fig. 22.—Section through retained placenta, showing continued proliferation of syncytium, anemic chorionic connective tissue, and decidua with pronounced round cell infiltration.

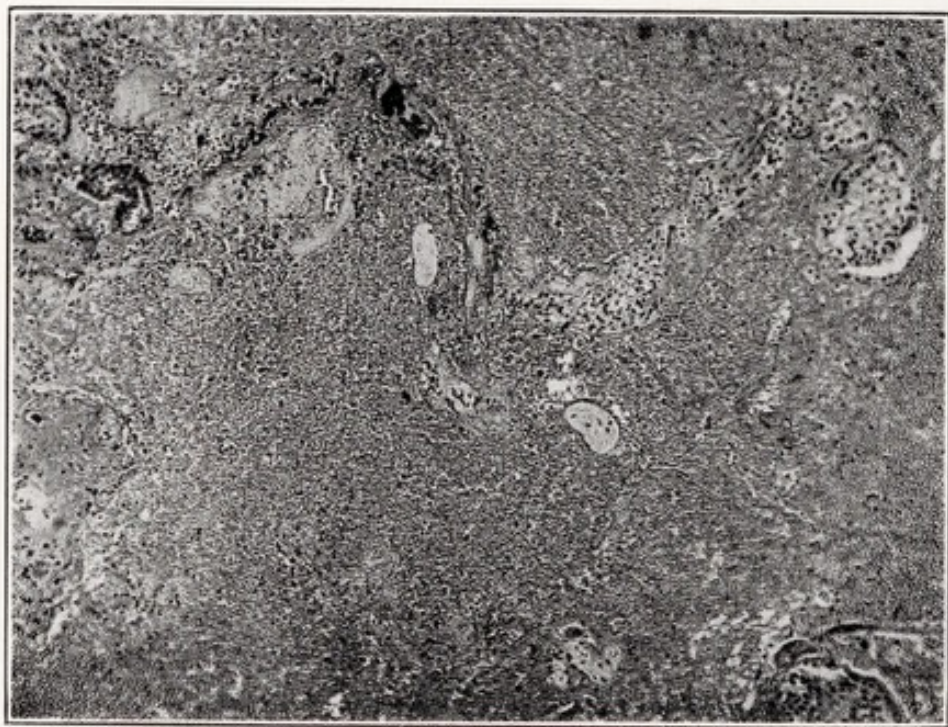


Fig. 23.—Section of abortion products, showing chorionic villous shadows encapsulated in a blood clot.

tion of the villous stems and their branches presents a characteristic histologic picture (Fig. 24). The chorionic vessels also show characteristic changes consisting of concentric proliferation of the intima with occasional round cell infiltration or hyaline degeneration of the vessel walls. No noteworthy pathologic changes occur in the membranes. They remain intact for considerable periods of time.

Placental Polyp.—(Fig. 25.) The relative frequency of placental polyp following abortion justifies more detailed pathologic consideration. These polyps vary in size from two to six centimeters in diameter, have a flattened or ovoid shape, and are attached by a broad base usually to the upper portion of the uterine body. In a few

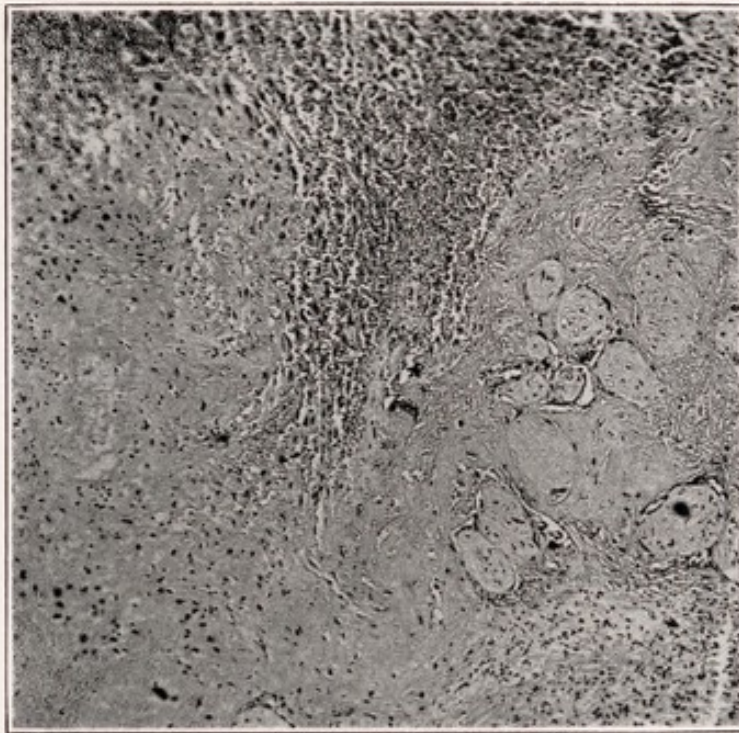


Fig. 24.—Section of degenerated chorionic villi with infected necrotic decidua.

rare instances they may be as large as a man's fist. Their surface is covered by a light brown fibrinous layer and their center contains, for the most part, a dark red organized blood clot with some irregular placental tissue visible at the base where the polyp is attached. They often show concentric layers due to the agglutination of additional layers of coagulated blood (Fig. 26). In this way the polyp sometimes grows larger and larger until it dilates the cervical canal and becomes visible at the external os.

Langhans explains the formation of polyps in the following manner. "When the ovum is expelled decidual remnants with arterial bundles remain behind. These arterioles empty into the uterine cavity and the blood seeping out of them forms a voluminous adherent clot.

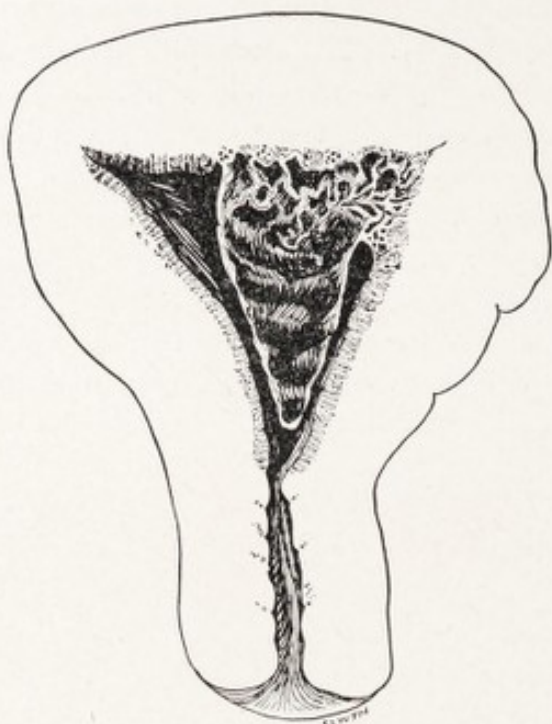


Fig. 25.—Diagrammatic picture of a placental polyp in the uterus. Note the broad base of attachment and the piled-up layers of fibrinous blood springing from it.

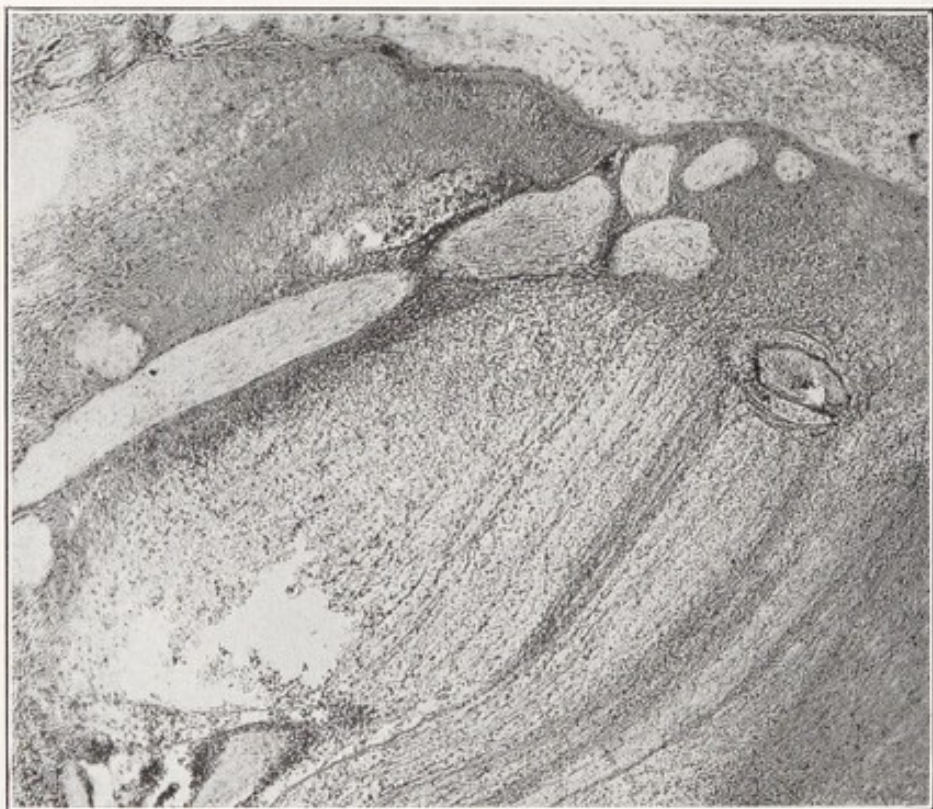


Fig. 26.—Section of a placental polyp, showing necrotic chorionic villi, round cell infiltration, and characteristic layered appearance of the blood coagulum.

This does not entirely occlude the arteriole but forms a sac into which new blood flows with gradual enlargement of the polypoid mass."

Heynemann believes that the incidence of such polyps is increased by uterine relaxation and a greater tendency to thrombosis. Occasionally the placental retained tissue in these polyps shows active proliferation and even superficial penetration of the uterine wall. In these cases, especially if the abortion ovum shows evidence of hydatid change, we must be on the lookout for a possible development of a chorio-epithelioma.

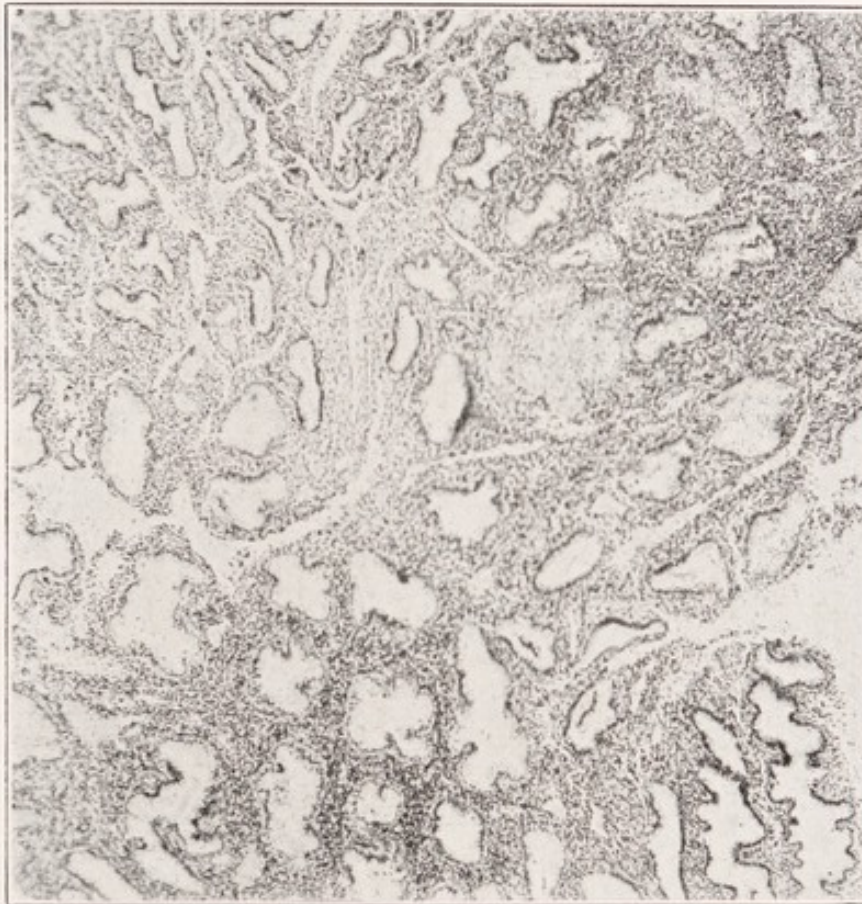
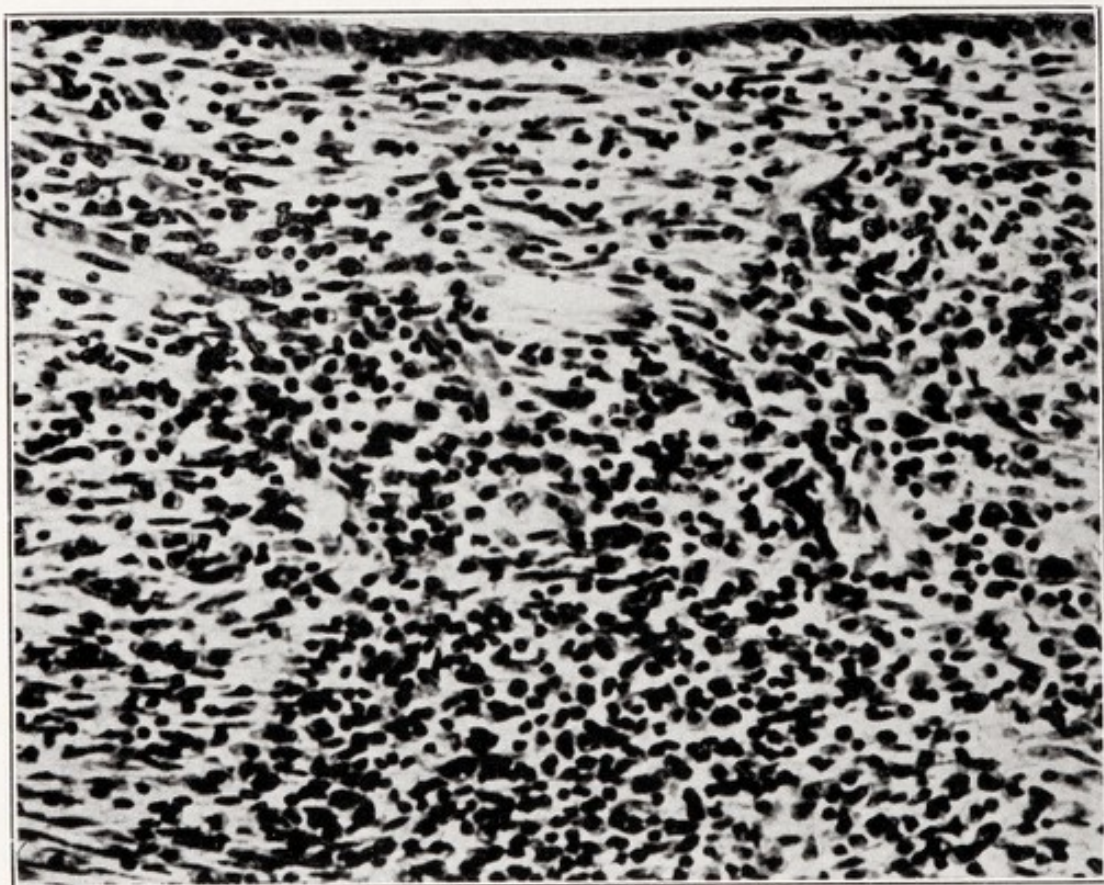


Fig. 27.—Section of postabortive endometritis. The uterine glands show the typical corkscrew proliferation of early pregnancy with a small island of decidua in the center of the section.

Post-abortive Endometritis.—The most common pathological lesion following abortion is that of so-called post-abortive endometritis or subinvolution. In the gross examination of such a uterus we find a markedly thickened uterine mucosa with a uterine wall that also is increased in size, and is softer and more hyperemic. The curette brings away considerable material varying in consistency from almost cartilaginous tissue to soft mucous particles. In the firmer pieces examined microscopically, we find degenerated chorion villi and plaques



A.



B.

Fig. 28.—Section of acute septic endometritis with pronounced leucocytic infiltration. *A*, Endometrium of uterus removed at operation. *B*, High power magnification showing infiltration by leucocytes.

of decidua cells. In the softer particles we find uterine mucosa showing the typical corkscrew-like proliferation of the uterine glands (Opitz) (Fig. 27). The uterine mucosa shows the marked round cell infiltration and hyperemia of a chronic infection. The decidual tissue shows a varying picture. In some areas it appears as an island of decidua cells, in other areas it is surrounded by or embedded in uterine mucosa. Often these cells show degenerative changes, becoming smaller, more spindle shaped and staining only faintly with a somewhat swollen nucleus. The round cell infiltration invades and separates these decidual bundles. In the presence of more active in-



Fig. 29.—Section of syphilis of the placenta. Characteristic of this disease are the round or club-shaped villi, the blanching appearance of the connective tissue, and the deeply staining spots in the syncytial covering.

fection polynuclear leucocytes are present throughout the mucosa and the blood vessels are considerably increased in size and number (Fig. 28).

The uterine wall histologically shows the typical picture of a sub-involution with some edema of the fibro-muscular coat and numerous open blood vessels.

While careful search of the curetted parts will usually reveal a few islands of degenerated chorionic villi, it occasionally happened that only decidual elements are found, and, in a few instances, if consider-

able time has elapsed between the abortion and the curettage all histologic evidence of the preceding pregnancy may be absent. In such cases we see only the hyperplastic endometrium with chronic infection.

Other Conditions.—Syphilitic changes in the placenta are usually not pronounced before the twenty-fourth week although we may find a tendency to club-shaped villi and obliterative endarteritis (Fig. 29).

Marta describes four cases of *placenta marginata* in abortion. All of these showed evidence of a previous infection, but without symptoms of constitutional reactions. He believes that such placentae develop from inflammatory rather than mechanical causes.

CHAPTER VI

ETIOLOGY OF SPONTANEOUS ABORTION

THE SUBJECT of the causative factors in spontaneous abortion is one of great complexity since a great variety of conditions may be responsible for the early interruption of pregnancy. Unlike such writers as Verrucoli, who in a series of 207 abortions could find no etiological factor in over two thirds, I have found that a causative factor is usually in evidence. The difficulty is rather that so many possible factors are present that it is often difficult to decide which to stress as of the greatest importance. While much additional research will have to be done before the causes of abortion are fully understood, considerable headway has been made in the past twenty-five years. The chapter on etiology in my original monograph (1910) must be completely discarded to make way for the newer ideas on defective germ plasm, endocrine pathology and dietary insufficiency as factors in spontaneous abortion. Certain of the factors in the etiology of abortion are temporary and may not affect succeeding pregnancies; others, on the other hand, are apt to recur with each gestation or be constantly present so that abortion occurs repeatedly. The term "habitual abortion" has been applied to this latter condition. The analysis of factors entering into the production of an abortion is sufficiently complicated without attempting a further subdivision into simple and habitual abortion. At the conclusion of this chapter I will summarize briefly those etiological factors that are apt to be recurrent, and thus lead to repeated interruptions of pregnancy.

The diagnosis of the cause of abortion in a particular case is doubly difficult because in so many instances a combination of factors enters into its production. Let us take, for example, one of the simplest, that of abortion following a sudden fall. We know that only a relatively small number of women who have such an accident will abort. In the presence of other factors, however, such as unusual irritability of the uterus, the time relation of the occurrence to the menstrual period, or local pelvic conditions, such as fibroid uterus, prolapse, cervical tears, predisposing to a loosening of the placental attachment of the ovum, an abortion may result. Similarly we have many instances in which both the embryo and the mother are subjected to some form of injury and it is impossible to say which of the two was the predominating cause for the abortion.

Classification

Nürnberg, in his chapter on etiology in the Halban-Seitz Handbuch, has retained the general division, dating back to the days of Morgagni, of ovular and maternal causes of abortion. I have preferred to consider these two as subdivisions of the general group of primary or fundamental causes, and to add thereto a second group of secondary or exciting causes. The main subdivisions of this etiologic classification would then be as follows:

- A. Primary or Fundamental Causes
 - I. Ovulogenic:
 - (1) Fetal
 - (2) Placental
 - II. Maternal:
 - (1) Constitutional Factors
 - (2) Endocrine Disturbances
 - (3) Infections
 - (4) Pelvic Pathology
 - (5) General Diseases
 - (6) Chemical and Physical Agents
 - (7) Operative Procedures
- B. Secondary or Exciting Causes
 - (1) Physical Trauma
 - (2) Thermic Irritation
 - (3) Psychic Trauma

A. FUNDAMENTAL CAUSES

I. Ovulogenic

(1) **Fetal.**—In attempting to trace the factors leading to spontaneous abortion to their ultimate causes, we have been led more and more to realize that these may antedate the pregnancy itself and depend upon the sex cells, male and female, or upon some special incompatibility between the two, making the impregnated ovum unable to proceed to normal development. The investigations of Mall and Streeter on early abortion ova have not only demonstrated the relative frequency of such ovulogenic factors but have thrown some light upon their origin. Unfortunately the average physician too seldom examines and reports on the expelled ovisac. If this were done, I am sure it would corroborate my experience and that of others, that in early spontaneous abortions one of the most common causes is arrested development of the ovum, leading to its death in the first few weeks. Often the little ovisac contains no visible fetus, or a mere vesicle in place of the embryo. Of human abortion ova dating from the first month, Mall found only a fifth normal, and from the second month only a half normal. The lower mammals with large litters regularly show a large percentage of defective ova that die early in

their development and are, for the most part, absorbed by the time the normal embryos reach maturity and are expelled. Evidence of this is cited by Corner who counted the number of corpora lutea just after ovulation, and found them always more numerous than the litter. In the ferret he found in 165 animals a total of 1,643 corpora lutea with 1,246 embryos, a fetal mortality rate of 24 per cent. In rabbits Hammond found an average of nearly ten corpora lutea per animal with an average of six offspring at birth, a prenatal mortality of about 40 per cent. In dairy cattle and horses, as related by Prof. Williams in Chapter III, indications point to similar prenatal loss, since mating in healthy animals does not always lead to a successfully terminated pregnancy. Following 28,000 matings in horses, Robinson calculated a prenatal mortality of 48 per cent.

Macomber uses the term "defective germ-plasm" as applied to this factor in abortion and notes that it occurs with greater frequency among couples with low fertility. In defining defective germ plasm, Streeter says: "It must be understood that defective plasm is described on the bases of behavior rather than microscopical appearance. The defective egg is one that does not develop properly, rather than one with a characteristic histologic appearance of tissues." In a recent discussion of this subject with me, Dr. Streeter stated: "At times the trophoblast is defective, at times the inner cell mass may be defective and sometimes the fault lies in both of them. At the start there is merely cell division of the impregnated ovum without growth. A certain portion of the cell mass then separates out into the trophoblast and the fate of the two becomes distinct. The trophoblast makes its own blood supply and connective tissue in which the embryo does not directly participate. As to the relative frequency of defects in the trophoblast and embryo, accurate data are not available. All varieties and degrees of defect may occur, sometimes caudal, sometimes at the head end. If the building materials are good then the egg is good. In such cases endocrine influences should not be powerful enough to disturb normal development. In defective germ-plasm preconceptional factors are probably more important than post-conceptional. Trophoblast defects are fewer in number and less important than embryonal defects. If one-half the trophoblast is good it should suffice for the embryo."

In the opinion of Huntington working with Streeter, defective germ-plasm is more apt to occur when the individual is over or under-nourished and is associated often with endocrine disturbances. In 104 abortion ova studied by Huntington, he found 82 ova with faulty developments.

It has long been noted that abortion ova are more apt to occur in male fetuses and Kirstein believes that there may be a hereditary factor that makes them more easily killed by external, harmful influences. If we could determine chemically the nature of the "lowered resistance" factor in males, measures might be devised to lower the number of such abortions. A fatalistic attitude is sometimes assumed by the women who suffer from this type of habitual abortion. Lehmann tells the story of a patient, who had had one living girl and four male spontaneous abortions, who refused to take his sedatives, saying: "If it is going to be a boy, your medicine will not help, and, if it will be a girl, I have no need for your medicine."

Riddle attributes the higher abortion rate in males to the greater vitamin and metabolic requirements of that sex. Especially large quantities of vitamin B are said to be necessary for the male. Genetic weakness of the male as an explanation of greater fetal death rate is untenable. Furthermore the hormone environment of the male fetus in a female host is claimed to be a disadvantage, since the placenta is not a barrier but a filter, and the mother's blood possibly reacts to the male fetus as to a foreign body, producing an anti-testicular substance antagonistic to the fetus.

Diminished vitality in the ovum or spermatozoon has also been mentioned as an etiological factor. Mayer believes that such an ovum may lack the necessary aggressiveness to embed itself into the uterus. The relative frequency of abortion in cases of irregular menstruation may possibly be due to the occasional impregnation of a post-mature ovum. It is, however, a definite clinical observation that abortions occur oftener toward the end of the reproductive period in women over forty years, and that this may be due to diminished vitality of the ovum and the maternal tissues.

G. L. Moench made careful histologic studies of pathologic spermatozoa and found that wives of individuals having a high percentage of such sex cells are apt to show greater than average frequency of abortion. The father is an important hereditary factor in abortion, since deformities are more apt to be transmitted through him. Mayer points out that the value of the impregnated ovum may be influenced by the sperm of the father. The fact that the abortion ova as well as over-size children are predominately masculine together with the evidence of sex determination by the sperm tends to the belief in a paramount importance to be credited to the influence of the sperm upon the growth. Of unusual interest are the two cases of repeated abortion with blighted ovum reported by Sanders, in which no reason could be found in the wife. The husband showed definite pus in the semen due to a non-venereal prostatitis. After massage treatment

the pus disappeared and the next conception, a few months later, was carried to term in both cases. This tends to corroborate the work of Moench. Sanders refers to the experiment done by Macomber, who found that after bilateral vesiculectomy in rats, the female impregnated by them showed an increased tendency to abortion.

Henkel declares that even with ovum and spermatozoa normal, the two may be mismated and lead to faulty development, since it is frequently noted that these same individuals may produce normal, full-term children in a later marriage.

Thus far we have been considering the internal factors in the production of fetal death that leads to abortion. External factors also exist, which, if associated with relatively minor disturbances present in the mother, will result in fetal death and thus eventually lead to abortion. Such harmful substances may be of an infectious, a toxic, chemical or physical nature. While the fetus, in the early months of its development, possesses a certain immunity to various maternal infections, these may at times be transmitted through the placenta and lead to fetal death. The same applies to the passage of certain chemical substances, such as carbon dioxide, chloroform, phosphorus and mercury, and toxins, such as those of diphtheria and tetanus, which, without appreciably damaging the mother, may in rare cases be responsible for fetal death. Hyperpyrexia and the shock of lightning may at times have a similar lethal effect. Nuernberger includes as a cause of fetal death certain metabolic deficiencies, such as the absence of oxygen, albumen, fat, carbohydrates, mineral salts, and maternal hormones. During the Great War there was evidence of the influence of such metabolic deficiency upon the ovum leading to abortion.

Multiple pregnancy is a frequent factor in premature labor and may at times lead to late abortion. This is more apt to occur if there is an excess of amniotic fluid or if there are three or more fetuses (Fig. 30).

(2) Placental Causes.—It is indeed hard to draw the line between those conditions producing fetal death, that are due inherently to the ovum and those for which the placenta is responsible. Mall is inclined to believe that a large percentage of cases of "blighted ovum" are due to factors in the trophoblast. In such pathological embryos he finds the villi atrophied and irregular, the chorion either thin and transparent or thick and hemorrhagic, and a considerable increase in the amniotic fluid with a granular deposit in the liquor amnii. Further discussion of the pathologic factors underlying the "blighted ovum" will be found in the chapter on Missed Abortion.

Litzenberg believes that a vast majority of abortions can be traced to abnormalities of the endometrium, decidua and placenta. In some instances, however, these uterine changes are secondary to other factors such as focal infection, acute inflammation, heart disease, etc. "It is evident," says Whitehouse, "that impairment of nutrition from faulty implantation, absence of essential food factors and the existence of lethal toxins are potent factors in abortion." That fetal death may be secondary to placental changes of great significance is stressed

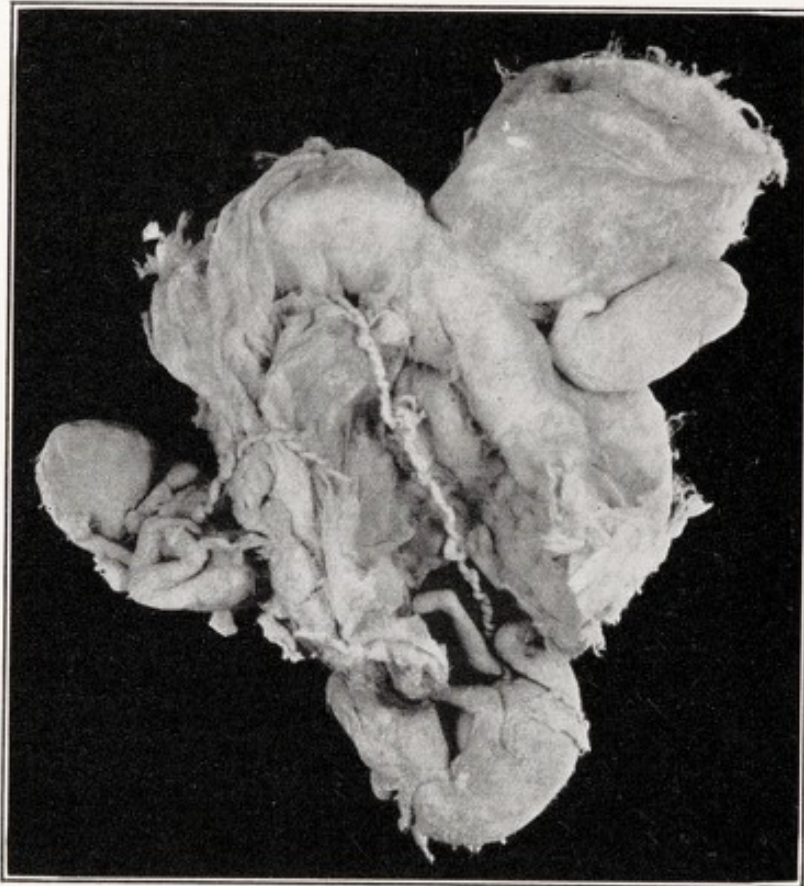


Fig. 30.—Triplet abortion placenta with partly macerated fetuses of about three months' development. (Specimen from Washington University Department of Obstetrics.)

by Henkel. Chorionic villi may have obliterated vessels and there may be hemorrhage and edema indirectly producing fetal death.

Placenta Previa, although more often responsible for interruption of pregnancy after the period of viability, does occasionally give rise to abortion between the third and sixth month. Rhentner and Pigeaud state that in abortion of three to five months gestation, placenta previa is the cause in 15 per cent of the cases. The abortion at this stage is due to changes in the decidua. By a reduction in the size of the decidual mass over the cervix, intervillous spaces and villi are exposed, and the bleeding that results therefrom leads to the expul-

sion of clots from the cervix producing contractions of the uterus by reflex action. These authors believe that the majority of placenta previas that go to term are at this stage of development lateral insertions and only later on cover the cervix completely. The early central implantation is apt to lead to abortion. Six cases of definite placenta previas were reported by them in pregnancies between the third and fifth lunar month. In two cases the diagnosis was confirmed before the abortion and in the remaining four the history and examination of the ovisac left no doubt that a placenta previa had been present. I have seen two cases of abortion, attended by unusually copious bleeding, that were evidently due to placenta previa as shown by the flattened surface, hemorrhagic areas, and shape of the placenta. In many of these cases the ovisac will be expelled intact, and careful inspection will confirm the suspicion of a low placental implantation.

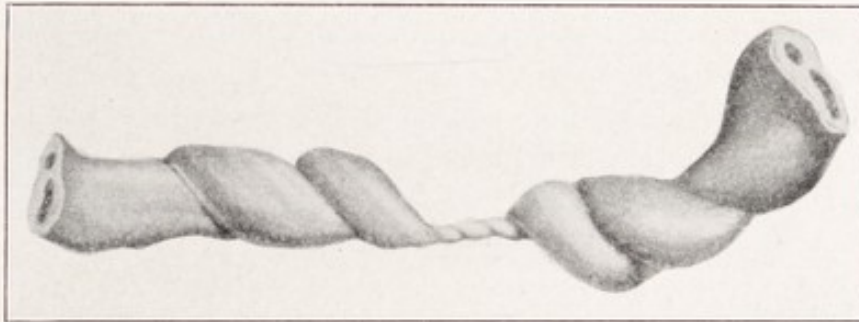


Fig. 31.—Twisted umbilical cord producing abortion. (Redrawn from Halban-Seitz.)

A *twist* of the *umbilical cord* has often been blamed for fetal death and the resulting abortion. A careful check-up, however, will reveal that in many of these cases the twisted condition of the umbilical cord came about after the death of the fetus, chiefly as the result of necrotic changes in the cord, leaving it without any elasticity to counteract twists that might naturally develop. In Fritsch's case the patient had five abortions in all of which torsion of the umbilical cord was noted (Fig. 31).

The suggestion was made by Aschner that some cases of habitual abortion were due to *primary diseases* of the placenta. Some of these cases he believes, heretofore classified as toxic nephritis, should be explained as toxic albuminuria of placental origin. This subject will require additional research before a proper estimate of its importance can be given.

The pathology of *hydatid mole* will be considered in another chapter but it must here be emphasized that in the vast majority of cases of hydatid mole the pregnancy does not proceed beyond the third month.

Only if the area involved by the hydatid change is relatively small and not situated beneath the umbilical insertion, can the fetus continue to develop. Less than one-half dozen such pregnancies going to term are recorded in literature. Hydatid mole is essentially due to a neoplastic proliferation of the trophoblast resulting in fetal death and spontaneous expulsion of the abortion ovisac with its grape-like appendages. Meyer and Mall found eight such moles in 2,400 specimens of abortion.

Inflammatory changes of the decidua, known as *deciduitis*, may result from infectious conditions in the endometrium over which this decidua has developed. The fact that round-cell infiltration is commonly found in all decidua examined in abortion ova will not be taken as evidence that the inflammatory condition is a primary factor, since this may have arisen during the process of abortion. The question is, however, not so much whether these endometrial changes are responsible for the abortion, as how often the blame lies with them. Among animals it has been shown that the presence of infection exudate is of prime importance in causing abortion. In human beings, however, Huntington, Verrucoli and others believe that such a preceding deciduitis due to endometrial infection is responsible for not over one in twenty-five abortions.

II. Maternal Causes

(1) Constitutional Factors.—

Blood Groups.—Careful study of individuals according to their blood group has shown a tendency to abortion in some instances where there was a difference in the blood group of husband and wife. Italian investigators have been primarily interested in this question. Tranquilli-Leali studied 41 habitual abortions without explainable cause and found in 38 an incompatibility of blood groups of husband and wife, and only three pairs with the same group. He compares this with 29 couples who had normal full-term children in whom there were 20 compatible and 9 incompatible blood groups. Paroli also believes that such a constitutional disharmony between mother and father may be a cause of abortion. He studied 27 cases of spontaneous abortion in which lues and other factors could be excluded and found that in 26 out of 27 the parents belonged to different blood groups. In 14 cases they were group I and II; in 5 cases group I and III; in 5 cases group III and IV; and in 2 cases, group I and IV. Additional data on a large scale are necessary before this difference in blood grouping can be definitely accepted as a cause of abortion, since as Mayer points out the placenta as intermediary would doubtless prevent any harmful effect due to the difference in blood groups. Nevertheless,

growth would probably be easier if both spermatozoon and ovum come from individuals of the same group.

Dietary Deficiencies. That the nutrition of the mother must play an important part in the development of the ovum and hence be responsible at times for abortion is self-evident. It was discovered that starvation early in pregnancy leads to fetal death in rats in many instances. Macomber and Vignes have shown that calcium deficiency may be responsible for abortion. E. P. C. Williams found that a disturbance of *carbohydrate metabolism* was present in many cases of unexplained abortion. In nineteen women who had had two or more such spontaneous abortions and who were again pregnant, and in twenty who also had had frequent abortions but were not pregnant at the time of examination, he did a sugar tolerance test and found that it was greatly lowered in 90 per cent. Only 2 of the entire series of 39 cases were normal.

The reason that this factor has been overlooked is that such women on ordinary diet show no leakage of sugar. Williams does the sugar tolerance test in the morning, giving one piece of toast and tea, without sugar four hours before beginning the test. Then 100 grams of glucose is given in one-half pint of water, and samples of blood are taken every one-fourth hour for the first hour and every one-half hour for the next one and one-half hours. The urine is also collected at the end of one and two hours, examined, and the total sugar leakage is estimated. The blood sugar curves obtained by these readings were found abnormally high in 14 cases. Additional evidence, according to Williams, of the significance of faulty carbohydrate metabolism lies in the fact that under proper correction of these dietary deficiencies, 11 of the 19 women who had habitually aborted were carried to full term.

The newer work on *vitamin deficiencies* in diet together with their effect upon fertility and other endocrine disturbances has led to the belief that they might be responsible for many abortions. Evans and Bishop found that vitamin E starvation caused death of the embryo with disintegration and absorption of the placenta, membranes, and decidual tissue. Urner believes that all vitamins may be a factor in abortion. Thus far, however, most of the evidence connecting vitamin deficiency with abortion depends on therapeutic tests. We have thus a number of investigators who found that by giving cod liver oil, especially in the form of viosterol or vigantol, abortion could sometimes be prevented. Klotz and Sanger cite instances of such an apparent favorable influence of cod liver oil extracts. From Scandinavian sources comes the suggestion of Vogt-Moeller to employ wheat germ and wheat germ oil containing quantities of vitamin E as well

as vitamin A to prevent habitual abortion. Even with wasting diseases such as tuberculosis, however, mothers usually give birth to fully developed babies. In this country, where all the needed constituents for a balanced diet are obtainable, dietary deficiencies probably do not play a very great part in abortion, except in domestic animals (Chapter III).

Age. Mention has been made of age as a factor predisposing to fetal death. Dengler records an interesting case in a woman of thirty-seven with a blood pressure of 195 over 125, but without any urinary or blood findings pointing to nephritis, who aborted at the third month. The placenta contained infarcts. Dengler considered that a constitutional arteriosclerosis possibly of hereditary origin (since both father and sister had similar conditions) was responsible for the tendency to abortion.

Neurogenic hypertonicity. Experimental work has demonstrated that the irritability of the uterine muscle to mechanical, thermic and other forms of stimulation is greatly increased during pregnancy. The presence of this high degree of irritability under conditions of ordinary health shows an increase in some individuals to such a degree that the slightest trauma, nervous shock, etc., brings about uterine contractions and leads to abortion. Individuals with excessive constitutional nervous irritability will usually show this in other ways such as marked peristalsis of the intestine, increased urinary frequency, or twitching of the body. Hirst points out that women afflicted with chorea, epilepsy, hysteria and tetany are apt to expel the product of conception prematurely. Under the head of secondary or exciting causes of abortion we have considered a large number of conditions that may bring about uterine contractions. External trauma and psychic disturbances will in some individuals produce not the slightest disturbance of the pregnancy. In fact it is amazing what some individuals may tolerate in this way. Other individuals will respond even to slight shock or trauma with immediate abortion. The favorable therapeutic results produced by complete rest and sedatives in certain individuals is strong evidence of the importance of constitutional nervous hyperirritability as a cause of abortion.

(2) Endocrine Disturbances.—The significant changes that occur in the endocrine system early in pregnancy make it easy to understand that where disturbances occur in this system abortion may readily result. Pituitary, ovary and thyroid are the endocrine organs that most often show some pathology in their function. In every case giving a history of previous spontaneous abortion the basal metabolic rate should be determined before the next conception and repeated during the early months of pregnancy. Frank believes that the follicle

sex hormone test is also of considerable diagnostic value, and should be done routinely in every case of pregnancy with a history of previous abortion.

Insufficiencies of secretion in the anterior pituitary gland are indirectly responsible for some cases of abortion through arrested development of the uterus. In such women pregnancy does not readily take place, and, when it does, the relatively small size of the uterus leads to a tendency to abortion. Such infantile uteruses are usually retroposed and associated with a short posterior vaginal fornix. It not infrequently happens, however, that after one such abortion the uterus has sufficiently enlarged so that in a subsequent pregnancy the child may be carried to term. Weinzerl cites six cases of habitual abortion in women between twenty-four and thirty-three who had such a hypoplastic condition of the uterus. Where conception occurs in very young girls shortly after puberty the lack of growth of the uterus is often responsible for abortion. In India and among Polish Jews where early marriages are of common occurrence abortion is frequent. As a possible explanation, Kermauner suggests incomplete development of the decidua as well as diminished size of the uterine cavity.

The pathological conditions influencing the secretion of ovarian hormones are of the greatest importance. Of these ovarian hormones, folliculin and lutein have thus far been isolated, and each has its special function. It seems logical to assume that disturbances of either will interfere with the imbedding and development of the ovum and so be responsible for abortion. Fraenkel showed over thirty years ago that the removal of the corpus luteum early in pregnancy tended to interrupt it and concluded that this structure had an internal secretion essential for the development of the gestation. Improper function of the ovarian hormones can to some degree be ascertained according to Frank, by the female sex hormone test.

It seems probable that alterations of the primary follicle secretion is of less importance in the etiology of abortion than corpus luteum insufficiency. The a priori assumption of a corpus luteum deficiency in cases of habitual abortion has been confirmed by the clinical experience of many observers. Weinzerl, Wagner, Patti and many others have been able to prevent abortion by the administration of corpus luteum preparation during the earlier months of pregnancy. Whether the benefit of these substances is due to a specific influence upon the development of the ovum or to a lowered irritability of the uterine muscle produced by them is still undecided. The fact that with a discontinuance of treatment in the 4th and 5th month, abortion may

nevertheless occur, points rather to a sedative influence of the corpus luteum than to a specific effect. Candela has done experimental work pointing to a quieting effect of the corpus luteum on a uterus irritated by pituitary extract. A somewhat similar sedative effect has been noted after the ingestion of placental extracts and these too have been recommended as agents for the prevention of abortion.

The condition of the thyroid gland, especially in the earlier months of pregnancy, is a matter of considerable importance, so that Litzenberg and others believe in a routine basal-metabolism test in pregnancy. If this test shows a reading between minus 12 and minus 30, thyroid should be given in small doses and will often be a factor in the prevention of abortion. Abruzzese found faulty functioning of the thyroid gland in 16 out of 30 women who had had an abortion without physical cause. In his 16 cases, a basal metabolism test showed 5 times that it was too low, and 11 times that it was too high. Huntington mentions a deficient thyroid secretion as responsible for cases of abortion. The frequency of abortion in the hyperthyroid women of Switzerland together with the correction of this condition by a thyroidectomy has shown the importance of Basedow's disease as an etiological factor. Mayer calls attention to the fact that experimental injection of thyroid extract tends to shorten pregnancy while a thyroidectomy tends to prolong it. He advises giving iodine in cases of habitual abortion due to hyperthyroid secretion.

Concerning the influence of other endocrine organs such as the thymus, the adrenals and epiphysis so little is known at present that no statement concerning their influence upon abortion is justified. Nuernberger in the Halban-Seitz Handbuch cites the few clinical observations upon this subject thus far recorded.

(3) Infections.—Many acute infectious diseases have a deleterious effect upon pregnancy, and may indirectly be a factor in its interruption through the associated toxemia and hyperpyrexia. Typhoid fever, cholera, scarlet fever, smallpox, erysipelas, encephalitis lethargica, and malaria produce abortion in about one-half of the pregnancies associated with these diseases. Of special danger to the pregnant mother is croupous pneumonia, and the severer type of influenza pneumonia, as reported in the epidemic of 1918. In these chest conditions the cyanosis of the mother is very apt to produce fetal death. It should be noted, however, that in all these acute infections of the mother the likelihood of an interruption of the pregnancy becomes greater with each month of gestation, and is greatest in the last three months.

Malta fever is a relatively rare disease, but special interest connects it with the question of abortion since the organism found in Malta fever (*Bacillus melitensis*) has been found to be identical with *Brucella abortis*, or *Bang's bacillus*, responsible for contagious abortion in cattle. It has been claimed by some observers that women, in tending cases of contagious abortion in animals, may themselves acquire the disease and have an abortion if they become pregnant. Whitehouse reports such a case in which he found the specific organism in pure culture in the mucopurulent vaginal discharge. Simpson and Frazier reported five cases of repeated abortion, four of whom gave a history of obscure undiagnosed fever. All had partaken of raw milk and showed an agglutination test pointing to infection with the specific organism of contagious abortion. Cornell and DeYoung found agglutinins in the placental blood in one patient who had aborted at two months but in 22 others this test was negative. At the present time therefore it would seem that this organism does not play an important part in the etiology of abortion even in those communities where raw milk is drunk from cattle infected with this disease.

Focal infection, while not a common cause of abortion, would seem to be a factor in a certain number of women having a tendency to repeated spontaneous expulsion of the ovisac. In every case of habitual abortion, therefore, it is well to make a careful investigation of the more common sites for focal infection. Curtis in 1916 was one of the first to call attention to the importance of focal infection as an etiological factor. Septic processes about the gums and posterior nasopharynx were found to be particularly associated with a tendency to abortion. The evidence in favor of such a relationship between the two conditions was based upon the finding of streptococci in the placenta in these cases, and the clinical experience that after removal of the focus abortion did not recur. Reith experimentally used cultures of streptococci obtained from the tonsils and placenta of a woman who had had five spontaneous abortions. He injected these into four pregnant rabbits and all four aborted, while of ten pregnant rabbits in whom injections were made from cultures of other organisms, none aborted. He concludes that foci of infection may harbor streptococci that possess properties favorable to the production of spontaneous abortion.

Nickel and Mussey isolated a green-producing streptococcus from infected teeth and tonsils and injected cultures of this organism into pregnant guinea pigs. In six out of seven such cases abortion resulted, with streptococci found in the blood in 50 per cent, in the

uterus in 83 per cent and in the fetus in 50 per cent. As a control they used material where the focal infection produced arthritis but not abortion and found experimentally that abortions were not produced by injections of cultures of this organism. They believe, therefore, that the premature emptying of the uterus in these animals was apparently due to the elective localization and growth of the streptococci in the placental site, and to the death of the fetus from invasion of its blood stream by this organism. The favorable clinical experience of Curtis with his first three cases has been corroborated by other gynecologists and has definitely established focal infection as an etiological factor in abortion.

Syphilis demands first consideration under the head of chronic infections responsible for abortion. A generation ago syphilis was considered the most important etiological factor in the premature expulsion of the ovum. Even at present we find many able clinicians who consider women who repeatedly abort as probably infected with a latent form of syphilis. The mistake is commonly made of not obtaining a careful history in these cases as to the period of gestation at which the ovum was expelled. While syphilis is undeniably the most important factor in the premature expulsion of a macerated fetus in the last three months of pregnancy, it is only in exceptional cases the cause of abortion in the first three months. It cannot, however be denied that so insidious an infection as syphilis may have a harmful effect upon the germinal cells of the parents and thus indirectly have an unfavorable influence upon the development of the impregnated ovum.

According to Litzenberg the *Spirochaeta pallida* is seldom found in the first three months of gestation. At the University of Minnesota Clinic, Adair found that the percentage of abortions in luetic women was not any greater than in women who did not have such an infection. In the much less frequent abortions occurring between the fourth and sixth month of gestation, syphilis is a far more important factor and probably in over one-half of these interruptions of pregnancy we will find the cause in a previous syphilitic infection of the mother. The work of McCord among the colored population of the South would tend to indicate that in this race syphilis assumes a malignant form and is probably productive of abortion earlier in pregnancy and in a larger number of cases.

In England, Pye-Smith found that out of 485 cases of pregnancy in untreated syphilis there were 63 abortions or 13 per cent, which is about the average of abortions in the population as a whole and would

indicate that maternal syphilis is apparently of no great importance as a cause of abortion. On the other hand, there were 73 stillbirths in this group, 15 per cent, which, compared to an average of about 3 per cent of stillbirths for the population as a whole, indicated the importance of syphilis as the cause of late fetal death. "Syphilis of the nervous system," declares Belote, "does not cause fetal death or predispose to miscarriage any more than ordinary late syphilis." According to Marin syphilis is rarely a factor in abortion up to the fourth month. Between the seventeenth and the twentieth week it produced not quite 2 per cent of abortions; between the twenty-first and twenty-fourth week, 7 per cent; and between the twenty-fifth and the twenty-eighth week, 20 per cent.

Tuberculosis will rarely lead to an abortion before the period of viability. It is practically only where some acute flare-up has occurred leading to a pneumonia, that the pregnancy is interrupted spontaneously.

Pyelitis will occasionally produce a disturbance of pregnancy in the middle months that leads to the premature expulsion of the ovum. This is in part due to the toxemia associated with the infection and in part also to the frequency of ureteral colic arising either spontaneously or as a result of ureteral catheterization. The close relationship between the sympathetic nerves supplying ureter and uterus not infrequently leads to rhythmical contractions of the uterine muscle in sympathy with the peristalsis of the ureter and these rhythmic contractions may, if not quieted by opiates, produce an abortion.

(4) Pelvic Pathology.—Various faults of development and pathological processes in the genital tract may predispose to abortion. Mention has already been made of the infantile uterus. A similar reduced capacity of the uterine cavity exists in the bicornuate uterus or one with septate cavity. The restricted space for ovular development in such an organ tends to abortion.

The *lacerations* of childbirth sometimes have an unfavorable effect. This is particularly true of tears that destroy the pelvic floor support and lead to prolapse of the uterus, and to those that involve the cervix, extending to the parametrium on one or both sides, thus leaving the contents of the uterine cavity exposed to infection and trauma. In pronounced laceration of this sort the abortion may be attributed with fair certainty to this cause; but in less severe tears it may be far more difficult to draw conclusions since many women with such lacerations carry their offspring to full term without difficulty.

Jahnke has stressed the frequency of abortion following vaginal cesarean section in which the internal sphincter fibers of the cervix

were cut and poorly united. Leonard, in reviewing the results of amputations of the cervix, states that where pregnancy followed such operations the percentage of abortion and premature labors was increased. A similar report is given by Sfameni. We therefore feel that where the laceration or operative procedure has resulted in a separation of the circular fibers near the internal os of the cervix, the retention of the ovisac within the uterine cavity is rendered more difficult; therefore abortion not uncommonly results.

Retroversion of the uterus is commonly blamed for abortion but this is justified in only a small percentage of cases. Since retroversion occurs in about one-fourth of all women who have had children and since, with but few exceptions, during pregnancy such a retroverted uterus will spontaneously correct itself, I agree with Plass that this etiological factor should not be stressed. Where, however, the retroversion is associated with rather extensive pelvic adhesions, the uterus may become partly incarcerated in the cul-de-sac and through pressure that is thus brought about, may lead to abortion (Fig. 32). Where the retroversion is associated with considerable pelvic relaxation, interruption of a pregnancy is more likely to occur. In these two groups of cases, I think we are definitely justified in attempting to hold up the uterus in its proper position, provided that all manipulations for this purpose are done with extreme care to avoid producing uterine contractions. This can be accomplished by wearing a pessary for the first four months of pregnancy and daily assuming the knee-chest position (Chap. VII, Fig. 33). In some instances the adhesion may be so firm that local measures fail to loosen them and the only escape from an incarceration of the pregnant uterus lies in a surgical correction of the retroversion with opening of the abdomen and division of the adhesions by the scissors.

Myomata are more common in sterile women but the association of pregnancy and myoma is sufficiently frequent to make each case a matter for careful consideration. In general it may be said that if the myomata are few in number, if they are relatively small, and if they are situated at some distance from the uterine mucosa, pregnancy will usually proceed to term without difficulty. If, on the other hand, these tumors are larger and impinge upon the uterine cavity, the circulatory disturbances with which they are associated will frequently lead to a placental hemorrhage and thus to premature expulsion of the ovisac. It would also seem that in the presence of these tumors there is increased irritability of the uterine muscle. Verrucoli believes that the abortion in cases of myoma is due less to mechanical

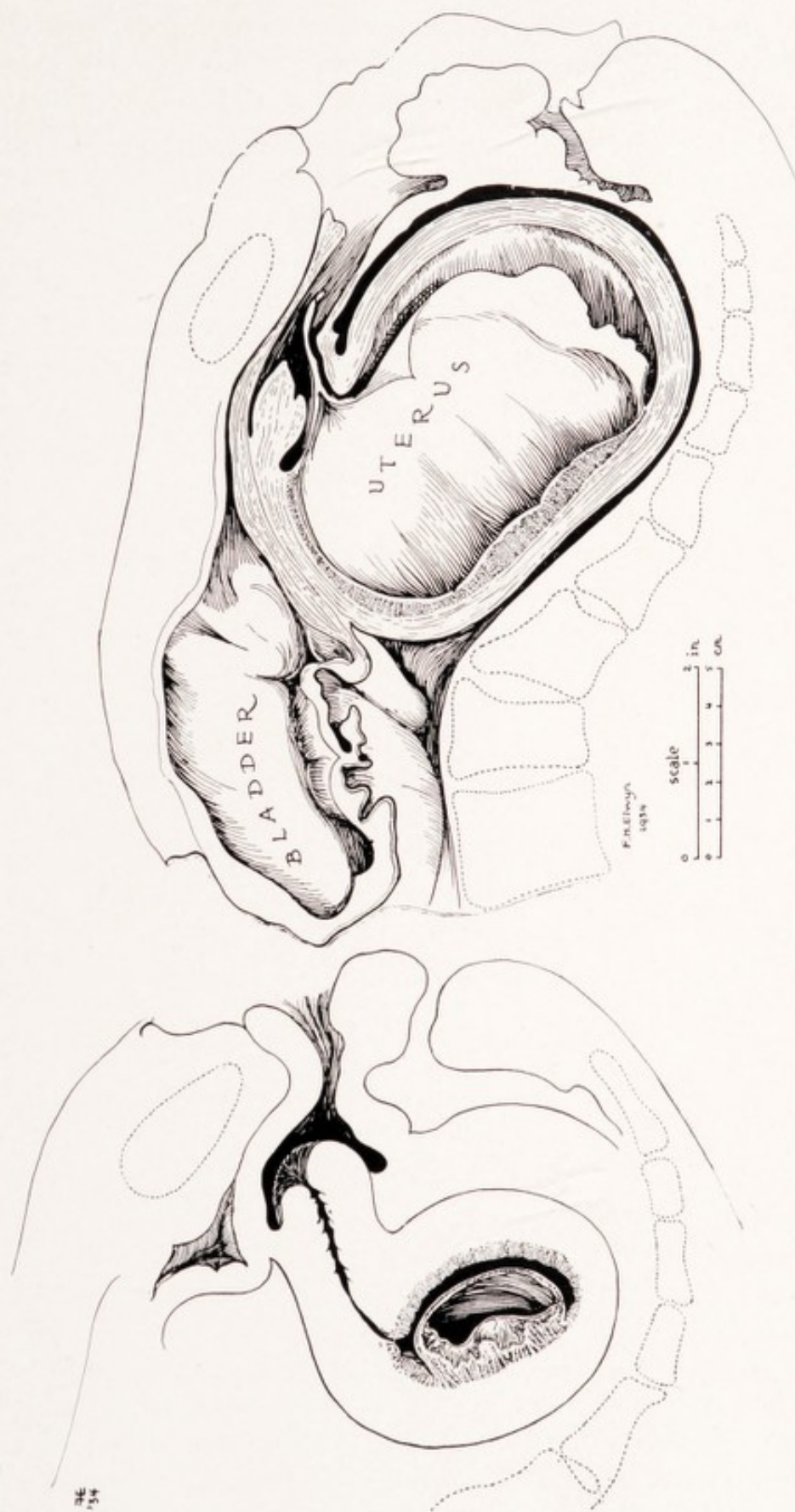


Fig. 32.—Retroverted pregnant uterus. The left-hand figure shows conditions at the end of two months when it is usually possible to correct the position by manual replacement. The right-hand figure demonstrates the anatomic relations in a four months' pregnant incarcerated retroversion of the uterus, with greatly dilated bladder, and threatened abortion.

interference than to death of the fetus resulting from circulatory disturbances that interfere with proper nutrition.

Of other pelvic tumors occasionally responsible for abortion mention should be made particularly of ovarian cysts, especially those that are impacted in the pelvis by old adhesions and thus produce abnormal pressure against the cervix during pregnancy. However, conception is infrequent where adhesions are present.

(5) **General Diseases.**—Though it is always difficult to ascribe with any degree of certainty a general disease of the mother, such as intestinal, urinary, or cardiac, as the sole etiological factor in abortion, clinical evidence would point to such a relationship in certain instances.

Urinary fistulae are often attended by abortion, if pregnancy occurs. Kroner found that in 23 out of 36 such cases the fetus was expelled before viability. Doubtless in many instances this is due to an associated urinary infection with bladder tenesmus. *Bladder calculi*, on the other hand, do not ordinarily bring on an abortion. Trettenero cites a case in which a bladder polyp, producing a severe vesical hemorrhage, was responsible for abortion. Of special interest are the observations of Guy Hunner who found a tendency to repeated abortion in cases of ureteral stricture. These abortions occurred for the most part in the middle of pregnancy and were usually associated with some degree of pyelitis. In three instances, after dilating the strictured area in the ureter, the patients were enabled to carry subsequent pregnancies without difficulty for the full nine months. It seems more than likely that in all such lesions of the lower urinary tract the immediate causative factor of the abortion is a *ureteral* or *bladder colic* brought on by these pathological conditions.

Intestinal conditions, such as obstruction of the bowels, or acute appendicitis, which are attended by marked peristalsis, tend as a rule to bring on abortion if the mother is pregnant at the time. This is less likely to occur, however, if the patient is immediately operated upon and sedatives given. If the appendix lies over the brim of the pelvis and hence close to the uterus, interruption of the pregnancy is the rule. In chronic catarrhal appendicitis there is usually little disturbance of the uterus and even the removal of the appendix is not ordinarily attended by abortion.

Diseases of the *liver* and *gall bladder* may occasionally be an etiological factor. In cholelithiasis, especially if there is an attack of colic, infection of the gall bladder or marked icterus, the continuation of the pregnancy is seriously threatened. In some of these cases the

hyperpyrexia is probably responsible for the abortion. In cases of icterus it is probable that the cholemia brings on uterine contractions and thus leads to a dislodgment of the ovum.

Jaschke, who analyzed 1,548 pregnancies associated with valvular disease of the heart, found that in only 4 per cent did a spontaneous abortion occur. In cases with marked decompensation, however, the resulting cyanosis often led to an interruption of the pregnancy. This is more likely to occur in multiparae than in primiparae. Bronchial asthma may lead to repeated abortion after asthmatic attacks (Kamier).

Diabetes, in former years, was rarely associated with pregnancy because of the resulting sterility of such patients. Nürnberger states that pregnancy occurs in only about 5 per cent of diabetic women. In the last decade this percentage, owing to improved treatment, is probably considerably greater. Nevertheless, the percentage of these pregnancies that end in abortion is very great. Offergeld places it as high as 50 per cent. All diabetic pregnant women must be under constant close supervision of their diet, with the addition of insulin as indicated, to avoid such a termination of their pregnancy.

(6) Chemical and Physical Agencies.—Of the chemical poisons productive of abortion the most common is *lead*. The French Department of Labor in 1905 found that 609 out of 1,000 pregnancies in lead workers resulted in abortion. Benson found in such cases traces of lead in the kidney and liver of the stillborn infants. Blair Bell found definite evidences of a destructive process due to lead in the epithelial lining of the chorionic villi of such abortion ova. It was in fact the basis for his interesting clinical and experimental work upon cancer, since he felt that if lead had such a specific effect upon the embryonal trophoblast it might similarly have destructive properties upon embryonal tumors such as cancer.

The deleterious effect of *alcohol* upon ovum and spermatozoon has been generally recognized and it seems likely that even the impregnated ovum is unfavorably affected if the mother is a chronic alcoholic. How much of this is a direct chemical effect and how much due to associated renal conditions is a difficult matter to gauge.

Nicotine, if absorbed in large quantities by workers in tobacco factories, may tend to abortion but it is most improbable that cigaret smoking even to excess can lead to such an event.

Since *anesthetics* are so frequently employed at the present time in various operative procedures upon pregnant women the question of their abortifacient properties demands careful consideration. Accord-

ing to Davis, chloroform is the most dangerous anesthetic for the fetus, destroying it through excessive injury to the liver cells. Objection is also raised by him to the prolonged use of nitrous oxide anesthesia.

In his monograph "Die Fruchtabtreibung durch Gifte und andere Mittel," Lewin has collected a vast literature dealing with *inorganic poisons*, organic products, and vegetable and animal substances having poisonous qualities that lead to abortion. In most instances these substances are intentionally taken by women to cause interruption of pregnancy. In the chapter dealing with "Methods and Accidents of Illegal Abortion" more details will be found. Here it should only be stated that such poisons may at times be ingested unintentionally with food, and occasionally drugs having abortifacient properties may be prescribed by mistake in quantities sufficient to bring on uterine contractions. This effect may be unavoidable, as in the intensive treatment of severe malaria with quinine. Nevertheless, very few, if any, of these substances are sufficiently powerful, even though classified as *ecbolics*, to bring about an abortion. In the second three months of pregnancy such drugs are more apt to produce an effect than in the first three months. In case of abortion, other predisposing factors are usually present.

Concerning *physical agencies* tending to produce an abortion, only electricity and irradiation need to be mentioned. A stroke of lightning or a powerful electric shock may lead to sudden fetal death or to the production of uterine contractions. Cases of this kind are extremely rare.

Irradiation of the pregnant uterus has been proved to have such a uniformly destructive effect upon the developing ovum that it has been recommended as a non-operative means for therapeutic abortion. Details concerning the dose employed and manner of application for this purpose may be found in Chapter XX. Occasionally, however, it has been employed in cases of pregnancy wrongly diagnosed as fibroid uterus, or in a combination of these two conditions. The positive exclusion of such a pregnancy by means of the Aschheim-Zondek test is therefore, very important. This is doubly true because in the event of a pregnancy treated by large doses of x-ray or radium, if abortion does not occur, the child at term will be found to be either deformed or mentally defective in a very large proportion of instances. These harmful effects of irradiation upon the ovum as shown by Douglas Murphy are limited almost wholly to the large therapeutic applica-

tions directly to the pelvic organs. Where x-ray treatment has been applied to a leucemic spleen and the pelvic organs have been carefully protected from any radiation effect, the pregnancy may proceed with the delivery of a perfectly normal, healthy child developing no harmful after-effects, as in a case recently observed by me. X-ray used briefly for purposes of diagnosis either in a radioscopic or radiographic manner produce no deleterious effects. Even if such examinations have to be repeated a number of times, abortion is usually not produced, nor harmful effects upon the ovum noted later.

Radium treatment for fibroids of the uterus is occasionally followed by a pregnancy. Linton, Marks and Smith found that out of 250 women, so treated, 13 subsequently became pregnant, and that out of 20 pregnancies in these 13 women, only 3 were terminated by abortion.

(7) Operative Procedures.—While all operations that can be postponed until the termination of the pregnancy should, as a rule, be delayed, it may become necessary to proceed actively in the treatment of certain complications. The more common of these are acute appendicitis, ovarian cysts with twisted pedicle, pedunculated adherent fibroids of the uterus, intestinal obstruction, and abscesses in various organs. Particularly if a pelvic tumor is located in the cul-de-sac or near the pelvic brim where it is likely to become a factor in complicating the delivery of the child at term, it is advisable to remove such a tumor relatively early in the pregnancy. The nearer the field of operation is to the uterus, and the more the case is complicated by fever, extreme pain and toxemia, the more likely is the pregnancy to be interrupted by the operation.

It is surprising, however, how well the pregnant uterus will tolerate removal of even fairly large myomatous tumors without abortion, particularly if the operator employs extreme gentleness in his maneuvers, and follows the operation with considerable doses of opiates over several days. Hemorrhoidal operations and operations on the external genitals are more apt to arouse uterine contractions than many major abdominal procedures. Owing to the frequency with which women during pregnancy have teeth that are decayed or infected, the question of whether and when to extract such teeth, often comes up for decision. My advise in these cases has been to delay extraction until at least the 4th month of gestation if this is at all possible, especially if it be a molar tooth and the extraction not a simple one. In most instances I have advised short gas anesthesia in place of cocainization in order to minimize the psychic shock to the

patient. I am quite convinced of the desirability of removing all such infected teeth in view of the dangers, already mentioned, of focal infection as a factor in habitual abortion.

B. SECONDARY OR EXCITING CAUSES

(1) **Physical Trauma.**—The frequency with which external injury or strain has been held responsible for the production of the abortion has already been mentioned. That it is often an important contributing factor in the initiation of uterine contractions cannot be gainsaid. But in most instances a careful analysis will show other more fundamental causes. One may well be skeptical of the effect of even rather violent external trauma in the production of abortion, since we have so many instances in which internal manipulations, such as curettement, have failed to bring on an abortion. Litzenberg cites as an example of this, a case in which he once removed a very large, bone hairpin from a three-months pregnant uterus by vaginal hysterotomy, with no disturbance of the gestation. In discussing this subject, Seitz found that the greatest tendency for traumatic interruption of pregnancy was in the first 16 weeks, even though at this time the uterus lay more protected in the pelvic cavity than later. Direct uterine or penetrating injury is rare. More often it is due to a sudden jar, to sudden increased intra-abdominal pressure, or to psychic trauma. Long, rough automobile rides, especially on motorcycles or side-cars, are productive of abortion in many instances.

Since the question of accident insurance is often raised in connection with alleged traumatic abortions a careful analysis of all possible factors must be made in every instance. If any of the fundamental causes mentioned in the preceding pages are present, the accident cannot positively be held responsible for the abortion. At times abortion may have been induced and the accident then claimed as a subterfuge in order to collect insurance. The presence of fever and ruptured membranes point to instrumental interference. The time relation between the accident and the abortion is also to be noted. If bleeding or rupture of membranes immediately follow the accident the connection between the two seems probable. In most accident cases reported by Zweifel the ovisac was promptly expelled.

Sexual intercourse is probably one of the most positive direct traumatic agents productive of abortion. Even Hippocrates called attention to this. Menge gives as evidence of the relation between coitus and abortion, the fact that in many instances habitual abortion may

be overcome only by the strict prohibition of sexual relations during pregnancy. That abortion should occur with greater frequency where the uterus is retroverted can readily be understood by a consideration of the anatomical factors of coitus under these circumstances. It is also possible, as A. Mayer points out from experimental investigation, that repeated sexual relations may disturb the normal metabolism between the corpus luteum and the implanted ovum. Nevertheless repeated forceful coitus with full orgasm is reported without disturbing effects (Dickinson).

Since there is a physiological connection between the act of nursing and the production of uterine contractions as is normally noted after delivery when the child is put at the breast, it happens at times that when a nursing mother becomes pregnant, the act of nursing will incite uterine contractions and lead to a loosening of the ovum from its uterine attachment.

(2) Thermic Irritation.—Occasionally heat or cold may be a direct exciting cause of the abortion, as it is well known that extremes of temperature applied over the lower abdomen will stimulate the uterine muscle to contraction. This is daily used as a means for controlling excessive uterine bleeding. In many instances of delayed menstruation the application of a hot foot bath or hot sitz-bath or hot water bottle to the lower abdomen is employed to bring on the flow of blood. Doubtless often the bleeding is not a delayed menstruation but an early abortion. Where a pregnancy is not desired by the mother this method of thermic irritation is frequently helpful. On the other hand, taking prolonged hot, vaginal douches, may sometimes unintentionally interrupt a pregnancy. Such accidents are more apt to occur where menstruation is at irregular or long intervals so that the patient is not conscious of the fact that she might be pregnant.

(3) Psychic Trauma.—Psychic shock is perhaps more often responsible for abortion than direct physical injury. Such is the opinion of Seitz and other writers who speak of the frequency of abortion following earthquake, flood, severe fires or the terrors of war. Davis explains this effect of fear upon the pregnant mother as similar to the well-known incontinence of urine and feces under conditions of extreme fright. Bouvogue stated that after the explosion of a powder mill in Grenelle he was called to see 92 women either aborting or threatened with abortion. During the siege of Strassburg, in 1870, many women, who sought refuge in cellars, aborted. Naturally the effect of psychic trauma will depend largely upon the nervous constitution of the mother. Sensitive women with low blood pressure,

who faint under slight provocation, will be more apt to be easily frightened and to have an abortion result therefrom.

In conclusion then, after this rather lengthy array of possible factors in the etiology of abortion, we must confess that our knowledge of this subject is perhaps inversely proportionate to the number of factors that have been mentioned. If, however, the next thirty years show as much increment in the way of information and progress in prevention as the past thirty years have done, we shall be appreciably nearer a solution of the problems that now face us.

CHAPTER VII

PREVENTION OF ABORTION

THE PREVENTION OF ABORTION must naturally be the corollary to the preceding chapter, in which we studied causes. In many ways it is the most important chapter in this volume since it presents the various ways and means at present available to bring about a cessation of those processes that prevent the successful carrying of a pregnancy to term. How much human happiness is involved in the saving of these fetal lives! What greater triumph than to bring to pass the birth of a living child by a mother who for years has had her hopes thwarted by habitual abortions! Unfortunately, as the review of our meagre knowledge concerning the causes of abortion shows, the means at hand for prevention frequently fail. Nevertheless, the practitioner is many times himself to blame for failing to utilize even such aids as are now known.

While we find in some texts a tendency to make a special category of "habitual abortion," it does not seem to me that the distinction adds anything to our understanding. Certain factors, to be sure, particularly those that produce primary death of the ovum, such as endocrine disturbances, defective germ-plasm or dietary insufficiencies, have a tendency to cause repeated abortion; while others, less fundamental, especially those due to external irritation, may not occur in subsequent pregnancies. As it is difficult to draw a sharp line between these factors, I have preferred not to make "habitual abortion" a special topic.

The prophylactic care of abortion can be considered under three heads:

- (1) Treatment of the cause before conception
- (2) Treatment of the cause during pregnancy
- (3) Treatment to prevent uterine contractions

Prophylaxis Before Conception

Either husband or wife, or both, may be a factor in the etiology of abortion, and preventive treatment must therefore include both if abnormal conditions are present. In the husband, it is usual for the abnormalities to be of such a character as to make conception difficult or impossible. If, however, an abortion has already occurred, and the semen of the husband is found to contain evidence of infection, it is important that he receive the necessary local treatment to cure it. Endo-

erine treatment, such as anterior pituitary products and theelin, have also been known to have a favorable effect on less virile spermatozoa. Quite empirically it may be advisable at times, where the husband's basal metabolism is low, to give thyroid gland in small doses to insure the better condition of the male germinal cells. Dietary treatment, especially that directed to increase the amount of vitamin E, is worthy of trial. In any case, wherever our study indicates that the abortion may be due to defects of the germ-plasm, we must bear in mind that these may be inherent in the spermatozoon as well as in the ovum. Finally, where we have evidence of a syphilitic factor, treatment of the husband is equally important with treatment of the wife, since it is claimed that the infectious organism may be carried by the male sperm; and in any case, infection is always possible.

In the treatment of the woman who has aborted, efforts to prevent further abortions should be first directed to the correction of possible factors in the genital tract. Relaxation of the pelvic floor with prolapse, may demand correction. Deep lacerations of the cervix, even though they may be expected to recur in subsequent labors, will at times require operative correction. Hyperplasia of the endometrium may require curettage. Retroversion of the uterus, especially if associated with pelvic adhesions, not sufficient to prevent conception but enough to interfere with the proper development and elevation of the uterus, should be corrected, either by breaking up adhesions and inserting a pessary, or by operative shortening of the round ligaments. In the case of a bicornuate or arcuate uterus with a septum, it may be necessary to cut the septum in order to provide room for the growth of the ovum. In some cases of uterine myoma and ovarian cyst, the removal of the tumor may be required. Since all these abnormalities of the genital tract have been occasionally associated with pregnancies carried to full term, it becomes extremely difficult to select those cases in which we can be sufficiently certain to warrant operating for this reason alone. Only where an abortion has occurred more than once are we justified in definitely insisting on such operations.

Local treatments of one sort or another to improve the condition of the pelvic organs may at times be necessary. In the case of an infantile uterus, benefit has been reported from cervical dilation with the introduction for two or three weeks of an intrauterine stem pessary. In the presence of ureteral stricture as a possible factor in abortion, we may follow Hunner's suggestion to dilate such strictures. In chronic parametritis hot douches and glycerine tampons may prove helpful. Endocrine treatment preliminary to conception has been recommended especially in women with low fertility due to a low ovarian function. Stimulating treatment with vaginal application of radium up to 350

to 400 mg. hr. has, in my experience, been followed in this type of patient by regular menstruation, and in many cases by a conception that was carried to term. The same result may be obtained by carefully administered suitable doses of x-ray. If the lowered ovarian function is associated with a hypothyroid condition, the patient should receive thyroid extract, grains one to three daily, for the month preceding the desired conception. It is also important, where there is excessive activity of the thyroid gland, to give iodine in increasing amounts for a short period preceding the desired conception. If the removal of the thyroid gland is at all indicated, this should preferably be done before another conception has occurred. Some of this preliminary endocrine therapy will fail to accomplish its purpose because of the uncertain fertility of patients of this kind.

A valuable addition to our therapy has come through the evidence that focal infection elsewhere may lead to an infection of the placental site with resulting abortion. The elimination of such possible foci about the teeth, the nasal sinuses, the throat or the abdominal viscera, becomes a matter of importance where there are repeated abortions in the early months without other apparent cause. The clinical experiences of Curtis and others amply justify such preliminary treatment.

Active treatment of syphilis in the mother should be given preferably before conception has occurred, even though it be continued during the pregnancy.

Prophylaxis During Pregnancy

Local treatment of the pelvic organs during pregnancy is necessarily limited by the fact that in sensitive individuals any manipulations are apt to arouse uterine contractions, and hence induce the very condition we are anxious to prevent. This applies particularly to the correction of the retroverted uterus (Fig. 33). Plass states his belief that since in the vast majority of cases such a retroversion is corrected spontaneously, attempted reposition is more likely to disturb the pregnancy than leaving it alone. My own experiences have not corroborated this viewpoint. While frequently abortion may result from forcible attempts to bring the uterus forward, I am convinced that if manipulations be made gently, no harm will be done, and the tendency to increased abortion which unquestionably exists in the retroverted uterus will be lowered. Where gentle bimanual manipulation in the Trendelenburg or knee-chest position fails to correct the retroversion, I usually employ a rubber bag filled with one to one and a half pounds of mercury placed in the vagina (Fig. 34) with the patient in the elevated hip posture for twenty minutes at a time, in order gently to lift the uterus out of the pelvis (Fig. 35). If treatments are given at intervals

of two or three days, and the patient is given opiates and instructed to rest the entire day after treatment, I have never seen any harmful results. Within two or three weeks, the uterus can be replaced, and can be held forward by a pessary until after the fourteenth week of gestation, when it will remain in position without support.

No method of treatment for the prevention of abortion has been attended with as much success as that of endocrine therapy. Particularly



Fig. 33.—Prevention of abortion by replacing the retroverted gravid uterus. The upper diagram illustrates the knee-chest posture and the lower figure shows a pessary inserted with the patient in this position to keep the uterus forward.

in repeated abortion do we find that corpus luteum, given by mouth, or preferably intravenously or intramuscularly, has yielded satisfactory results. Weinzierl orders six to eight tablets of luteo-glandol daily, accompanied by two or three hypodermic injections a week. His six cases, all of whom had previously aborted, went to full term without any additional precautions as to rest. He believes that the lutein extract has a specific effect on the ovum and a sedative effect on the uterus. Even

where the bleeding has already begun and the abortion is threatened, Wolfsohn has successfully employed lutein extract (luteogan) in daily injections intramuscularly, with cessation of bleeding and a successful termination of the pregnancy in seven out of ten cases.

In American literature we also find many favorable reports with the use of lutein extracts. Krohn, Falls, and Lachner advocate the continued use of corpus luteum extract preparations during pregnancy in cases of habitual or threatened abortion. They continue its employment until death of the fetus has been established. In fourteen

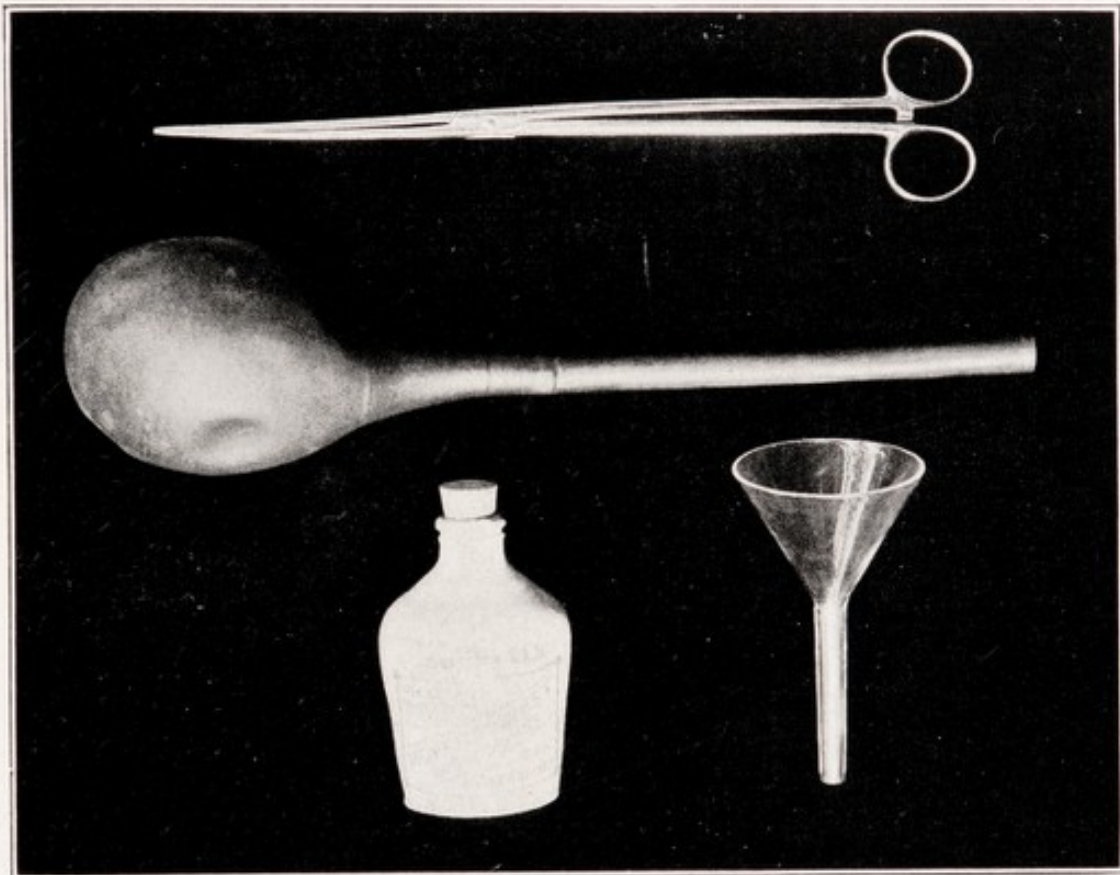


Fig. 34.—Instruments for mercury weight treatment, consisting of a colpeurynter, a flask containing two pounds of mercury, a funnel, and dressing forceps.

out of nineteen cases they were successful. These nineteen patients had had forty-eight previous pregnancies, 69 per cent of which had terminated in abortions.

My personal experience with this form of treatment has been most satisfactory. In one patient who had been pregnant four times, spontaneous abortion occurred twice where no lutein had been given, while in the two pregnancies in which lutein therapy was carried out consistently, the child was carried to term. While we are justified in a certain amount of skepticism regarding the therapeutic value of substances concerning which we know as little as we do concerning

corpus luteum extract, the clinical experience of many men in many countries justifies the assumption that the giving of this extract, especially in the intravenous form during pregnancy, has definite value. In view of the small number of therapeutic measures available, this one should be employed in every case of "habitual abortion."

Other endocrine extracts seem less effective. Theelin, the follicular hormone of the ovary, seems actually slightly to predispose to abortion, and in view of the fact that it is excreted in large amounts in early pregnancy, cannot be required by the embryo and hence is of no value.

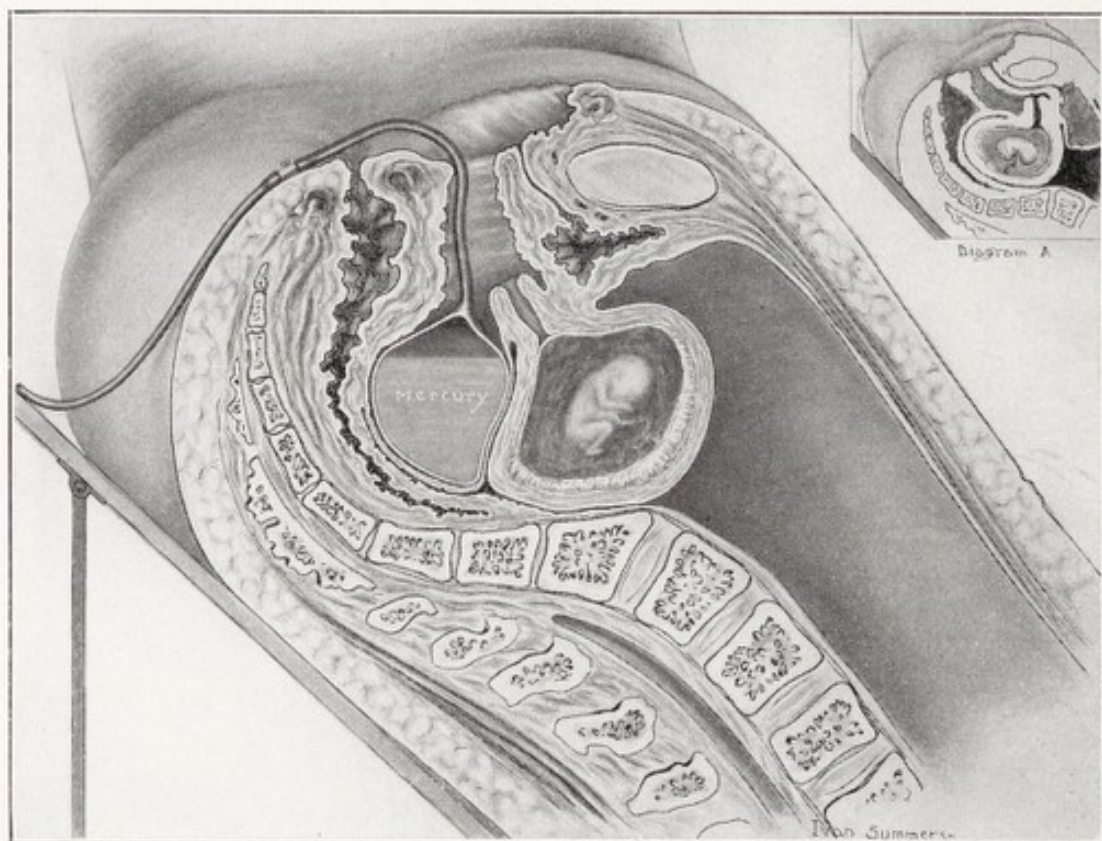


Fig. 35.—Mercury weight pressure treatment for replacing the retroverted gravid uterus. The patient lies in the elevated hip position for twenty minutes, with the bag filled with mercury, pressing against the posterior vaginal fornix. Insert shows anatomic relations before introduction of bag.

Placental extracts as recommended by De Snoo and H. H. Schmid act similarly to corpus luteum. Schmid reports two cases where powdered placenta was given with good results in "habitual abortion." De Snoo gives three grains daily of placental extract, especially in cases of more advanced pregnancy (fourth to sixth month), with the idea that it decreases irritability of the uterus. In cases of marked hypothyroidism, especially if associated with loss of hair and general weakness, thyroid in increasing doses may prevent an abortion. In other instances, iodine will be employed with favorable results. In fact, iodine in the

form of potassium iodide was the favorite remedy for the prevention of abortion for over thirty years between 1880 and 1910. The favorable effect of these iodides was formerly explained as due to the cure of a latent syphilis, but in most instances the effect is more likely to be attributable to its influence upon the endocrine secretions and body metabolism.

An interesting suggestion made by Sellheim, and corroborated by the clinical experiences of other German gynecologists, is the administration of the serum of other normal pregnant women to those having a tendency to abortion. Cases of habitual abortion have been successfully treated in this way abroad.

Sellheim injected 10 c.c. of the blood serum of normally pregnant women with negative Wassermann reaction, intramuscularly every 14 days throughout the pregnancy. The blood was not always taken from the same patient and several times the injections were not continued in the later months. He believes a smaller dosage may be equally effective.

- (1) The influence of the growth stimulating hormone upon the vitality of the chorionic villi.
- (2) The effect of the serum upon fetal metabolism.
- (3) The fact that it may combine with harmful toxins that would otherwise produce fetal death.
- (4) The fact that it favors increased growth of the uterus, and decreased irritability of the uterine muscle.

In connection with the possible effect of such pregnancy serum upon harmful toxins, mention should be made of the favorable results obtained by Vignes in cases of focal infection due to streptococci by the use of a specific streptococcus vaccine. In one case four previous abortions had occurred, and the streptococci were found under the gums of the patient. Twelve injections of an autogenous vaccine, made from these streptococci, were given, and the pregnancy was carried to term.

Finally, the diet of the expectant mother demands careful attention. It should preferably be salt free or salt low, should include ample calcium supply and be rich in vitamins, especially B and E. Vitamin B may be given as viosterol, ten drops two or three times daily; and vitamin E in the form of whole wheat bread, eggs, cream, custard, etc. Vogt-Moeller strongly recommends giving wheat-germ oil containing large quantities of vitamin E in the form of a proprietary preparation called Fertilan. Unfortunately, the preparation of most of these vitamin products is so imperfectly developed that we can as yet make no definite recommendations of any concentrated extracts, but must largely depend upon dietary measures.

The interesting observations of E. C. P. Williams on carbohydrate

metabolism have already been mentioned in the previous chapter. In such cases, where abortion is apparently due to lowered sugar tolerance, the following treatment is instituted: 150 to 300 gm. of carbohydrates are given daily, but in six small instead of three large meals. Insulin was added to this limited diet in two cases, with favorable results in the majority of pregnant women.

To Prevent Uterine Contractions

Since the cause of a previous abortion cannot be determined with any degree of accuracy in more than half the cases, and since in a very considerable number the threatened abortion arises in the first pregnancy of the individual without any clues as to a possible cause, preventive measures must, in this group, consist largely of efforts to head off uterine contractions, or to arrest them if they have already begun.

Our success in these measures will depend to a considerable degree, first upon the underlying sensitiveness of the uterine muscle to various forms of irritation, and in the second instance on the co-operation of the patient in carrying out measures that will prevent the onset or persistence of uterine contractions. Mention has been made of the varying degrees of sensitiveness among women to trauma and pelvic manipulation. Cases are on record where patients have been subjected to intra-uterine procedures such as the introduction of a catheter, curettement, etc., and nevertheless have carried the pregnancy to full term. In several instances, the catheter or other foreign body introduced into the uterus remained until the onset of labor and was expelled with the child; while in other individuals, the gentlest of pelvic examinations may bring on uterine contractions and abortion.

The co-operation of the patient in the prophylactic treatment is of greatest importance. Many times the patient is unwilling to be subjected to the absolute rest in bed necessary to prevent a miscarriage, owing to the fact that she is not particularly anxious to have more children. In other instances the social and economic conditions in the home may be such as to make it impossible for her to give up her family occupations such as cooking or care of children; or, in the case of the actual onset of bleeding, to go to a hospital, where absolute rest in bed may be assured. In many instances it will require great tact on the part of the physician, and patience on the part of the expectant mother, to bring the pregnancy to a successful termination. The physician often-times will be unjustly criticized in those cases where in spite of prolonged rest in bed, the abortion has nevertheless occurred. Such unjust criticism every physician must face from time to time, and notwithstanding will do his utmost to carry out the measures necessary to save the life of the child "in utero," even though the mother is lukewarm in her desire

for further offspring. The physician should, of course, familiarize himself with the symptoms and findings of inevitable abortion, more particularly with those cases of fetal death giving a negative pregnancy hormone test, so that the rest treatment need not be carried on unnecessarily when the fetus is dead and the abortion is no longer preventable.

Before the actual onset of contractions or bleeding, which point to threatened abortion, our efforts should be directed toward the elimination of all possible irritating factors. Once a diagnosis of pregnancy has been made, all forms of violent exercise, such as tennis, running, swimming, or prolonged dancing, must be prohibited. Household obligations should be limited to the simplest things, with the avoidance of anything that entails heavy lifting or stretching. Attention to regularity of the bowels is of great importance so as to avoid straining at stool, which is apt to loosen the attachment of the ovum. Prolonged automobile rides are inadvisable, and in fact any form of travel involves some risks. Sexual relations are absolutely to be prohibited in women who tend to abort readily in the first four months, and in certain instances this restriction should extend throughout the pregnancy.

We know from physiological investigations that although, as a rule, ovulation ceases during pregnancy, the menstrual wave, as manifested by slightly increased body metabolism and increased nervous irritability, may persist for several months after conception in certain individuals. For this reason the measures employed to allay uterine irritability are to be more strictly enforced at the time of the expected period. I make it a rule, in cases where the possibility of abortion demands special consideration, either because of a previous accident of this sort or because of a preceding sterility, to put the patient to bed for from five to ten days at the second and third expected menstrual period; at the same time giving luminal, half grain three times daily, in certain instances, combined with a quarter or half grain of codein. During this period of prolonged bed rest, the diet is regulated, with or without the addition of mild laxatives such as mineral oil, to prevent constipation. The evidence from recent reports of the sedative value of corpus luteum extracts justifies our giving this preparation in hypodermic form or intravenously, especially at the expected menstrual periods.

Even more stringent measures are necessary, if in spite of these instructions, or without previous warning, symptoms of uterine bleeding or contractions have arisen. In such cases, large doses of opiates should be given at once in the form of morphine (gr. $\frac{1}{3}$ to $\frac{1}{4}$), repeated in a half-hour until pains cease or respirations are reduced to fifteen per minute. Dilaudid (gr. $\frac{1}{32}$), hypodermically, repeated every two to three hours for four doses, should effectively control uterine contractions, and seems to have less tendency to produce constipation than other forms of

opiates. The barbiturates in fairly large doses also have an excellent sedative effect and may be given for a long period of time after the opiates have quieted uterine contractions. Varo recommends a combination of novatropin and papaverin. Graff gives suppositories containing extract of belladonna (gr. $\frac{2}{3}$) or atropin ($\frac{1}{600}$ gr.), three times daily.

All medication, however, is of secondary importance to absolute rest in bed. If the patient remains at home, a bed pan must be employed. Preferably, such patients should be sent to the hospital where they can be watched more closely, and hypodermics given whenever needed. Psychic rest is also of considerable value, and this constitutes another reason for hospitalizing many patients, especially where the presence of children or other members of the family may be a source of irritation at home. It will often be a matter of considerable difficulty to decide how long such absolute bed rest must be employed, but I prefer to err on the side of extreme caution, since in many cases where I have tried to shorten the time of precaution, bleeding and contractions have returned. If no fresh bleeding has occurred for five days, and only a small quantity of brownish vaginal discharge is present, I permit the patient to sit up in bed and in the course of another week, to leave the hospital. Naturally, we must be guided to a large degree by the particular circumstances of the case. If the pregnancy has occurred after long years of waiting, and the possibility of another conception is very dubious, no stone must be left unturned to carry out the treatment of rest and sedative to the ultimate degree. In some instances, only by prolonging this rest to the period of viability, can we hope to be assured of carrying the pregnancy to a successful conclusion. Patience is rewarded in many of these instances. Jensen-Carlen reports success in five out of seven cases of "habitual abortion" with bed rest alone. Van Dongen was able to save 38 per cent of his threatened miscarriages.

In conclusion, therefore, we must avail ourselves of all agencies known at present for the prevention of abortion, and trust that future investigations throwing further light upon possible causes will before long place more effective measures in our hands.

CHAPTER VIII

MECHANISM OF ABORTION

IN CONTRAST to the mechanism of labor at term the *Modus Abortus*, or method of abortion, presents interesting variations that may be grouped into the typical one-stage expulsion and the atypical two-stage expulsion.

One-Stage Abortion

The one-stage type is usually limited to the first twelve weeks of pregnancy. If we will recall the anatomic conditions at this time, the reason for this will be self-evident. The ovisac at this period has not as yet developed villous stems that penetrate into the uterine wall and effect a firm attachment of the embryo to the mother. Particularly in the first six weeks, only a layer of decidua rather loosely glues the ovisac to the uterine mucosa. This decidual layer completely lines the uterine cavity and separates the mucosa from the fibromuscular wall. When, therefore, either through fetal death or other spontaneous causes, uterine contractions are aroused, the separation of the entire ovisac with the decidual envelope is readily accomplished. Particularly if preceding these contractions there has occurred liquefaction necrosis of the decidual layer will the expulsion of an intact ovisac be the usual mechanism (Fig. 36). At times that portion of the decidua over which the ovisac lies is first loosened and the blood clot that forms back of it extrudes it into the uterine cavity. If the parietal layer still partially clings to the uterine wall, a mechanism may result similar to the expulsion of the placenta by the Schultze method, the ovisac preceding the passage of the parietal decidua, so that the surface lining the uterine cavity is outside.

The mechanism of such one-stage abortions is only possible where there has been no previous intrauterine instrumentation. In the latter event there is almost always a considerable amount of retained material. Even in the typical one-stage abortion we not infrequently find a larger or smaller island of parietal decidua which is subsequently expelled or removed with the curette.

Two-Stage Abortion

Where pregnancy has advanced beyond the twelfth week, it is extremely rare for the ovisac to be expelled intact. Nürnberger describes four varieties of two-stage abortion (Fig. 37):

(1) The decidua capsularis tears off from the parietal decidua and the embryo is expelled in its capsularis sac with subsequent expulsion of the remaining parietal decidua.

(2) The embryo is expelled intact, covered by its membranes but with both capsular and parietal decidua remaining in the uterus and expelled later.

(3) The chorion has also been detached and the embryo is expelled in its amniotic sac.

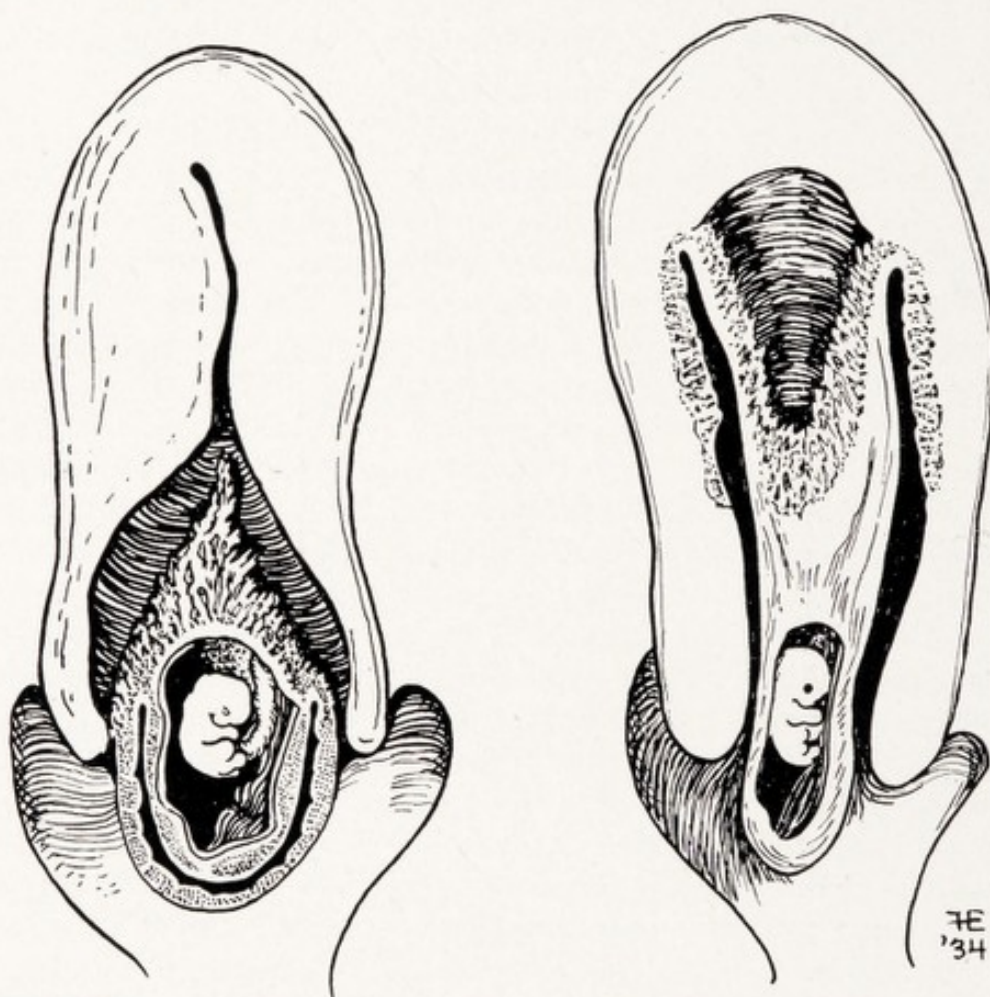


Fig. 36.—One-stage mechanism of abortion. The left-hand drawing shows the ovum expelled intact in its decidual sac; the right-hand drawing shows the decidual sac ruptured and the ovisac extruded with the inverted decidua following it.

(4) The membranes rupture, the embryo is expelled followed later by the placenta as in delivery at term (*Modus Partus*).

Concerning these four methods of two-stage abortion, it is noteworthy that the fourth type in which the fetus is expelled separately, occurs more often between the twentieth and twenty-eighth week. This mechanism of abortion is usually followed where there has been instrumental rupture of the sac and is more common in cases in which inflammatory changes of the membranes have produced abnormal friability.

The expulsion of the embryo in its amniotic sac is extremely rare and happens usually between the twelfth and eighteenth week of gestation (Fig. 38). In the first form of two-stage abortion the smooth, glistening

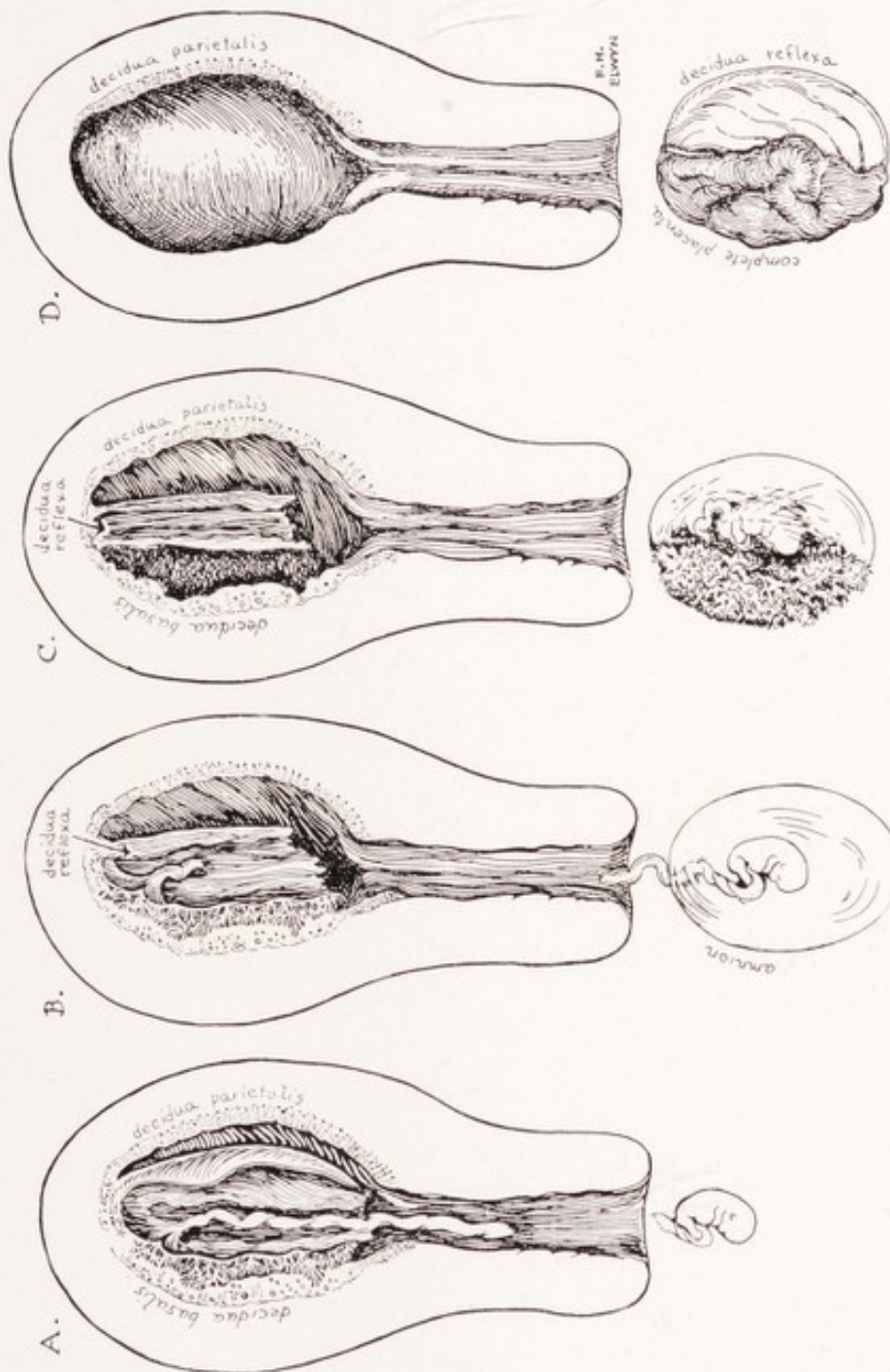


Fig. 37.—Two-stage mechanism of abortion. A. Fetus expelled first, followed by placenta, decidua and membranes. B. Fetus expelled intact in its amniotic cavity, followed by placenta and decidua. C. Fetus expelled in its amnio-chorion, followed by entire decidua. D. Fetus expelled unruptured with its entire placenta, leaving only the decidua parietalis in the uterus.

surface of the decidua can readily be distinguished from the rough, shaggy covering that marks the placental site. Where the entire decidua has been stripped off and left in utero, the expelled ovum is entirely covered by such a shaggy surface (Fig. 39). On the whole, the decidual

coating is more friable than the other tissues and portions of it are more apt to break off and be left behind. In most instances these pieces



Fig. 38.—Eight weeks' fetus with unruptured amniotic sac, corresponding to stage B in Fig. 37.

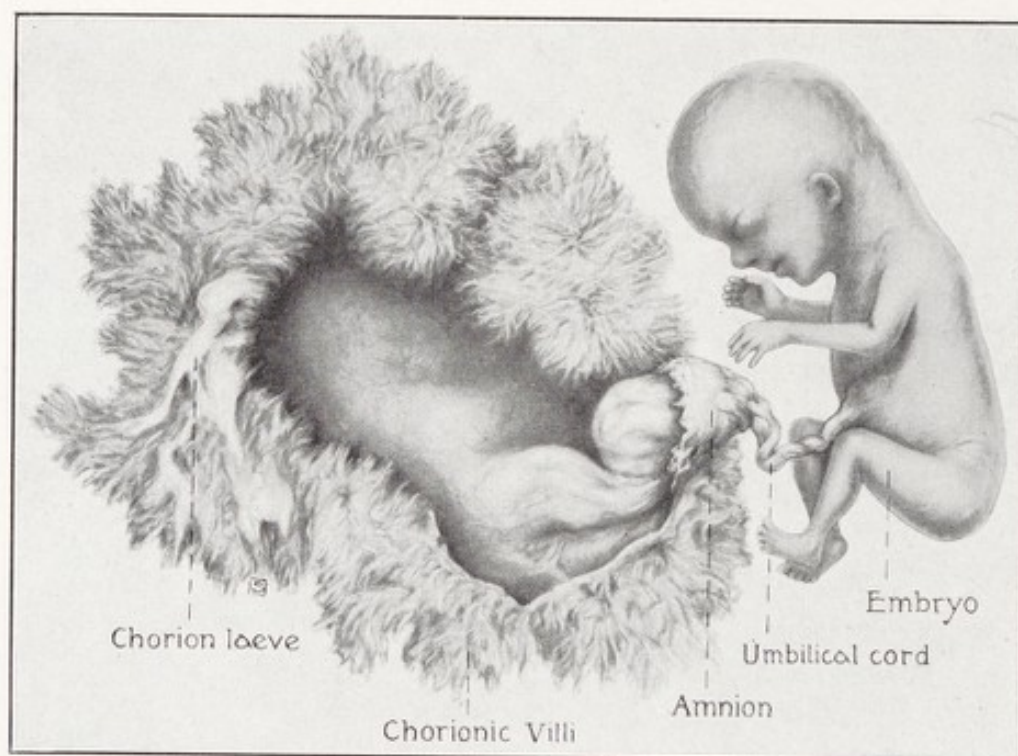


Fig. 39.—Fetus and placenta of twelve weeks' development. The fetus after rupture of the membranes was first expelled but remained attached to its placenta.

of decidual tissue are expelled spontaneously one or two days after the abortion has occurred (Fig. 40).

If the entire ovisac is expelled spontaneously in one or two stages, we apply the term *complete abortion*. If, on the other hand, portions of

the embryo, the placenta or decidua remain in the uterus, the term *incomplete abortion* is used. In the stage in which contractions and bleeding have started but the ovisac has not yet been detached, we apply the term *threatened abortion*. If such a detachment of the ovisac has reached a stage where nothing can prevent its expulsion, we refer to it as *inevitable abortion*.



Fig. 40.—Intact uterine cast of decidua, expelled subsequent to the fetus and placenta from same case (Fig. 39).

Cervical Abortion

Among the more uncommon forms of abortion is that in which the mechanism of expulsion of the ovisac meets with such resistance at the external os of the cervix that although the ovum has been completely

detached from its site in the body of the uterus, it remains lodged in the cervical canal for a considerable time (Fig. 41). A few factors that predispose to such cervical retention might be mentioned: low amputation of the cervix, radium stenosis of the cervix, cautery stenosis, and agglutination or partial atresia of the cervix. Bacialli reported a case of two months' gestation in which the cervix was ballooned out by the

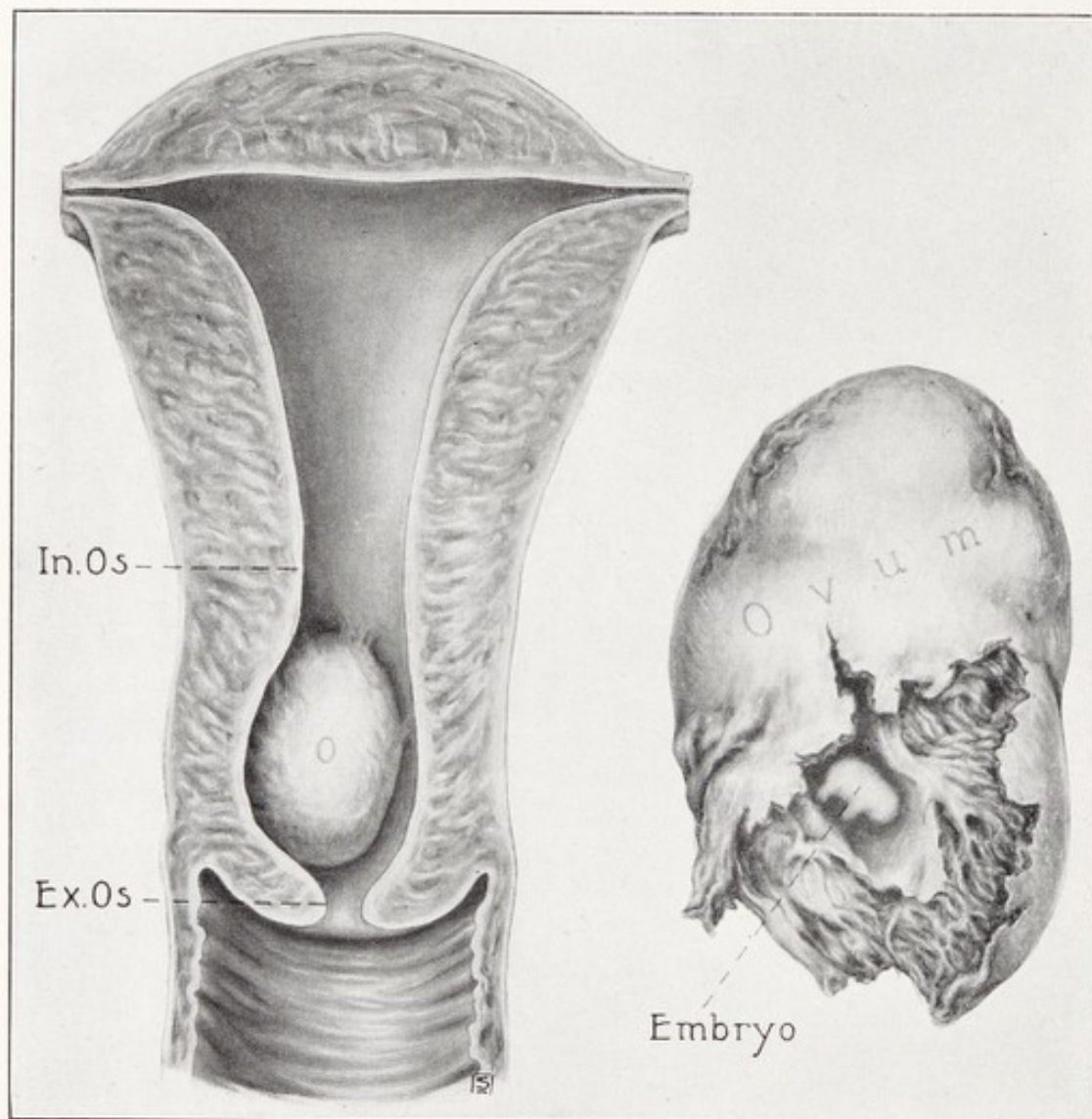


Fig. 41.—Cervical abortion. To the left, the uterus with ovum lying loosely attached in the dilated cervical canal; to the right, the ovum opened up after expulsion to show the small embryo within its amniotic cavity.

ovisac with the fundus of the uterus riding above it like a cap. In this case there was free hemorrhage so that the cervix had to be cut to permit the extraction of the ovisac. In the case described by Masieri a cervical abortion occurred at the third month followed in three months by another pregnancy in which a similar lodging of the ovisac in the cervix occurred. The absence of contraction pains and the frequency

of rather free bleeding is characteristic of this mechanism of abortion. It is possible that in some of these cases the development of the placental site may have been near the internal os. But the rarity of a decidual reaction in the cervix makes it improbable that we are here dealing with a primary attachment of the ovisac in the cervical canal. Furthermore, examination of the expelled ovisac reveals usually a fibrinous coating indicating that the ovum has been detached from the maternal circulation for some period of time.

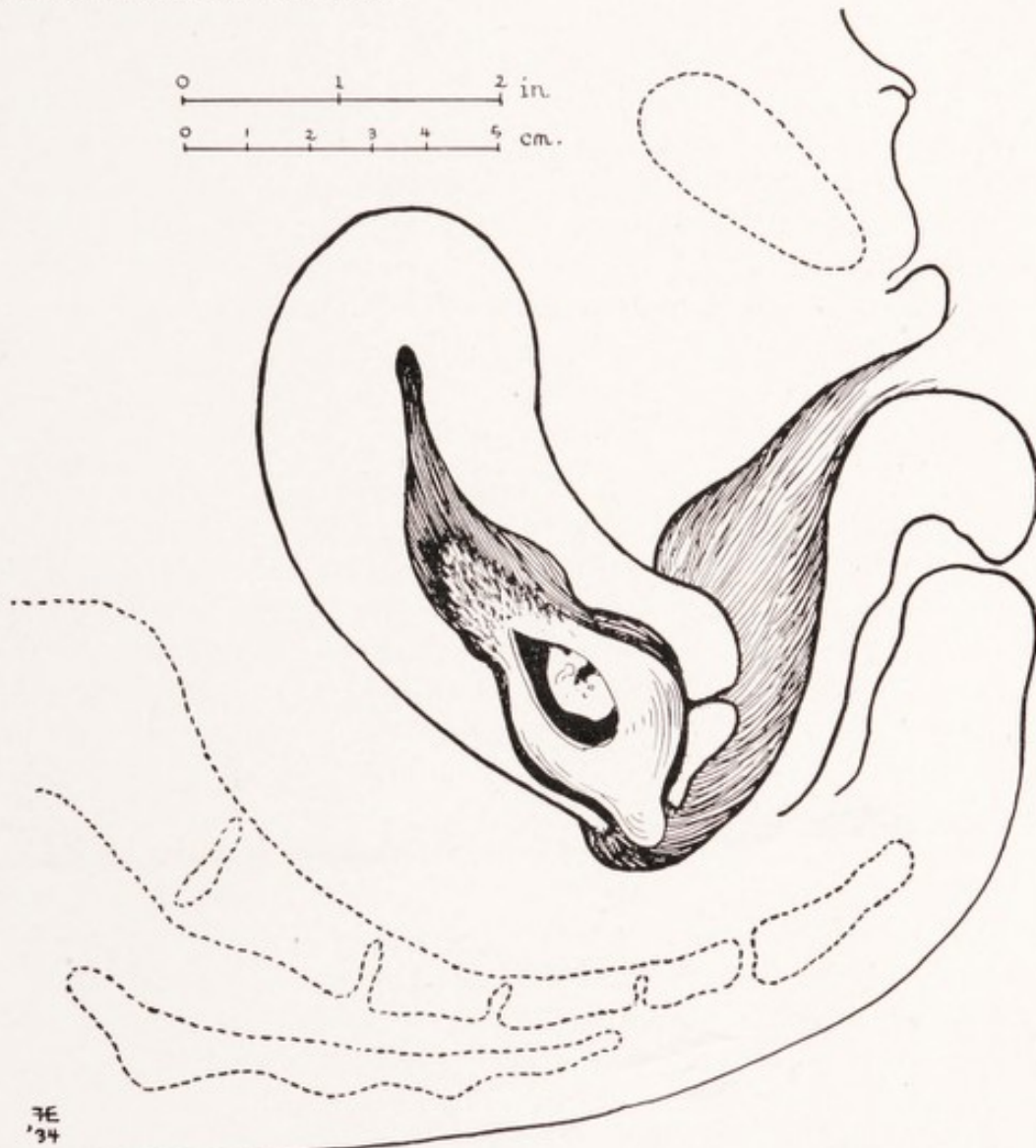


Fig. 42.—Abortion through cervico-vaginal fistula. Notice the thick, tightly closed, cervical canal, and the thinned-out ruptured posterior wall of the cervix with ovisac protruding.

Abortion Through Cervico-Vaginal Fistula

As an occasional termination of abortion Heynemann calls attention to a mechanism in which, with a tightly closed cervical canal the ovisac is forced through the thinned out cervico-vaginal junction, thereby creat-

ing after its expulsion a cervico-vaginal fistula (Fig. 42). Vonnegut in analyzing three cases with this type of mechanism was of the opinion that previous instrumentation, or attempts at instrumental abortion, had weakened the cervical wall and created a false passage so that the ovisac was expelled more readily through this passage than through the cervical canal. He states that such fistulae occur almost exclusively in primiparae after the third or fourth month. Caffier (four cases) also states that these fistulae almost invariably are preceded by criminal punctures or ill-advised efforts to dilate the cervical canal. The spontaneous expulsion of a five and one-half month fetus through the posterior wall of the cervix into the vagina is described by Silin who attributes it to an abnormally rigid cervix. In the summary of thirteen cases in literature reported by Bublitschenko only three had previously had children. He believes that where there has been no instrumentation this accident may occur as a result of extreme ante flexion of the pregnant uterus with anatomical thinning of the upper part of the cervical canal.

Vaginal Abortion

In extremely rare instances we may find a stenosis of the vagina that, similarly to the mechanism of cervical abortion prevents the expulsion of the ovisac, although it is lying in the upper vaginal canal completely extruded from the uterus. A tendency to rather extreme hemorrhage has been noted in the few cases on record of this method of expulsion.

Concerning the mechanical factors that enter into the prolonged retention of the ovisac, as in missed abortion and mole pregnancy, we refer the reader to Chapters XVI and XVII, where this subject is considered in greater detail. In general we may say that the normal physiological reactions in the form of rhythmical contractions of the uterine muscle are as characteristic in abortion as they are in full term labor. These colic-like pains of uterine contraction are limited to the period in which the foreign body (ovisac) is still within the uterine cavity. Once it has been expelled into the vaginal canal the painful contractions cease, provided the mass of the ovisac is not too large. We thus find in abortion of the first three months, even though the ovisac is not expelled from the vagina, that the cessation of uterine contractions indicates that in all probability the ovisac has been completely expelled from the uterine cavity.

CHAPTER IX

SYMPTOMS AND SIGNS OF ABORTION

PRECEDING THE SYMPTOMS produced by the abortion, we find practically without exception some evidence of the pregnancy itself. These symptoms consist of absence of menstruation for a greater or less period of time, nausea and vomiting, fullness and tenderness of the breasts, and increased frequency of urination. Any or all of these symptoms may, however, be lacking at times, so that the patient does not even suspect the occurrence of a pregnancy at the time when the abortion has already begun. Two conditions are particularly likely to lead to such mistakes. One is that in which the presence of myomata in the uterus has led to a persistence of a menstrual-like bleeding in the early pregnant uterus. The other occurs in patients who have been in the habit of menstruating with great irregularity at intervals of from six weeks to four or five months and who have therefore paid little attention to a renewed period of amenorrhea and have interpreted the return of clotted vaginal bleeding with cramps as an abnormal painful menstruation until the expulsion of the ovisac has demonstrated their mistake.

Usually the symptoms of pregnancy will pursue their normal course, with typical changes as the pregnancy advances. Where, however, there has occurred relatively early a sudden complete cessation of the nausea, or where in later months the fullness of the breasts shows a definite subsidence associated with an absence of enlargement of the uterus and the lower abdomen, we may seriously suspect, even in the absence of the active symptoms of abortion (bleeding and contractions) that something has happened to the ovum to produce fetal death.

As a rule, the first symptom of an impending abortion is experienced by the patient as a rather pronounced backache, or colicky cramps in the lower abdomen. Particularly in primigravidae should the occurrence of a persistent backache in the first two or three months of pregnancy, if not explainable on other grounds, arouse suspicion of an impending abortion. Associated with this backache we occasionally find an increased amount of mucous discharge, even before the appearance of any bloody tinge. Then within a period of time varying from a few hours to several days there may occur a bloody vaginal discharge usually bright red at its outset with a few clots that enable one to distinguish it fairly readily from a menstrual flow.

At other times bleeding may be the first symptom. The patient may wake up in the middle of the night without any feeling of discomfort in the back or abdomen but with a free bright red vaginal bleeding as evidence of the disturbed gestation.

The severity of the pains and the amount of the bleeding vary greatly in the individual case. In some women the pains are so slight that they pay but little attention to them and proceed with their daily routine until the abortion has occurred. At other times the pains may be so severe that the patient declares that it was worse than having a baby. Naturally, the more advanced the pregnancy, the greater the dilatation of the cervix, and consequently the greater the severity of the contractions and the pain experienced. In the primigravida whose cervix has not before been subjected to dilatation the pain experienced is more severe than in the plurigravida.

In the quantity of bleeding and its persistence there is also great variation. More profuse bleeding is present in the more advanced pregnancies. The character of bleeding varies, depending upon whether or not there has been a cessation of uterine contractions. From a bright red color with clots the vaginal discharge gradually changes to a dark red and finally to a brownish tinged flow. With renewed detachment of the placental site, this discharge may again assume a bright red color with increased flow. Other symptoms such as a dragging sensation in the pelvis, increased frequency and urgency of urination and a pressure in the rectum associated with a tendency to constipation may be present. These rectal symptoms are particularly pronounced if opiates have been given to retard the progress of the abortion.

In a pregnancy of over ten weeks' duration the amniotic sac may rupture with the expulsion of a watery discharge. In a few instances this symptom associated with a slight tinge of blood may be the first indication of the abortion and in such cases the abortion is inevitable. As a rule, the rupture of the amniotic sac occurs only after a considerable period of uterine contractions associated with pain. The amount of fluid naturally varies with the stage of development of the pregnancy. The passage of the fetus following upon the flow of amniotic fluid is characteristic of abortion where the pregnancy has advanced to four to six months.

The course of the abortion shows great variation in its duration. At times the process is completed within an hour regardless of rest and the giving of sedatives. At other times it may extend over several weeks or even months before the ovisac is expelled.

Physical Signs.—Examination of the patient with beginning abortion will usually reveal certain definite changes. By vaginal palpation the cervix will be found somewhat softened, with the external os as a rule

showing increased patency, often sufficient to admit the finger tip. At times a bit of the ovisac can be felt protruding from the uterine cavity into the cervical canal. Even where the cervix is closed, however, other changes will be manifest. The characteristic softening of the lower uterine segment known as Hegar's sign will either be absent or markedly less than the average finding, so that cervix and body of the uterus are equally and continuously firm in consistency.

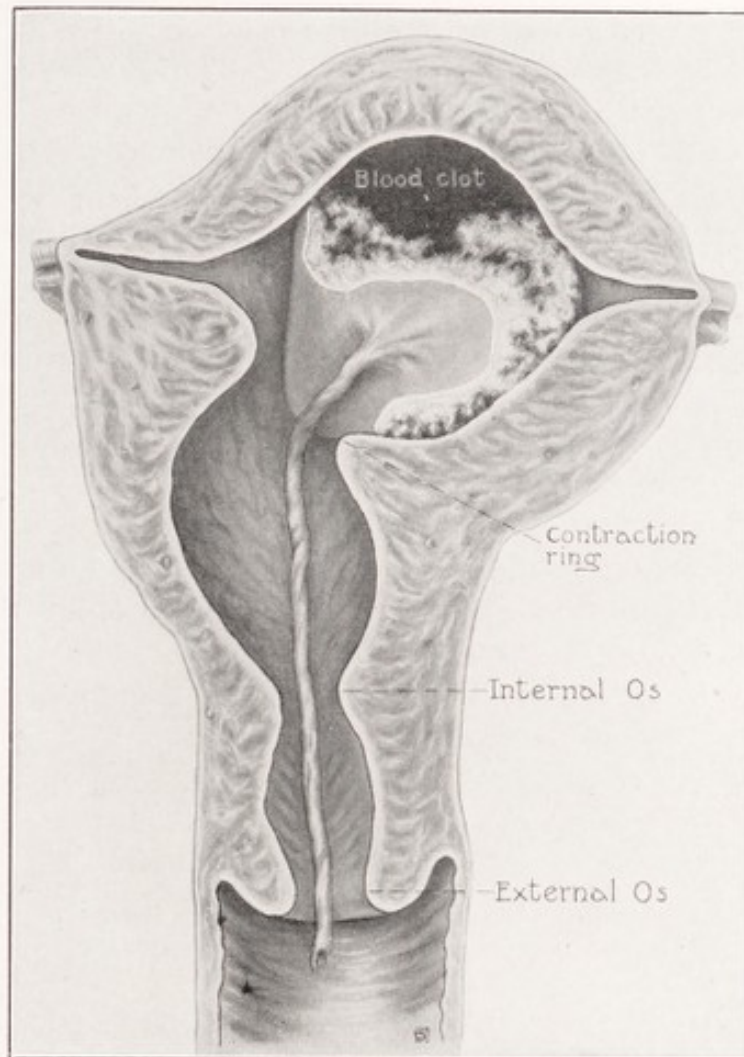


Fig. 43.—Placenta of five months' gestation pocketed in the horn of the uterus.

The impression is gained of a lessened angulation or ante flexion of the uterine body. The body of the uterus will also be altered in consistency. Its compressibility will be less marked, the contours of the uterus will be more clearly outlined, its consistency will be somewhat firmer, its shape more definitely rounded, and its position more erect. At times, in the process of palpation an increasing hardness, associated with discomfort or pain by the patient, will give evidence of increased uterine irritability, with relaxation and contraction noticeable to the fingers in the bimanual

examinations. As the expulsion progresses, the physical examination will reveal greater dilation of the cervix with more or less extrusion of the ovisac into the vagina. At times the fetus may be felt lying within the cervix or halfway extruded into the vagina with the uterus riding above it, still containing the placenta. When the fetus has been expelled and the placenta retained, the uterus remains large and boggy, somewhat asymmetrical (Fig. 43).

The adnexal regions will usually show no abnormal findings, although in thin-walled women it may be possible to palpate the ovary which has been enlarged by the corpus luteum of pregnancy.

In abortions occurring from the fourth to the sixth month of gestation, we occasionally find that, after the complete expulsion of both fetus and placenta, there may develop on the third day post-abortum, as in full-term pregnancy, an engorgement of the breasts with an outpouring of milk-like secretion. This engorgement may be quite painful and last for several days.

Since the risk of infection is great, even in spontaneous abortion, physical examinations should be reduced to the minimum. Rectal bimanual palpation will usually suffice to diagnose the condition of the cervix and the presence of abortion products in the vagina. If vaginal examination is required, the vulva should be shaved and cleansed and the hand protected by sterile gloves. The presence of blood clots about the vulva makes it desirable to shave the vulva and apply sterile pads, even where no treatment or examination is planned.

CHAPTER X

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS

SINCE IRREGULAR menstruation in the form of amenorrhea followed by a rather free flow of bright red clotted blood is not uncommon, it is most important to determine whether or not in a given case the patient is pregnant, so that treatment may be guided accordingly.

Pregnancy Hormone Test.—In arriving at this diagnosis, we may now rely not merely upon the history and physical signs, but also upon the results of the *Aschheim-Zondek* or *Friedman* laboratory tests for the presence of a pregnancy hormone. The factors producing this reaction and the technique of this test will be found fully explained in textbooks on obstetrics. With increased perfection of technique the percentage of error in cases of pregnancy advanced beyond the fifth week of gestation is now not over two or three, and it has therefore become one of the most valuable adjuncts in the diagnosis of pregnancy and so important that every practitioner should be familiar with it. The main features of the Friedman test are as follows:

About three to four ounces of a fresh morning specimen of urine of the patient are brought to the laboratory, and 5 to 10 c.c. of this urine are injected intravenously into the marginal ear vein of a mature female rabbit. After thirty-six to forty-eight hours the animal is opened for examination of the ovaries and in case the patient is pregnant, there are one or more hemorrhagic follicles or corpora lutea. The urine is usually filtered and weakly acidified before injecting it into the animal.

The use of a rabbit, first suggested by Friedman, in place of the mice or rats originally used by Aschheim and Zondek, has the advantage of greater simplicity and speed. The test is about 98 per cent positive (Fig. 44).

Wheal Test.—A further test worthy of mention in the early diagnosis of pregnancy is the development of wheals, "quaddel-reaction" following upon the intracutaneous injection of an isotonic saline solution. The technique of this test is as follows: 0.2 c.c. of an exact isotonic normal saline solution is injected intracutaneously in the flexor surfaces of the lower arm and lower leg. The wheals formed by this injection will usually remain on an average for an hour. Obladen, who investigated this test in pregnant women, found that these wheals were absorbed more readily in pregnant than in normal women. In pregnancy from the

third month on the wheals disappear in twenty to thirty minutes. In pregnancy after the second month, the test was positive in 27 of the 31 cases. In the first eight weeks of gestation, however, the test was positive in only 12 out of 18 cases. In 19 patients who aborted the reaction returned to normal 3 to 4 days after the ovisac was expelled. In two out of three cases in which the fetus had been expelled but the placenta retained, the reaction remained positive. (Absorption of the wheal in

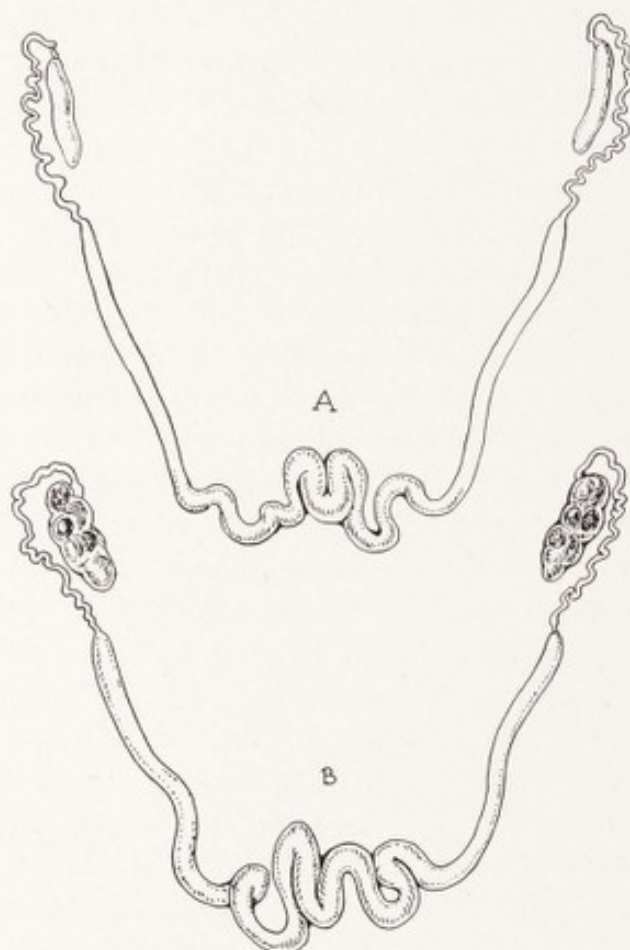


Fig. 44.—Friedman hormone test for the diagnosis of early pregnancy. A shows a negative reaction; B, a positive reaction with many hemorrhagic follicles.

thirty minutes.) In 60 controlled cases where no pregnancy existed there was never any shortening of the absorption time of the wheal.

With a percentage of error amounting to 7 the wheal reaction cannot replace the hormone reaction of the Aschheim-Zondek test, but may prove to be a valuable corollary to it. The greater value of the pregnancy hormone test is in the earliness of the answer, right after the first omitted period. By the time the second period is overpassed, bimanual examination will elicit the globular, enlarged compressible uterus with softening of the lower uterine segment, and laboratory tests will usually not be required to establish the diagnosis of a pregnancy.

Another important aid in the early diagnosis of pregnancy is a roentgenogram of the pelvis after pneumoperitoneum. Peterson who developed this method was successful in making the diagnosis uniformly between the sixth and tenth week of gestation without any disturbance

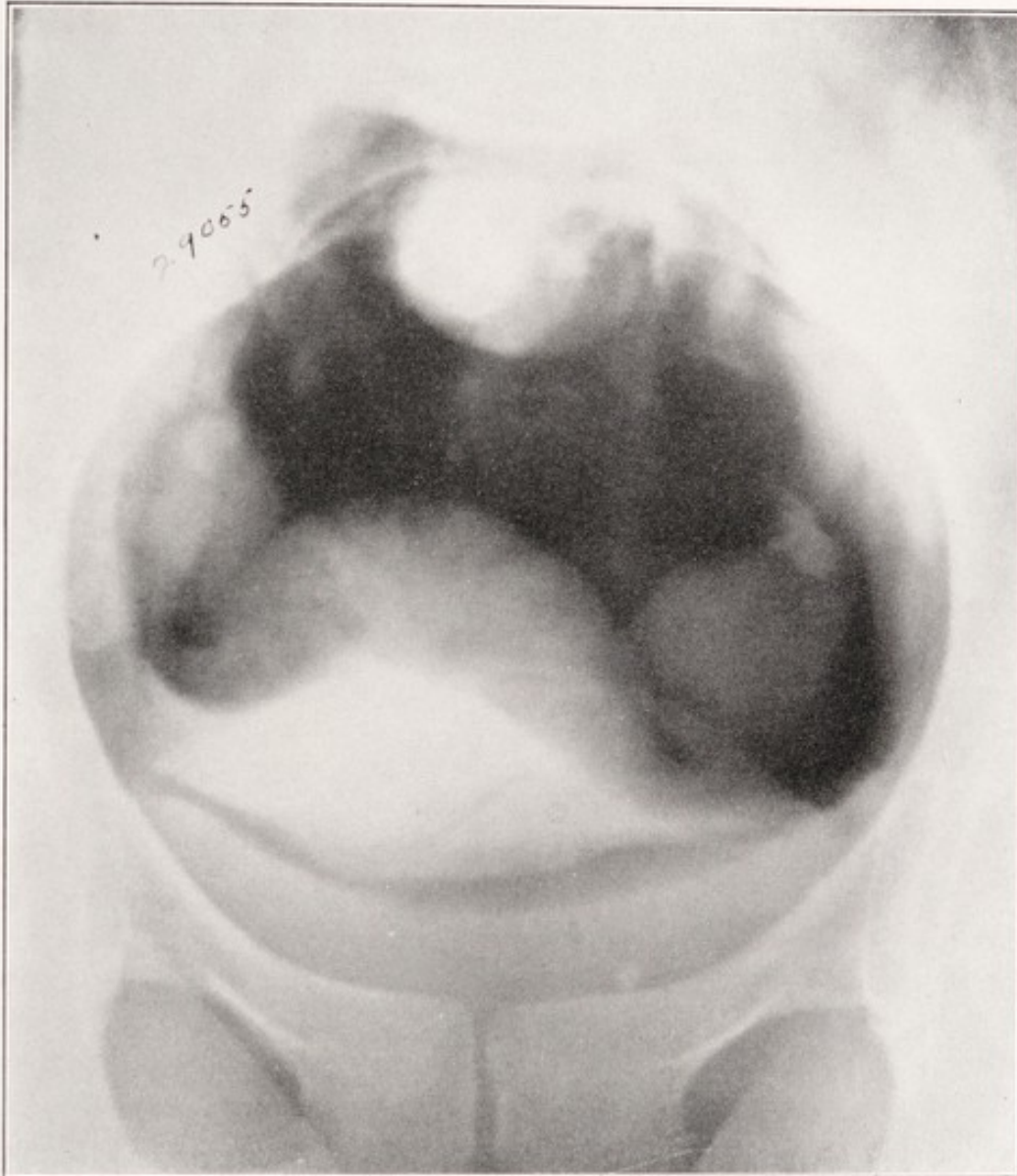


Fig. 45.—Roentgenogram after pneumoperitoneum of pelvic organs in a patient two months pregnant, an aid to early diagnosis. (Courtesy of Dr. Irving C. Stein.)

to the patient from the injected air. The enlargement of the uterus, especially at a point corresponding to the lower uterine segment, is quite characteristic. The accompanying illustration (Fig. 45) was made from a case of Dr. Irving Stein, who has done much to develop the technique of this procedure. It is positive long before any ossification centers of the fetus can be visualized.

Diagnosis of the Abortion

Granted that the fact of pregnancy has been established with reasonable certainty, upon what do we base the diagnosis of an abortion? First of all upon the bleeding, irregular as to onset and amount, lasting far beyond the usual menstrual period, and attended with clots; in the next place upon the pains, characterized by their rhythmic progression, radiating over the lower abdomen to the symphysis. If the patient has been recumbent for some time, digital examination will reveal the presence of clots, in greater or less amount, filling the vagina. The cervix will, as a rule, show some degree of dilation depending upon the stage of abortion during which the examination is made. It may happen that a portion of the ovum is palpated at the external os in process of being expelled. Bimanually, the uterus has no longer the soft consistency of the pregnant organ, but is quite firm, owing to the continued contractions. Owing to this hardness the outline of the organ becomes more distinct. At times, in abortion of the fourth or fifth month, such uterine contractions can be observed by the examining hand.

Should the question of pregnancy be in doubt, the diagnosis of abortion becomes much more difficult. We must try to discover the various factors that might reveal the existence of a gestation. However, this is a matter of considerable diagnostic difficulty, since during the abortion the physiological succulence and softness of the pregnant uterus has to some extent disappeared. There is some diminution in the size of the uterus. In the second month of gestation the aborting uterus may feel almost as firm as a normal one.

Where the previous history and the physical examination leave us without a clue, we can often draw positive conclusions by investigating the character of the material expelled from the uterus. Unfortunately, women do not realize the importance of saving such pieces for the inspection of the doctor. Too often we are met with the reply that they were passed in the toilet or thrown away, as of no consequence, or we must be guided by the oftentimes very inaccurate description offered by the patient herself. When the tissue is kept for examination, small pieces of chorionic membrane are usually readily recognized by their delicate coral-like character. Often the embryo is not discovered in early abortions. Not infrequently it undergoes partial or complete liquefaction. The decidua has usually a somewhat brownish color and is in layers. The ovisac itself may vary in size from a small vesicle, the size of an acorn, to a mass as large as a grapefruit.

Microscopically, the diagnosis of a preceding pregnancy, and hence of an abortion, may be made from such spontaneously expelled material, or from the particles obtained by a uterine curettement. Suspicion of a

pregnancy may be aroused by the presence of proliferating glandular tissue as described in the chapter on Pathology, and by the presence of decidua cells. Many have contended, and it seems to me with reason, that the positive diagnosis of an abortion can be made when large islands of typical decidua cells are found in the curetted particles. To those who have examined many such specimens, the differentiation between such deciduous areas and those found in menstruation or in interstitial endometritis is comparatively easy. If the number of decidua-like cells is few, and they are scattered, no positive conclusions can be drawn from their presence. A certain microscopic diagnosis can be made by the finding of a single chorionic villus and typical proliferating syncytium. Such a picture can be produced by no other pathological condition and is of special value in the testimony of cases of criminal abortion.

Diagnosis of the Stage of Abortion

It is not enough, in a given case, merely to determine the fact that we are dealing with an abortion. We must further seek to determine in what stage the abortion may be, for the treatment differs radically, depending upon this factor. In general we speak of *threatened* abortion when definite symptoms have set in, but it is still possible that the expulsion of the ovum may be prevented. *Inevitable* abortion is the term applied when it is no longer possible to check the expulsion. Abortion is spoken of as *incomplete* when portions of the ovum are still left in the uterus. *Complete* abortion refers to the condition immediately after the expulsion of the ovum has been fully accomplished. *Recent* abortion is the condition several days after complete expulsion of the ovum. Each of these five stages in the expulsive process has distinctive signs and symptoms, and must be carefully differentiated.

Threatened Abortion.—This is indicated by a vague feeling of malaise, headache, backache, and increased frequency of urination. After these symptoms have persisted a day or so there is usually a show of blood in the vaginal discharge and a few abdominal cramps.

Inevitable Abortion.—Abortion can usually be considered inevitable.

- (1) When the amount of blood lost is considerable or the bloody discharge prolonged for several weeks.
- (2) When the pains become severe, occur at regular intervals, and are of a cramp-like character.
- (3) When the cervix is dilated sufficiently to admit one finger.
- (4) When there has been a watery discharge indicative of a rupture of the membranes.
- (5) When the fact of fetal death has been determined.

The diagnosis becomes more certain if several of these factors have been established. Boldt declares that if there is present a persistent bloody grumous discharge, even without any marked pains or cervical dilatation, an abortion is inevitable. The extent of cervical dilatation is of diagnostic value chiefly in primiparae. In women who have had children, there may be considerable cervical dilatation without any interruption of gestation.

One of the questions that we are often called upon to answer, is: How long can I let this woman bleed before changing my diagnosis of threatened abortion to one of inevitable abortion? The question is not always easy to answer, for we must be guided by the total quantity of blood lost, the severity of uterine contractions, the methods of treatment previously employed, and by the patient's reaction to them. Whether the bleeding has lasted several weeks or not, abortion is not usually to be considered inevitable until the usual measures to check bleeding and expulsive pains have been tried in vain.

In general, we may say that where treatment produces no decided effect within one week an abortion is likely to occur. Bleeding prolonged over three weeks is rarely attended by continuation of pregnancy. A word of warning, however, should be given against using the watch and the calendar in the determination of this question. Our judgment must be based upon a consideration of all the various factors.

A sign of inevitable abortion emphasized by Tarnier is the effacement of the acute angle, formed anteriorly between the neck and body of the pregnant uterus. This effacement indicates a contraction of the longitudinal fibers of the uterus, and hence a descent of the ovum itself, owing to dislocation from its site of attachment.

Rock says that if the flow of blood in 24 hours equals the height of the usual menstrual flow, the chance of saving the pregnancy is small, especially if this bleeding is associated with the onset of regular painful contractions. Fresh blood indicating persistent bleeding is of greater importance than dark red or brown discharge. Five napkins soaked with red blood in one day or five days of three napkins each points to inevitable abortion. Rock also considers intermittent contractions as more favorable than continuous ones. Even so, it is important to establish a definite formula for the general practitioner. Naturally if an error is to be made it should be rather on the side of conservatism, trying to preserve the pregnancy, whenever possible, especially in those cases where a child is greatly desired.

Incomplete Abortion.—It is often extremely difficult to determine with certainty whether expulsion of the uterine contents has been completed. Consideration of the clinical course and the bimanual examination will usually solve the question. Of the clinical signs the continuance

of profuse bleeding points to retention of placental tissue. Normally we find after abortion a moderate bloody discharge which within a day or two becomes very slight. If tissue has been retained the flow remains brighter red and clotted, with an increasing odor to the discharge so that in five or six days it becomes unbearably offensive. There are usually noticeable waves of uterine contraction and a somewhat persistent backache.

Characteristic of the retention of portions of the ovisac is the reaction to ergot. Especially in abortion of the third month or more, we find that there is a noticeable increase in the strength and regularity of the painful uterine contractions within one hour after the ergot is administered if there is material inside the cavity.

In the physical examination of cases of incomplete abortion we especially observe the openness of the cervix and the relatively large size of the uterus itself. Naturally the duration of the pregnancy will have to be considered in determining whether or not the uterus is still abnormally enlarged. Increased softness also points to retention of placental tissue. If the cervix is large enough to admit a finger tip, it may be possible actually to feel such particles of retained placenta. In abortions of the first month or two, the cervix may be entirely closed and the uterus uniformly firm in spite of the fact that material has still been retained. When symptoms point to the possibility of such retained material it will usually be wiser, provided the patient is in a hospital, to proceed with a curettement even though such a procedure will at times bring away very little additional material. As will later be discussed in the chapters on Treatment, many physicians prefer to do a routine curettage in all afebrile abortions even without definite evidence of placental retention.

Diagnosis as to whether or not an abortion is complete is rendered more certain if all material that has been expelled is saved and carefully inspected. Under the head of Mechanism of Abortion will be found a description of the physical appearance of the ovisac under various conditions. All blood clots must be carefully teased apart to exclude the possibility that they conceal parts of the ovisac. The transparent jelly-like appearance of the ovisac in the earlier months covered by the coral-like projections of the chorionic villi is quite characteristic. The smooth, somewhat striated, grayish red appearance of the decidua is also noteworthy. The fetus, especially in cases of retained abortion, may be so macerated as to be barely recognizable as a brownish amorphous mass. The retinal pigment in these cases resists disintegration and the two black dots in the amorphous mass may be the only positive evidence that we are dealing with a fetus. In cases of blighted ovum the intact

amniotic sac may be opened and reveal no visible evidence of the embryo. Since much valuable information both as to retention of portions of the ovisac and as to possible causes for the abortion can be obtained by careful gross examination of the tissues expelled, it is important to ask patients to preserve such bits of tissue in a jelly glass or jar and cover them with dilute alcohol (half strength commercial) for this purpose.

Recent Abortion.—Recent abortion, that is to say, abortion that has occurred anywhere from two to fourteen days previously, occasionally demands diagnosis for medico-legal and therapeutic reasons. Especially where the suspicion of criminal interference is at hand, a careful diagnosis is of the greatest importance. On digital examination we find, in abortions that have recently occurred, a rather free, usually blood-stained or brownish discharge, a patulous cervix and a somewhat enlarged uterus that is still a trifle softer than normal. From the microscopic examination of curetted particles, or from the uterus at autopsy where death has occurred, we can determine the presence of typical decidua or of chorionic villi. The uterine cavity at autopsy usually presents a somewhat shaggy appearance at the site of the placenta.

Diagnosis of Fetal Death

Since on the one hand conditions may arise producing death of the fetus without arousing any uterine contractions, bleeding, or other symptoms of threatened abortion, and since, on the other hand, fetal death obviously indicates an impossibility of carrying the child to term, it becomes a matter of diagnostic importance to determine whether fetal death has occurred. Naturally if by careful observation no progressive enlargement of the uterus is noted, it is fair to assume that fetal death has occurred. Since these facts, however, are usually very difficult of determination except after a month or two, efforts have been made to supplement physical examination by laboratory tests. An interesting observation has been made and confirmed that the so-called pregnancy test already referred to becomes negative approximately two weeks after fetal death has occurred. Characteristic of this group of cases, in which the dead ovum is retained for a long period, is the fact that this process occurs most often in women who have been previously sterile, that it is characterized by a prolonged, bloody vaginal discharge of a crumbly, brownish character, and that uterine contractions are usually very slight or entirely absent. With such a history we should at the end of two or three weeks do a pregnancy hormone test. According to Brindeau, if the pregnancy test is carried out on a quantitative basis, it will in the case of retained dead ova show a strength of 80 to 500 units as compared

with the 2,000 to 3,000 units normal in pregnancy and an abnormally high positive of 300,000 units in cases of hydatidiform mole.

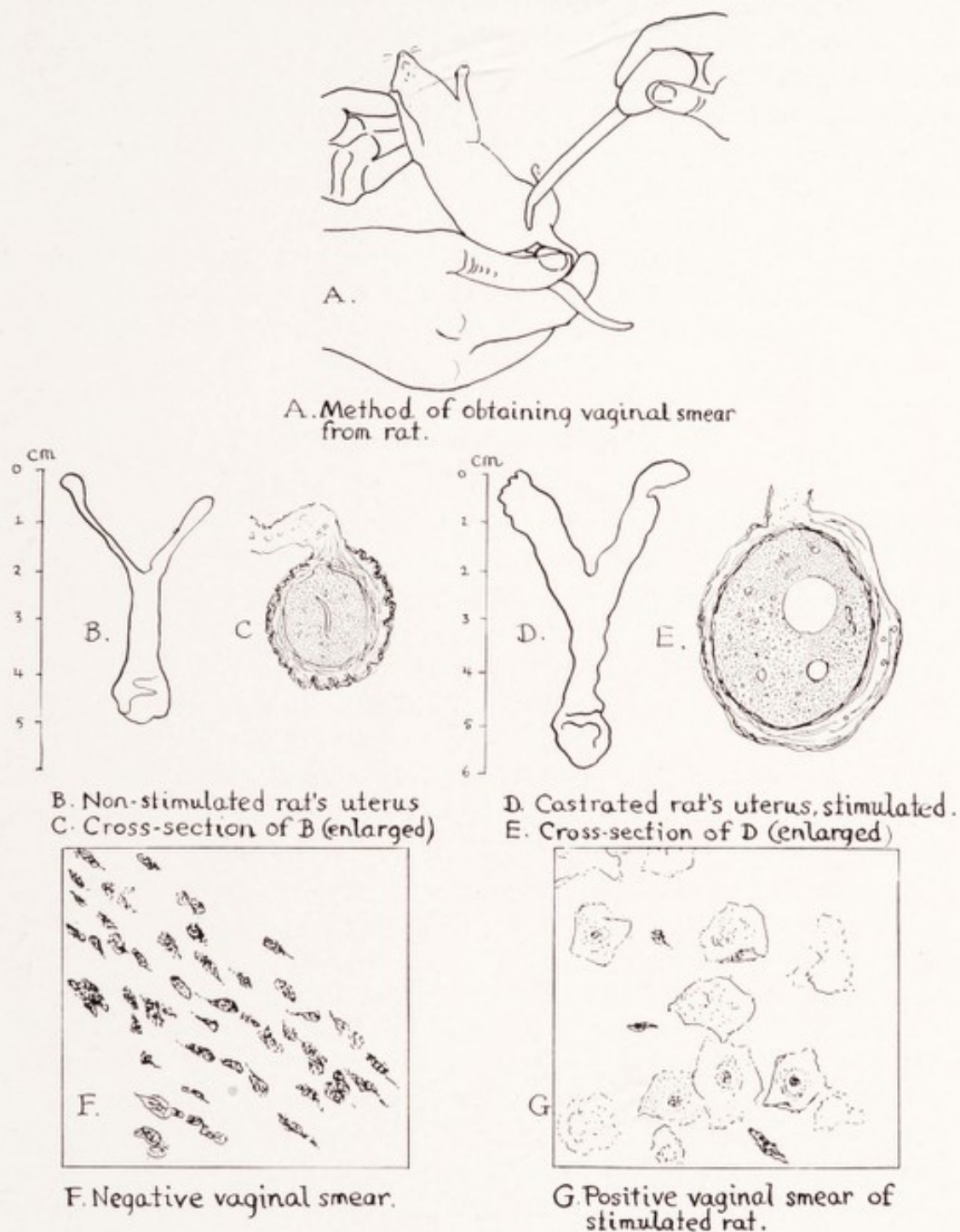


Fig. 46.—Female sex hormone reaction.

In discussing the hormone diagnosis of the viability of the fetus, Spielman, Goldberger and Frank studied in 33 cases of certain or suspected fetal death the presence of female sex hormone and prepituitary hormone. They found that the Aschheim-Zondek test, if negative, indicated that

the fetus was dead, but, if this test was positive, the fetus might be either dead or alive, and the test was correct in only 50 per cent of their cases. On the other hand, the *female sex hormone test*, as elaborated by Robert Frank, was 100 per cent correct. Twenty-three cases were negative with dead fetus; eight cases positive with living fetus; and two placental retentions with positive fetal sex hormone test (Fig. 46). According to these investigators the relative inaccuracy of the Aschheim-Zondek test in these cases is due to the presence of quantities of prepituitary hormone so large as not to be readily eliminated after fetal death, especially if the placental tissue was still viable. On the other hand, the fetal sex hormone test became negative relatively early after fetal death and hence was definitely to be preferred in the laboratory diagnosis of this condition.

Diagnosis of the Cause of Abortion

The question of the cause of a spontaneous abortion will at times present serious difficulties. Careful inspection of the ovisac may point to a defective germ-plasm as the etiological factor. In more advanced pregnancies the possibility of *placenta previa* must be considered. The presence of *infarcts* may point to toxic or infectious factors. The characteristic placental changes found in *syphilis* with a positive Wassermann may establish the diagnosis. Medical examination of the patient may reveal a diabetes, kidney or heart lesion, or other disturbing factors. Locally, we may find on bimanual examination a deeply lacerated cervix, a retroversion or prolapse, or the presence of myomatous tumors that point to the cause of the abortion.

Most important of all is the differentiation between spontaneous and induced or criminal abortion. All such criminal manipulations have the inherent possibility, even probability, that infectious organisms may have been carried into the uterine cavity, so that subsequent active treatment such as a curettement may lead to the spread of such infectious material into the maternal circulation, thus producing a septicemia. The fact that the patient herself is apt to deny, for obvious reasons, any such previous manipulations makes it important to consider other objective findings in arriving at a diagnosis. In abortion of the first three months rupture of the membranes, associated as it is with a tendency to separate expulsion of embryo and placental tissues, is presumptive evidence of previous instrumentation. The presence of fever early in the course of abortion also points to criminal interference. Bleeding is likely to be more profuse and sudden in its onset in such cases.

The proportion of induced abortions after the third month of gestation is relatively small. Magid, in an analysis of 578 cases with a view

to making a differential diagnosis between spontaneous and induced abortion, found that criminal interference was proved in about 30 per cent of the cases that had fever, and in only 12 per cent of those without fever. A careful questioning of the patients will often help in the diagnosis. The sudden acute onset, in a patient previously well, the history of some minor accident without evidence of any trauma, a chill occurring soon after the onset of the abortion, and delay in seeking medical assistance, arouse suspicion of intrauterine interference, even where this is denied.

Occasionally, we may find on specular examination of such a patient small puncture wounds of the cervix, where it was grasped with a tenaculum, or other evidences of direct trauma to the cervix or upper vagina through instrumentation. If these wounds show evidence of beginning infection, the diagnosis of induced abortion is even more certain.

Differential Diagnosis

In the differential diagnosis between abortion and other pelvic conditions the following deserve special consideration.

- (1) Irregular menstruation of functional origin
- (2) Membranous dysmenorrhea
- (3) Myoma of the uterus
- (4) Carcinoma of the uterus
- (5) Ectopic pregnancy

(1) **Irregular Menstruation of Functional Origin.**—It is not at all uncommon to meet with women who have spells of amenorrhea of three to four months' duration, which are followed by a free bloody discharge, with cramps and the passage of clots. To say in any one instance that the case is not an abortion is not easy. The previous menstrual history, as well as the fact that on examination the uterus is of normal size and consistency, will usually clear the diagnosis. It is the amenorrhea that leads to the assumption of a pregnancy, and later the patient is apt to interpret the sudden profuse return of menstruation as the onset of an abortion. The liquid character and dark color of menstrual blood is of considerable diagnostic value. Frequently we are called upon several weeks and even months after such a bloody discharge from the uterus to decide whether or not it was an abortion. Where we have only the patient's statement to guide us, it is impossible to give a positive answer.

(2) **Membranous Dysmenorrhea.**—(Fig. 47.) While the usual clinical manifestations of endometrial hyperplasia are readily differentiated from abortion, we meet at times with patients who expel the entire endometrium as a sac that grossly resembles an early intact abortion or fragments that have a shaggy appearance like decidua. These are the women

who report innumerable miscarriages. This condition known as *dysmenorrhea membranacea* is characterized by severe cramp-like pains, not markedly different from those of abortion, and ceasing with expulsion of the sac. There is usually more than the regular amount of menstrual bleeding with a tendency to the expulsion of clots. The absence of previous amenorrhea with symptoms of pregnancy, the tendency to regular or often repeated expulsion of such uterine casts at the monthly period and the careful inspection of such casts showing complete absence of any chorionic sac, will ordinarily point to this diagnosis. Microscopic examination of the tissue expelled showing absence of chorionic villi and decidua will confirm it.

(3) **Fibroid Tumors.**—Fibroid tumors, especially of the submucous type, may cause the uterus to appear softer and more spherical, but here there is apt to be a history of profuse and too frequent menstruation. The value of a good clinical history becomes evident, since the physical



Fig. 47.—Differential diagnosis between membranous dysmenorrhea and abortion. A. Cast of uterine mucosa in membranous dysmenorrhea. B. Early abortion sac of similar size. C. Abortion sac opened to show embryo.

findings may permit of no differentiation. As a rule, however, careful palpation will show in cases of fibroid tumors some irregularity of outline and consistency. In more advanced cases of abortion (third to fifth month), the similarity between them and submucous fibroids in process of expulsion into the vagina must be kept in mind (Fig. 48). Both may give rise to profuse hemorrhage and an odorous discharge of necrotic material. The history of amenorrhea, increased softness of the pregnant uterus, greater friability of placental tissue over fibroid tissue, render the differentiation comparatively simple. The pregnancy hormone test will give positive evidence of the existence of a pregnancy, but may be negative in cases of retained abortion. The diagnosis may be complicated by a combination of abortion in a myomatous uterus.

(4) **Cancer of the Uterus.**—Cancer of the uterus must likewise be distinguished from abortions. If the cancer be located in the cervix this will not be difficult, but if it be located in the body of the uterus the



Fig. 48.—Cross-section of uterus containing necrotic myoma. A perforation was made by a midwife under the assumption that the patient was pregnant, thus complicating the subsequent hysterectomy. Case of Drs. H. S. Crossen and C. O. C. Max. (Crossen: *Diseases of Women*.)

differentiation will have to be based, to a considerable extent, on the patient's history (Fig. 49). Cancer of this type rarely appears at an age when child-bearing is likely to occur, but when it does, the continuous bloody discharge with passage of clots and necrotic shreds may closely simulate an abortion. Here the microscope is necessary to clear up the nature of the trouble. We must remember, however, that a form of malignant tumor of the uterus, called chorio-epithelioma, from the fact that it develops from the chorionic epithelium, occasionally arises after an abortion.

(5) **Tubal Pregnancy.**—Most difficult is the differentiation between tubal pregnancy, or, rather, tubal abortion, and intrauterine abortion, especially when the latter is associated with inflammatory trouble of the adnexa. It is a very common event to have a uterus curetted on the supposition that there is a post-abortive retention of the placenta, only to discover a little later that the correct diagnosis was extrauterine pregnancy. To keep from making such mistakes we must bear the following points in mind:

In the history of the case we are apt to have in uterine abortion a longer period of complete amenorrhea before bleeding starts. Tubal abortion is more apt to occur between the fourth and the sixth week, whereas uterine abortion occurs with greatest frequency between the eighth and twelfth week. In tubal abortion the onset of pains and bleeding is often attended by dizziness or even fainting, owing to the shock of intra-abdominal hemorrhage. Furthermore, the cramps or sudden stabs of violent pain are felt on the affected side, whereas in uterine abortion the cramps are directly in the hypogastrium, coming and going like menstrual pains or labor. Vomiting, due to peritoneal irritation, is more often found in tubal gestation.

The character of the bleeding is of some differential value. In tubal abortion, for instance, only small fragments of decidual tissue are expelled from the uterus; the bleeding is never active and often there is only a prolonged brownish discharge. In uterine abortions, on the other hand, there are apt to be many clots, a copious bleeding, and pieces of decidua or placental tissue expelled. Again, in tubal abortion bimanual examination reveals a slightly enlarged uterus with a one-sided oval or sausage-shaped mass, the size of a fist or even larger, extremely sensitive to pressure, rather boggy to the touch, semi-fluctuating, adherent; whereas in uterine abortion we have a more or less spherical, enlarged uterus, not sensitive, with perhaps a one-sided or double-sided mass of variable size depending on the amount of associated inflammatory trouble in the adnexa (Fig. 50). If this inflammatory mass is sensitive, there are apt to be several degrees of fever, 101° to 103° , whereas it is the rule in tubal abortion for the thermometer to register only 99.5° to 100° . The pulse,

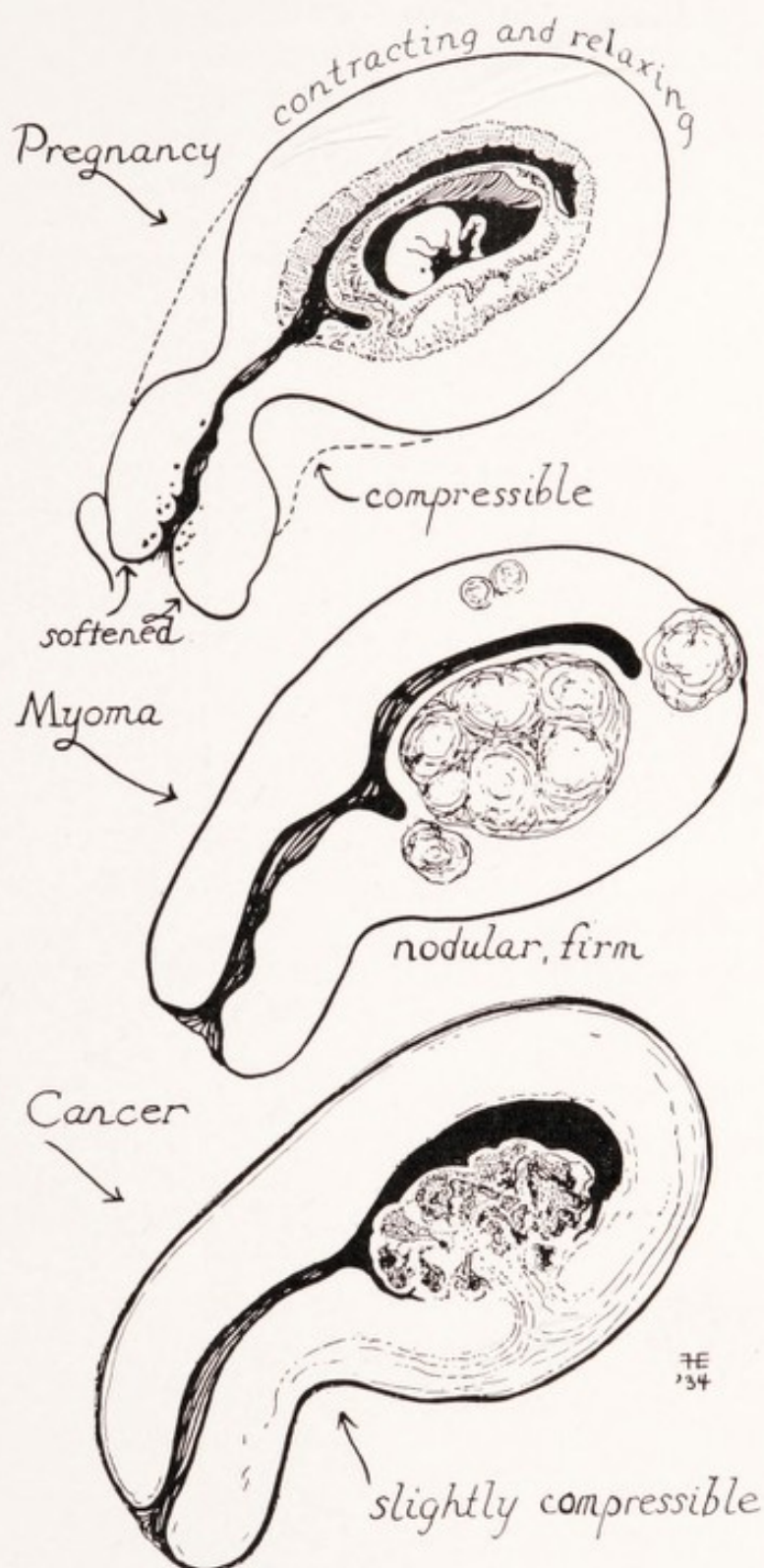


Fig. 49.—Differential diagnosis between early pregnancy, myoma of the uterus, and adenocarcinoma of the uterine body.

on the other hand, is more often rapid in the latter condition, ranging between 100-130 in accordance with the extent of the internal hemorrhage. The differential diagnosis will occasionally be impossible until the patient has been under observation for some time.

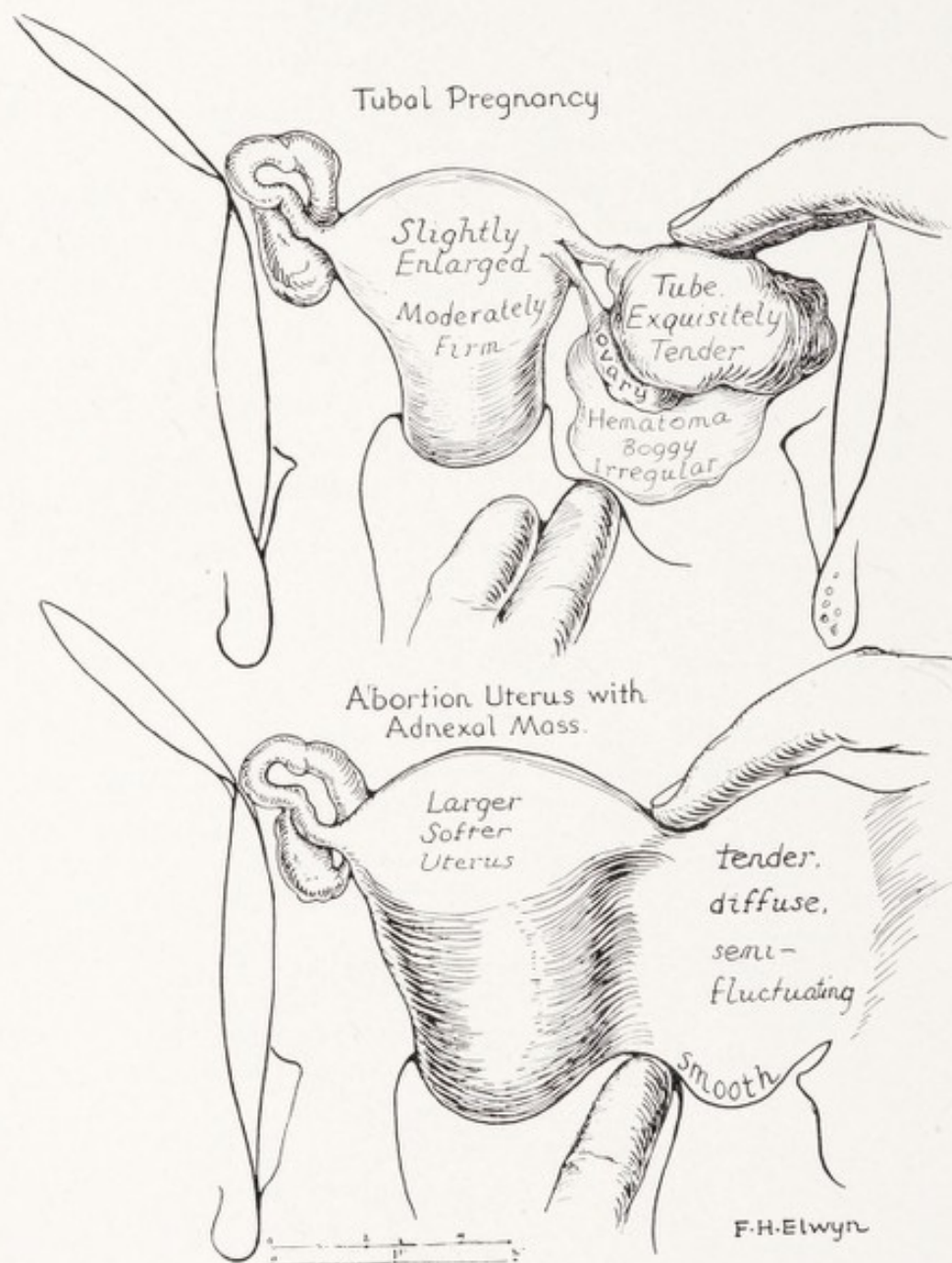


Fig. 50.—Differential diagnosis between tubal pregnancy and abortion complicated by adnexal infection.

Another trying element in the management of these cases is the unwillingness of the patient to be confined to her bed or go to a hospital for observation. Wishing something done at once, she often hurries the physician into measures whose consequences are fatal to the patient. Many cases of tubal pregnancy are on record where a hurry-up diagnosis

of retained placenta was made and the uterus emptied digitally or with a curette, only to have the patient collapse from internal hemorrhage and shock immediately afterward, and die before she could be taken to the hospital to be operated on.

The material expelled should be saved, and sectioned microscopically. The presence of chorionic villi or epithelium is proof of an intrauterine pregnancy, whereas, if decidua alone is found on examining many sections, one may be very suspicious of tubal pregnancy especially if a tender adnexal mass is present. In this connection we must remember that there are now on record in the neighborhood of one hundred cases of combined extrauterine and intrauterine pregnancy. Hence the possibility of such an event, in spite of its rarity, must be kept in mind in making a diagnosis.

To summarize once more the differentiation between tubal abortion and uterine abortion we have:

TUBAL ABORTION

- (1) Occurs most often between 4th and 6th week.
- (2) Pains severe, one-sided, attended with faintness and at times vomiting.
- (3) Bleeding moderate, chocolate colored, crumbling. Decidua at times expelled intact as a cast.
- (4) Bimanually, uterus only slightly enlarged.
- (5) Bimanually, a mass to one side, semi-fluctuating, sensitive, often sausage-shaped, boggy to the touch.
- (6) Temperature 99.5° to 100°.
- (7) Pulse 110 to 130.
- (8) Pieces from uterus show only decidua microscopically.
- (9) Marked leucocytosis (20,000-25,000).

UTERINE ABORTION

- (1) Most frequent between 8th and 12th week.
- (2) Pains moderate, central, often rhythmic.
- (3) Bleeding copious, reddish, clotted. Placental pieces or decidua expelled, necrotic odor at times.
- (4) Bimanually, uterus enlarged in accordance with stage of pregnancy.
- (5) Bimanually, usually normal tubes and ovaries; if associated with tubal infection, a mass sensitive to touch and semi-fluctuating can be felt, one side or both.
- (6) Temperature (in cases of uterine or tubal infection) 102° to 103°; otherwise normal.
- (7) Pulse 80 to 100.
- (8) Pieces from uterus show chorionic villi or syncytium with decidua microscopically.
- (9) Leucocyte count slightly elevated. (10,000-15,000).

CHAPTER XI

TREATMENT OF ABORTION

CERTAIN PHASES of the treatment of abortion are considered in other chapters. Threatened abortion is discussed under the head of prevention; and perforation, extra-uterine septic infection, other complications, and therapeutic abortion are treated separately under these heads.

Historical

A brief review of the treatment of abortion in the past century is of interest preparatory to the discussion of the present conflict between those advocating active treatment and those advising conservative measures. Before the nineteenth century the measures employed consisted mostly of medicines or of external applications.

In 1806, John Burns of Glasgow published an interesting series of "Observations on Abortion" in which he advised "plugging of the vagina" for the control of hemorrhage. (p. 102 ff.) "This is best done," he says, "by taking a pretty large piece of soft cloth and dipping it in oil and then wringing it gently. It is to be introduced with the finger, portion after portion, until the lower part of the vagina be well filled. The remainder is then to be pressed firmly on the orifice and held here for some time. This acts by giving the effused blood time to coagulate. It gives no pain, it produces no irritation, and those who condemn it, surely must either not have tried it, or have misapplied it. . . . In obstinate cases we may, before introducing the plug, insert a little powdered ice, when it can be procured, tied up in a rag."

Digital removal of the fetus and placenta, Burns does not recommend, but he adds: "I do not wish to be understood as altogether forbidding manual assistance; but I am much inclined to consider it as a useful precept, not to be hasty in extracting the ovum." If the placenta is retained, he advises that the finger be introduced "and the remains of the ovum slowly detached by very gentle motion; and we must be very careful not to endeavor to pull away the secundines until they are fully loosened, for we thus leave part behind, which sometimes gives a great deal of trouble." Inflammation and "other hysterical symptoms" sometimes follow. "When this disease proves

fatal, there are often, though not always, conjoined symptoms of gangrene, weak fluttering pulse, cold sweats and hiccough."

Dewees in 1843 recommended the use of acetate of lead as an astringent to control bleeding. Hodge, in his "Principles and Practice of Obstetrics" (1864), considered the wire crotchet (Fig. 51) for removing the ovum, devised by Dewees, too dangerous and in place of it used a small blunt lever, or ovum forceps (Fig. 52). These blunt instruments are slowly revolved within the uterus to loosen the placenta before extracting it. In cases of retained placentae Hodge says (p. 469), "the practitioner may patiently wait for the occurrence of uterine contractions. Even if a part of the ovum can be felt, no attempts should be made to extract it, as hemorrhage may be excited. If a portion be projecting, and the hemorrhage great, its descent may



Fig. 51.—Dewees' wire crotchet.

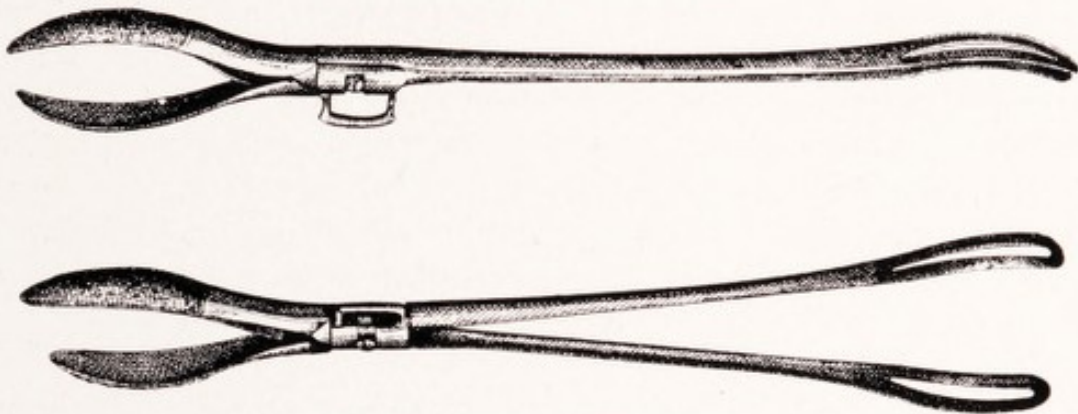


Fig. 52.—Hodge's ovum forceps.

be facilitated by one or two fingers in the vagina, provided the *secale cornutum*, cold, etc., have proved inefficient. . . . All such artificial assistance is however very seldom demanded."

Somewhat bolder is the treatment recommended by T. Gaillard Thomas in his little monograph on "Abortion" (1896). He recommends the use of an ordinary large curette for the removal of retained placental tissue. If at this time pressure is made over the fundus by one of the attendants, "you will be amazed to find how quickly the uterine contents will roll out." Thomas, however, still preferred to treat the majority of cases by a careful tampon applied to the cervix, if it is sufficiently dilated, as well as to the entire vagina. The improvement in antiseptic methods is noted in his directions for sterilization by boiling and by using carbolic acid, bichloride or iodoform. If the ovum is still intact, he considers that "the tampon is *the* remedy in abortion. . . . With the tampon in position, you may go about your

work feeling perfectly at ease. Your main duty consists in *not* interfering. Nature is perfectly competent to carry on her work to completion without your aid."

In Germany we find a similar tendency to conservatism at this time. Hegar in 1862 advised against active treatment especially in the presence of fever; but toward the end of the century that ardent gynecological operator, Dührssen (1887) came out with the statement that the immediate evacuation of the uterus was demanded in all cases of abortion. This principle was soon generally accepted, although there was some difference of opinion as to whether the finger or instruments should be used for this purpose. The curette, first recommended for retained placenta by Spiegelberg in 1876, became the popular instrument. In the first decade of the present century, almost all gynecologists employed active treatment in cases of incomplete abortion.

As a sequel to this wide-spread operative furor, cases of perforation, peritonitis and septicemia began to be recorded. A few warning voices were raised, but it remained for Winter, in 1911, to show conclusively that only by conservative measures could the evacuation of the uterus be accomplished without risk of spreading infection or traumatizing the pelvic organs. The increase in criminally induced abortions, with their high percentage of infections, made it more necessary than ever before to adopt a waiting policy. How far we should go in this conservatism will be latter discussed in detail, but certainly we owe a debt of gratitude to Winter for his careful scientific study of this important problem.

Differentiation of Clean and Infected Cases

The outstanding point in the dialectics following upon the publication of Winter's paper, which has engaged the attention of gynecologists throughout the world since that time, is that we must differentiate in our treatment between the clean cases and the infected, or potentially infected, cases. To speak of them as *afebrile* or *febrile* abortions is not a good method of classification since we may at times have febrile cases that are not infected, and absence of fever by no means excludes the possibility of such infection. Yet in the effort to define what we wish to include under the head of septic abortion, the rise of temperature is perhaps the most reliable index, and the safe rule is:

If the temperature be over 38° C. (100° F.) for more than twenty-four hours the case should be considered septic.

Both the history and the course of the abortion must however be taken into consideration. If the abortion has been induced by patient, midwife or abortionist, the chances for contamination with septic organisms is so great that the case must be handled as though infected, even if there is no fever. The history of such interference will be difficult to obtain but early rupture of the membranes, early severe bleeding and traumata about the cervix or upper vagina, will make such a diagnosis more than probable. On the other hand, if the ovisac or blood-clots have been retained in the cervix and vagina, and putrefaction has taken place, the resulting rise of temperature and discharge does not necessarily indicate uterine infection, especially if it falls promptly upon the expulsion of this material.

Laboratory tests may help us in two ways to differentiate between the infected and the non-infected cases: (1) A study of the blood picture; and (2) bacteriological examination of the vaginal and uterine secretions and the blood.

Schilling Hemogram.—The study of the blood picture became of far greater value after the epoch-making work of Schilling on the juvenile and degenerative forms of the neutrophilic leucocytes ("Das Blutbild," 1926). Whereas formerly we relied largely on the leucocyte count alone, with a differential count merely pointing to increase in polynuclear leucocytes in cases of infection, we now have an index that is of great value in the diagnosis of infection, and of even greater prognostic importance.

In the normal blood count there are per 100 leucocytes, 1 basophile, 3 eosinophiles, no myelocytes or juvenile forms, 4 stab-cells, 63 segmented neutrophils, 23 lymphocytes and 4 mononuclear cells. In cases of infection basophiles and eosinophiles are absent; lymphocytes and mononuclears are reduced to half their number; and the neutrophils are increased from a total of 67 to 80 or 90. Most significant is the ratio in the neutrophils. Myelocytes and juvenile forms are present, their number increasing with the seriousness of the infection as measured by the virulence of the invaders and lack of resistance of the invaded host. Stab-cells are increased to eight or ten times that of the normal count and segmented forms are proportionately reduced.

While valuable information can be obtained from a single Schilling blood picture, even greater importance is to be attached to the comparison of repeated blood examinations. From them we can visualize the progress of the infection, whether it is being localized, whether the resistance of the patient is being maintained, or whether an overwhelming infection will lead to death in a short time. While it is

unwise to base prognosis solely upon any laboratory test, experience has shown that repeated Schilling tests rarely fail to give accurate information concerning the progress of the infection. Particularly in cases of severe septic abortions will such a blood count be a valuable aid in the management of the case and be a guide as to when or whether to interfere in an operative way.

A single illustration taken from Schilling will serve to demonstrate the value of these tests. In Table I it will be noted that the infection grew worse from April 11th to 17th, but that on the 18th eosinophiles again appeared and myelocytes disappeared indicating increased resistance. In eight days more the eosinophiles were still more numerous, juvenile forms were no longer seen, stab-cells were reduced to half their former number and lymphocytes returned to normal. By May 5th the blood picture was almost normal, except for the still elevated eosinophile count. The blood counts correspond closely to the clinical progress of the case, except that the changes in the blood-picture usually precede by several days the alteration in the patient's general condition. In a study of the blood count in appendicitis J. V. Luck has shown that in fatal ruptured cases with peritonitis the total white count would often be between 4,000 and 8,000 with as many as 4 to 10 myelocytes and between 28 to 52 juveniles. Similar blood counts are present in the severe fatal cases of peritonitis and septicemia following septic abortion.

TABLE I
BLOOD PICTURE IN SEPTIC ABORTION WITH LUNG METASTASIS
(From Schilling: "Das Blutbild")

(DAY)	(1) TOTAL WHITE COUNT	(2) BASO- PHILES	(3) EOSINE- PHILES	(4) MYELO- CYTES	(5) JUVE- NILES	(6) STAB- CELLS	(7) SEG- MENT CELLS	(8) LYM- PHO- CYTES	(9) MONO- NU- CLEARS
Normal	7,500	1	3	0	0	4	63	23	6
(1st) April 11	Much								
(7th)	Increased	0	2	0	3	46	36	9	4
April 17	9,400	0	0	2	2	31	50	8	7
(8th)									
April 18	Increased	2	3	0	3	34	46	5	6
(16th)									
April 26	Increased	0	5	0	0	20	44	26	5
(26th)									
May 5	8,500	0	8	0	0	8	60	18	6

Bacteriologic Tests.—The second laboratory test of value in the diagnosis and management of septic abortion is bacteriologic examination of the vaginal and uterine secretions and the blood. There is,

however, considerable debate as to how much reliance can be placed upon it. During pregnancy the vagina frequently contains streptococci and other organisms that may, under favorable conditions such as bleeding and traumatized wounds, become pathogenic. S. Soule and T. K. Brown studying 207 cultures from the vaginas of normal pregnant women found anaerobic streptococci in 40 per cent of the cases, but in no instance were hemolytic streptococci present. Two years before Brown had analyzed the bacteriologic findings in 112 cases of puerperal sepsis, over a third of which followed abortion, and found that the anaerobic streptococcus was the offending organism in the large majority of cases.

When unsterile attempts at inducing abortion lead to further contamination beyond the organisms already present, bacteriologic examinations of vaginal and uterine secretions may have definite value.

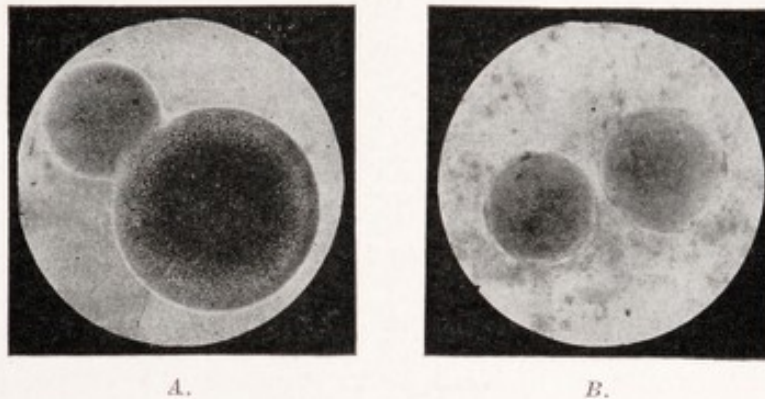


Fig. 53-A.—Colonies of *Streptococcus hemolyticus* on blood agar. Note that all the blood cells have been dissolved. (From Gradwohl: *Clinical Laboratory Methods and Diagnosis*, The C. V. Mosby Co.)

Fig. 53-B.—Colonies of *Streptococcus viridans* on blood agar. Note only partial hemolysis of blood cells. (From Gradwohl: *Clinical Laboratory Methods and Diagnosis*.)

Such examinations should be made by one who has had special experience in the study of puerperal infections since the average bacteriologist is often not qualified to make the special differentiation of organisms required for this work. Furthermore, as Heynemann justly emphasizes, the bacteriologic findings must always be considered side by side with the clinical picture before drawing any conclusions.

Virulence Test.—Special value has been placed by Waitz, Kubinyi and others upon the so-called Rüge-Philipp virulence test. This consists of growing bacteria in the defibrinated blood of the patient. More important than the method of growth is the careful diagnosis of the particular organisms present (Fig. 53). Here we come to an important practical difficulty, for the clinician cannot wait too long in deciding upon the diagnosis and plan of treatment and the conscientious bac-

teriolgologist must confess his inability often times to establish the identity of organisms except by further cultures that may require several days additional time.

In Germany it was claimed by Winter and Walthard that in the presence of hemolytic streptococci all intrauterine manipulations were contra-indicated. The contradictory findings however when bacteriologic tests were repeated, and the failure to improve clinical results by adopting this rule led to a swing of the pendulum in the opposite direction. I think Heynemann is correct in believing that this counter-movement has gone too far. If we recognize the necessary limitations of these laboratory tests, we can utilize them to advantage in connection with the clinical findings. The presence of the hemolytic streptococcus, hemolytic staphylococcus, or anaerobic streptococcus putridus in the vaginal or uterine culture, should make us hesitate with instrumentation or digital exploration, even where no signs of extension of infection beyond the uterus are present. Simple drainage of the uterine cavity by means of an alcohol gauze wick would not seem to be so dangerous, since in 40 cases treated without fatality by G. Schwarz in this manner, 12 showed hemolytic streptococci and several others hemolytic staphylococci. Krieger, using a similar technique in 128 cases found hemolytic organisms, 24 times in the vaginal secretions and 4 times in the blood with but one death.

TABLE II

INFECTIOUS AGENT FOUND IN BLOOD OR IN PERITONEAL PUS BEFORE DEATH
(From Schottmüller: München. Med. Wchnschr. Vol. 57.)

ORGANISMS IN ORDER OF FREQUENCY	(1) TOTAL	(2) CASES OF SEPSIS	(3) CASES OF PERITONITIS
Total Cases -----	231	142	89
Streptococcus hemolyticus -----	72	44	28
Streptococcus putrificus (anaerob.) ---	72	41	31
Staphylococcus aureus or albus -----	42	32	10
Bacillus emphysematosus Fraenkel ---	16	9	7
Pneumococcus -----	3	2	1
Bacterium coli -----	4	—	4
Anaerobic staphylococcus -----	1	1	—
Mixed infections -----	21	13	8

All more active procedures, however, that would tend to break down the natural barriers that have been erected by the patient to combat the infection should be delayed, if practical, until the bacteriologic findings have been given due consideration. Winter's reports of 30 per cent mortality in 130 cases where hemolytic streptococci were present and 86 per cent mortality in 14 cases where they were in pure culture, is contrasted with 2.4 per cent mortality in 211

cases where other organisms were found. The accompanying table from Schottmüllers' study of 231 fatal cases of septic abortion gives a good picture of the relative importance of the various organisms found.

Not merely the identification of the offending organism, but a determination of its virulence should be our aim. All attempts to accomplish this, even the new Rüge-Philipp virulence test, have failed to be sufficiently accurate to be of practical value. According to Heynemann, infections due to the gas-bacillus, *Bacillus emphysematosus*, *Fraenkel* (or, more properly, *Bacillus aerogenes capsulatus*, *Welch*, since Welch described it four years before Fraenkel), demand special consideration. This organism is usually limited to the uterus for some time. Prompt evacuation of the uterine cavity is indicated or, in cases of beginning peritonitis, a hysterectomy rather than the conservative measures recommended in cases of streptococcus infections.

All these detailed bacteriological examinations can with difficulty be applied in general practice where adequate facilities for such studies are not at hand. For maternity hospitals and wards they are of unquestioned diagnostic value and must be given due consideration, especially if the organisms are found in pure culture.

From the temperature rise, the history and clinical findings, and the blood and bacteriological examinations, we should therefore be in a position to separate with reasonable accuracy the clean and septic cases.

Synopsis of Clinical Experience

A vast amount of clinical experience has been recorded in medical literature, especially comparing the active, expectant, and conservative treatment of abortion. Reports before 1920 have been summarized in text books and monographs, and for our purposes a review of the more recent literature will suffice, before proceeding to a consideration of treatment. In the following summary reports are grouped geographically, and in all these cases the mortality rate is given in terms of per cent.

Sweden.—In *Malmö*, Lindqvist (1931) analyzed 2,047 abortions with 25 deaths, a rate of 1.2 per cent. In all 1,593 were clean and 454 (22 per cent) septic. The mortality rate was only 0.3 in the clean; but in the *septic*, with temperature up to 38.5° (102° F.) it varied from 2.3 in cases of one to three months gestation, to 5.9 in those of four to six months, and where the temperature exceeded 38.5° (102° F.) the rate was 5 for the first two months and 13 for those from three to six months gestation.

Bovin studied the results of expectant treatment in 1,141 febrile cases (over 38°, 100° F.), excluding those with extra-uterine and complete abortions. In 623 treated expectantly, the mortality rate was 1.3; while in 518 for which prompt evacuation was preferred, it was 2.9 per cent. The septic cases studied formed about 30 per cent of the 3,809 total in this group.

In *Upsala*, Olow (1923-29) reports on 740 abortions of which 300 were infected and 440 non-infected. Immediate intervention was done in 348; intervention after expectant treatment in 282; and expectant treatment alone in 107, with results that justified active treatment.

Norway.—In *Oslo*, Harbitz (1931) reports on a series of 3,791 abortions with 82 deaths, a mortality rate of 2.2 per cent. But of the 1,871 afebrile cases there were only 7 deaths, or a rate of 0.37, compared with 75 deaths in the 1920 febrile cases, a rate of 3.8. In other words the *febrile cases were ten times more fatal than the afebrile*. And of the 129 febrile patients with complications, 44 died, or 34 per cent.

Details of Harbitz' report are shown in Table III. It is noted that no deaths followed the 201 uncomplicated febrile cases treated conservatively, and that the next best showing was among those treated actively after fever had dropped. Of the 129 complicated febrile cases, 85 recovered including 37 patients with pelvic abscesses, 19

TABLE III
ABORTION TREATMENT AND RESULTS (OSLO)
(After Harbitz: *Acta obst. et gynec. Scandinav.* 11: 50, 1931.)

ABORTION: NATURE AND TREATMENT	(1)	(2)	(3)	(4)
	CASES		DEATHS	
	NUMBER	PER CENT	NUMBER	RATE PER 100 TREATED
Total Cases	3,791	100	82	2.2
(1) Afebrile cases, total.....	1,871	49	7	0.4
a. Evacuated on admission.....	1,294	34	5	0.3
b. Evacuated 2nd day or later....	338	15	2	0.6
(2) Febrile cases, total.....	1,920	51	75	3.9
a. Uncomplicated:	1,791	100	31	1.7
i. Active treatment	1,069	60	23	2.2
ii. Expectant:	521	29	8	1.6
active after fever dropped	220	12	2	0.9
active before fever dropped	301	17	6	2.0
iii. Conservative treatment	201	11	0	—
b. Complicated	129	—	44	34.1

with parametritis and 10 with salpingitis; and in the 44 fatal cases, death was due to peritonitis 23 times, to septicemia 11 times and to embolism 4 times.

Harbitz considers that his experiences justify expectant conservative treatment in all septic cases.

Denmark.—Grann-Petersen treated 1,118 actively out of 1,146 abortions with 5 deaths, a rate of 0.4 per cent, as compared with 2 deaths in 28 cases treated conservatively, a rate of 7 per cent. He had 747 afebrile cases without a death, and favors active treatment.

Germany.—From *Karlsruhe*, in 1925, Becker reported on 1,785 abortions, showing among 1,524 afebrile cases a morbidity rate of 1.9 and a mortality of 0.2 per cent; as compared with 261 febrile cases where the morbidity rate was 15.3 and the mortality 5.7 per cent. Becker advocates active treatment of febrile abortion, since the mortality following this method was only 2.8 per cent or less than half of the total febrile rate.

From *Nürnberg*, Bund analyzes 513 abortions, 342 of which were afebrile, and 90 per cent of these were treated actively with no deaths. Of 171 febrile cases, 77 per cent were treated actively, with 14 deaths (18.1 per cent).

Berlin. From Gitschiner Hospital, Sternberg reports an experience of 2,617 abortions showing 1,164 septic cases with 88 deaths (8 per cent), of whom 54 died within one to four days without active treatment (complicated cases); and 16 others (also complicated) were curetted. This left 18 uncomplicated fatal cases, a mortality of 1.54 per cent. Out of 1,453 afebrile abortions there were no deaths; only 39 cases had fever for one to three days. In the afebrile cases it was possible to get along without any treatment 208 times (14.4 per cent), and in 72 instances pregnancy was preserved.

From Moabit Hospital, Joseph and Sachs report 242 febrile abortions out of a total of 939, of which number 202 were treated actively with 1 per cent mortality, and 40 by expectant-conservative measures with 5 per cent mortality.

Vierneisel from *Leipzig* also finds a higher mortality from conservative measures since out of 3,020 febrile abortions there were 2,613 treated actively with 33 deaths (1.3 per cent) compared with 407 treated conservatively with 15 deaths (3.6 per cent).

In *Kiel* (1923-1931) there were 473 incomplete febrile abortions. According to Schroeder and Clauberg, 76 of these were complicated cases in which, on account of hemorrhage, instrumental or digital removal became necessary 18 times. Twenty-seven deaths resulted in this group. Eliminating these complicated cases, we find 397 febrile abortions of

which 259 were ended by medication in three days (65 per cent); 46 had to be emptied in the presence of fever with four deaths resulting; 52 were emptied after the cessation of fever on the fourth day.

An increased mortality was noted by Englert in *Munich* where treatment was delayed in cases of incomplete febrile abortions. If the uterus was emptied within three days, the mortality was 1 out of 152 (0.6 per cent); if over three days, it was 3 out of 206 (1.4 per cent); if a longer time had elapsed, it rose to 4 out of 148 (2.5 per cent); if previously treated but incompletely emptied, 5 per cent mortality; in neglected cases, 12 per cent mortality. Englert's figures are based on the treatment of 745 incomplete febrile abortions.

M. Gerstmann from *Breslau* (1912-1921) employs the statistical method suggested by Dietrich according to which all cases of infection beyond the uterus are excluded from comparison, since here there can be no question between active and conservative treatment. His figures comprise a total of 1,434 abortions as shown in Table IV. From this Gerstmann concludes that active treatment gives the best results.

TABLE IV
ABORTION TREATMENT AND RESULTS (BRESLAU, 1912-1921)
(From Gerstmann: *Ztschr. f. Geburtsh. u. Gynäk.* 68: 228, 1925.)

ABORTION: NATURE AND TREATMENT	(1)	(2)	(3)	(4)	(5)
	CASES TREATED AND RESULTS				
	TOTAL	CURED	WITH MORBIDITY	MORTALITY	
				NUMBER	PER CENT
Total Cases -----	1,434	1,329	75	30	2
Afebrile -----	592	583	9	0	0
Febrile -----	842	746	66	30	4
Treatment:					
Active -----	614	577	30	7	1
Expectant -----	49	47	0	2	4
Conservative --	179	122	36	21	12

Grünstein in *Hamburg* during the same period (1912-1921) reported 297 uncomplicated febrile abortions with the following results:

	CASES	MORBIDITY	MORTALITY
Active Treatment (12 hospital days)	200	12	1
Conservative Treatment (14 hospital days)	72	7	0
Expectant Treatment	25	12	0

His conclusions are directly opposite to those of Gerstmann.

Kottlors' experience in two and a half years with active treatment

of abortion comprises 468 abortions, 366 of which were clean cases with no complications and no mortality; and 92 were septic cases, one of which had complications resulting from treatment, and no deaths.

Finland.—In *Viborg*, Pelkonen studied 378 febrile abortions of which 330 were treated actively and 48 were treated expectantly with a mortality of 2.1 per cent.

Russia.—Mgalobeli (Tiflis) prefers active treatment because it shortens the period of hospitalization. Among 1,050 abortions, 101 patients had fever with a temperature over 38° of whom one died.

Kasanskij reported that one-third of 4,450 abortions in his series were febrile, that 94.2 per cent were emptied instrumentally within 24 hours; 4.3 per cent were emptied digitally; and 1.5 per cent were treated conservatively (cases with complications?). The curetted cases showed 0.6 per cent mortality for the afebrile and 1.8 per cent for the febrile group. The digitally emptied cases showed 8.9 per cent mortality for the afebrile and 12.5 per cent for the febrile group. The conservatively treated cases had a mortality of 14.6 per cent for afebrile abortions and 27.3 per cent for the febrile group.

Poland.—Afebrile abortions and febrile abortions without complications were treated alike by Grzankowsky and Kozlowski in *Warsaw*. Curettage was done only in the early afebrile cases. Of 247 such abortions, only one died; of 977 abortions treated by digital removal, 31 died (3.15 per cent).

From the *Cracow* clinic Niewola gave the following figures: The

	CASES	MORBIDITY	MORTALITY
Afebrile	465	0.6	0
Uncomplicated febrile	225	1.7	2.2
Complicated febrile	59	15.6	8.5

arguments favoring active treatment are supported by Chetmeeki from the *Warsaw* University clinic. Comparing the active treatment employed from 1921-1922 with the conservative treatment of the years 1923-1926, he found that in the former group there was only one death (0.5 per cent) out of 179 cases with 2 complications (1.1 per cent), whereas in the latter group of 637 abortions, of which 139 were treated conservatively, there were 7 deaths (1.1 per cent) with complications in 18 (3 per cent).

Hungary.—Out of 1,394 abortions in *Budapest* from 1918-1922, Hegedius selected the 416 febrile cases for special study. This showed that the 233 cases treated actively had a mortality of 1.2 per cent, a morbidity of 20 per cent, and an average hospitalization of 9.5 days, whereas the 183 cases treated expectantly had a mortality of 1.6 per

cent, a morbidity of only 9 per cent and an average hospitalization of 11 days. The lower morbidity makes him favor expectant treatment.

Kubinyi's statistics cover 550 abortions. Of these 78 per cent were afebrile with 1 per cent mortality and 22 per cent were febrile with 5 per cent mortality.

Schnerger found that active treatment shortened the hospital stay, which is of vital importance in the working classes. In febrile cases active treatment was delayed for one to six days after the temperature had reached normal. His report is based on 816 cases.

Italy.—Out of 1,272 abortions in *Livorno*, Paci found that 106 ended spontaneously and 1,166 required instrumental aid. Out of 216 febrile cases six died (3 per cent).

Since Coggi treated his more serious cases of abortion conservatively, he does not feel that it is fair to compare the 26.17 per cent mortality of 42 cases treated conservatively with the 1.79 per cent mortality of 558 cases treated actively.

Clauser (*Padua*) stressed diminished blood loss in cases treated actively. Out of 526 abortions treated actively there were 262 afebrile cases without mortality and 264 febrile cases with 2 deaths (0.75 per cent). Only in cases of peritonitis or septicemia does he favor conservative measures.

Canada.—W. B. Hendry, studying 542 abortions at *Toronto* in the years 1925-1929 found a mortality of 1.8 per cent. He preferred the sharp curette to either the dull curette or use of the finger.

United States.—In *Chicago*, Hillis analyzed 1,000 abortions at the Cook County Hospital (1920-1923). Twenty-two per cent of these cases were induced. Owing to the difficulty of distinguishing between induced febrile cases and febrile cases with positive evidence of infection, he preferred to treat conservatively all cases that ran a temperature. He found that if evacuation was delayed until 5 days after the temperature reached normal, there was less subsequent morbidity. Where the delay was less than five days, only 5 out of 12 (41.7 per cent) had no further fever, while in 36 out of 59 cases (61 per cent) where the full 5-day delay was maintained there was no return of fever. Out of the 20 deaths in this series of 1,000 cases, 16 were definitely criminally induced and 14 had positive involvement beyond the uterus on admission. Only 3 out of 20 fatal cases were curetted.

W. O. Johnson sums up a two-year experience with abortions at the City Hospital of *Louisville*. Out of 288 incomplete abortions, there were 3 deaths (1.1 per cent), two from septicemia. Conservative treatment was adopted in 90 per cent of the cases, since in about one-half

of the abortions there was some rise of temperature on admission, and 21.8 per cent stated that the abortion was induced.

From 1927-1931 R. E. Watkins in *Oregon* observed 341 abortions, of which only 169 were spontaneous. Of the 149 induced cases, 108 were done by the patient and 41 by an abortionist. He divided the 307 febrile cases (90 per cent of the total group) into 193 with fever less than 100.6 degrees, and 114 with fever higher than this. There were only two deaths, both in the latter group of cases. Conservative treatment was employed except in 36 patients where hemorrhage necessitated intervention.

Witherspoon selected 200 cases of definitely septic abortions out of 2,253 total abortions at the Charity Hospital of *New Orleans*. The temperature in all these cases was over 101.5 degrees and the average of the series was 103 degrees. Out of these 200 cases, 100 had been treated by operation, and 100 treated conservatively. Of the 100 operated cases, 64 were rendered more septic by the operation and 9 died. In 19 patients no indication for the operation was apparent. Of the 9 operative deaths, 6 were due to perforation of the uterus. The 100 conservatively treated cases showed no deaths, fewer complications and a shorter period of convalescence.

Statistical Fallacies

Difficulties in drawing conclusions from many of these clinical records lie partly in the small number of cases reported. Even when several hundred septic abortions are analyzed conclusions are indeterminate, as shown in the following record from Latzko's clinic in Vienna:

TREATMENT	YEAR	CASES	DEATHS	PER CENT
Active:	1911	239	44	18.5
	1913	206	4	2.0
Expectant	1915	182	11	6.0
	1918	206	24	12.0

If 1911 and 1915 are compared, expectant treatment would appear three times safer; but if 1913 and 1918 are compared, it would appear to be only one-sixth as safe. Only the tabulation of approximately 1,000 cases justifies any definite conclusions, and if this number is again subdivided into groups, we cannot be positive in our statements concerning such groups.

On the other hand, the conclusions drawn from large collective statistics are equally subject to criticism because of the lack of uniformity in the clinical records from the various hospitals. Winter at-

tempted such a compilation from about 24,000 abortions, from which only about one-third could be utilized, with the following results: 6,512 actively treated septic abortions had a mortality of 2.9 per cent; 1,048 conservatively treated septic abortions had a mortality of 1 per cent; and 792 expectantly treated septic abortions had a mortality of 1.1 per cent. But Winter did not include any complicated septic cases in his groups.

Dietrich draws his conclusions from 10,000 septic cases from 20 clinics without the elimination of the complicated cases, grouping expectant and conservatively treated together. This showed:

	MORTALITY PER CENT
(a) Cases with temperature over 38° (100° F.)	
(1) Actively treated cases including complications treated conservatively	4.8
(2) Expectantly treated cases including those treated conservatively---	3.1
(b) Cases with temperature over 37.1° (98.6° F.)	
(1) Actively treated cases including complications treated conservatively	2.1
(2) Expectantly treated cases including those treated conservatively---	1.6

These figures point to somewhat better results from expectant treatment than from active treatment. The difference is not so pronounced but that an additional 10,000 cases might reverse the figures. It must also be borne in mind that hospital figures include a higher percentage of serious cases than if dispensary and home cases were included. Active treatment is of necessity more often employed if patients are not hospitalized.

Clearly nothing conclusive is to be hoped for from a mere numerical calculation on the basis of reports derived from different countries and hospitals, in which varieties of methods of treating abortion are employed, and various ways of accounting for results. The statistics for the most part are suggestive merely, and cannot be applied to any given case where the variables are numerous.

The question at issue, as I see it, is not whether active treatment is preferable to expectant or conservative treatment but when active treatment is preferable and when expectant or conservative measures should be employed.

Treatment of Uninfected and Afebrile Abortion

Complete Abortion.—The chapter on diagnosis stressed some of the difficulties in determining whether an abortion has been completed. When there is doubt, some assume that it is incomplete and proceed with active measures; others, assuming that it is complete, adopt expectant measures. Which to pursue should depend largely on external factors such as economic and home conditions and accessibility

to hospital. Where it is important that the patient assume her household duties promptly, curettage in a neighboring hospital has advantages. If a few days of waiting would make no difference to the patient, we can readily wait for the appearance of symptoms that necessitate intervention.

Vogt considers the absence of bleeding and uterine cramps as a good index that the abortion is complete. I have found that if the giving of ergot produces increased bleeding and colicky pains it is usually a sign that some material is still retained in the uterus. Rouville and Madon advise a curettement in every early abortion owing to the difficulty of determining whether material is still retained and because of the danger of bleeding and infection from such remnants. If the patient has aborted in a hospital, such additional operative work may at times be condoned, but in general every unnecessary operation, even if relatively a minor procedure, should be avoided.

In the post-abortion care of complete abortion, or of abortions that have been completed artificially, we must advise a hospitalization with rest in bed from 5 to 10 days depending upon the period of gestation in which the abortion occurs. If the abortion takes place between the fourth and sixth month inclusive, a longer convalescence will be required and the post-abortion care will not differ greatly from the post-partum care following premature labor. The breasts usually fill with secretion on the third or fourth day. They must be tightly strapped, and ice-bags applied if the congestion becomes painful or persists an undue length of time. Since subinvolution is more apt to follow abortion than full-term delivery, the routine administration of ergot is recommended.

The amount of rest required after abortion varies with the complication attending the emptying of the uterus. If there is the slightest suspicion of a latent infection, we must be cautious about getting the patient out of bed too soon for fear of a phlebitis. It is amazing how many women "get by" with no period of rest at all. If the abortion is produced by curettement in the first two months, some patients will proceed uninterruptedly with their daily tasks. In Russia, owing to insufficient number of hospital beds, a routine of only three days rest is prescribed with but few untoward consequences. Nevertheless this should not be our aim. Rather should we keep in mind that one of the most common causes of chronic invalidism after abortion is insufficient care and rest in the after-treatment. I personally prefer to keep patients in bed a minimum of six or seven days and hospitalized for from eight to ten days after the uterus has been fully evacuated.

Inevitable Abortion.—If the abortion can no longer be averted, our object must be to hasten its conclusion. Usually the cervix will be partially open at this time and undue delay might very well result in the entrance of vaginal organisms into the uterine cavity with resulting infection. Continued bleeding also makes the termination of the abortion a thing to be desired. In what way and when to assist the natural forces that proceed to the expulsion of the ovisac is a matter that requires deliberation. If the abortion occurs in the second trimester of pregnancy and the ovisac is intact, we should adopt a waiting policy, merely giving medicines to stimulate uterine contractions. Even in less advanced gestations, there is rarely need for undue hurry, and many cases can be terminated spontaneously by simple means. Of these simple means an ice-cap over the abdomen to stimulate contractions and an enema given as warm as the patient will tolerate it, often suffices to complete the abortion. Since in nulliparous women the vaginal introitus sometimes holds back an ovisac that has been fully extruded from the uterus, it is well to let the woman sit up and bear down; or to try to determine this fact by rectal palpation, and exert pressure from above to promote expulsion.

Medication to stimulate uterine contractions consists of quinine, pituitary extract and ergot. While such medical treatment is particularly advised in septic cases where operative interference is strongly contraindicated, we can also use it to advantage in afebrile cases.

Quinine can be given in fairly large doses by mouth. Poschacher gives 4-grains every four hours with good results. In incipient abortion this resulted in spontaneous evacuation in 82 per cent of the cases. Strakosch gives 3 grains every hour for 6 to 8 doses. Heynemann believes that a total dose of 18 grains should be the maximum.

Since many patients have an idiosyncrasy to quinine with eruptions or pronounced ear symptoms, I would advise giving smaller doses often and stopping medication at 10 grains if there is tinnitus aurium. Some patients do not tolerate quinine well by mouth, but the administration of this drug intramuscularly or intravenously is not very satisfactory.

The *pituitary* extracts are not very effective in stimulating uterine contractions previous to the fourth month of gestation but can be given up to 2 c.c. as an adjunct to quinine or ergot with considerable benefit.

Ergot when given by mouth in the form of the fluid extract will sometimes cause a spasm of the cervico-uterine musculature that deters rather than hastens expulsion of the ovum. While this occurs only in a small percentage of cases, this uncertain action of ergot has militated against its use. According to Heynemann and others the

purified alkaloid given hypodermically in the form of gynergen does not have this disadvantage and is recommended as the strongest and most reliable medical agent for hastening the progress of abortion. A maximum dose of 0.5 c.c. is recommended owing to the occasional occurrence of gangrene of the extremities when larger doses are used. This can be repeated, however, in six hours and on subsequent days.

Within reason, therefore, spontaneous evacuation can safely be awaited if the entire ovum, or at least the entire placenta, is still retained. Fink makes an interesting comparison between clinics adopting such a conservative course and those employing more radical operative procedures. Out of 500 abortions at Königsberg, 174 ended spontaneously, 64 of them requiring the aid of medication. The comparison is shown below:

	TOTAL ABORTIONS	SPONTANEOUS	
		NUMBER	PER CENT
Fink (Koenigsberg)	500	174	35
Schmidt (Bremen)	3,600	600	17
Gerstmann (Breslau)	540	77	14
Ludwig (Switzerland)	187	21	11
Halban (Vienna)	4,900	270	5

Fink concludes that Halban could have avoided about 1,470 operations and narcoses if he had awaited spontaneous evacuation. This, he believes, can be done: (1) by not considering every bleeding an indication for operation; (2) by awaiting spontaneous delivery if both fetus and placenta are still in the uterus; (3) by not doing a prophylactic curettage, when the abortion is complete.

To be sure, the adoption of such a waiting policy will in a few instances be followed by the development of a placental polyp requiring subsequent curettement, but in the balance against this must be placed the many unnecessary curettements with their attending complications and tendency to the development of an atrophic endometrium.

Incomplete Afebrile Abortion.—When portions of placental tissue are retained and no fever is present, there is general agreement that an evacuation, either with the finger, the ovum forceps, the curette or a combination of these three agents, should be done. In some instances the placental tissue or ovisac lies loosened from its uterine attachment but still held by its cervical ring. Here the technique of bimanual pressure according to Hoening or Budin may suffice to cause its extrusion into the vagina. (See Chapter XII.) In some instances it will be simpler to introduce a speculum and catching the

portion of the placental tissue lying in the upper vagina with one or more sponge sticks gently release it from the grasp of the cervix.

The selection of the best method for the evacuation of the uterus in afebrile abortions will depend upon three things:

- (1) The period of gestation.
- (2) The degree of dilatation of the cervix.
- (3) The nature of the retained material (ovisac, placenta, placental remnants).

In general, active treatment to hasten the evacuation of the uterus is to be recommended in these afebrile cases, since it definitely shortens the period of convalescence. Such a saving of time and money has definite advantages. Bleeding is also reduced in amount. A single exception is in the case of the more advanced gestations with intact ovum especially if the cervix is partly dilated, where medication, as already mentioned, will usually suffice to terminate the abortion. A few days of preliminary rest is of advantage, according to Hillis' observations, who found that afebrile cases curetted after five days in bed had a greater tendency to remain normal than those curetted immediately. The greatest difference of opinion in treatment is as to the agent to be employed in evacuating the uterus. Hendry prefers the sharp curette to the blunt curette or finger. Clauser prefers the ovum forceps and dull curette to the finger. Grzankowsky definitely favors the finger whenever possible, while Sternberg prefers instruments, since less dilatation is required. Such variations of opinion could be multiplied a hundredfold. It is undoubtedly true that every one works best with those agents with which he has had most experience, and that there are many ways of accomplishing the same results. Nevertheless certain cardinal principles are almost universally accepted:

(1) In earlier gestation where much cervical dilatation is unnecessary and difficult, instrumental evacuation is preferable. Before the third month the cervix is in danger of laceration, if stretched to admit the finger.

(2) If in such gestations considerable material is still retained, the ovum forceps and blunt curette are safer, whereas if only placental remnants are retained, these can more thoroughly be removed by the large sharp or semi-sharp curette.

(3) If gestation is somewhat more advanced, the finger is a safer agent than instruments for loosening placental tissue, even though ovum forceps or a sponge stick is used for its removal.

(4) In gestations beyond the third month, the finger is always to be used as a guide, even if instruments are at times necessary as an adjunct for removing tissue.

(5) Where the cervix needs to be dilated, in the first two months of pregnancy, the ordinary graduated metal dilators are the simplest and best instruments. In later gestations a gauze pack in the lower uterine segment and cervical canal is safer and after the fourth month a small rubber bag dilator may be required.

With these cardinal principles in mind, I have prepared an outline for the treatment of inevitable or incomplete afebrile abortion, whenever action is required. Of necessity it represents to some extent my own personal experiences and preferences. Similar graphic outlines have been prepared for the treatment of septic abortion and therapeutic abortion. (See pages 183 and 339.) In the cases considered for this plan of treatment it should be borne in mind that the abortion is already in progress and that the patient is not infected.

OUTLINE A. ACTIVE TREATMENT OF INEVITABLE OR INCOMPLETE AFEBRILE ABORTION

CONTENTS OF UTERUS	<i>First Seven Weeks</i>		<i>Eighth to Twelfth Week</i>		<i>Thirteenth to Twenty-eighth Week</i>	
	Cervix Closed	Open	Cervix Closed	Open	Cervix Closed	Open
OVISAC RETAINED	Metal dilator	Ovum for- ceps and curette	Gauze pack	Ovum forceps or finger, or both	Medica- tion, gauze pack, col- peurynter	Medica- cation
PLACENTA RETAINED	Metal dilator	Curette	Gauze pack or metal dilator	Ovum forceps or finger, or both	Gauze pack or finger dila- tion	Finger and ovum forceps
PLACENTAL REMNANTS RETAINED		Curette	Ovum forceps and curette. Finger as guide (?)		Finger and Ovum For- ceps	

Treatment of Septic or Febrile Abortion

We have discussed some of the difficulties surrounding the diagnosis of septic abortion. It is of crucial importance in the treatment to answer as accurately as possible this question of infection. History, clinical findings, blood counts, bacteriological tests all have their values.

Equally serious with the question "*Is there infection?*" is "*Has this infection extended beyond the limits of the uterus?*" For in the latter event, the warning of *noli me tangere* should in almost every case be heeded. If on bimanual examination a definite thickening in the

parametrial or adnexal regions can be felt, the assumption of an extrauterine infection must be made. In Heynemann's opinion, even definite tenderness in this region or over the abdomen justifies this supposition. In doubtful cases a second examination a few days later may give a definite answer. In all such cases, the principle should be "if doubtful, don't"—that is, don't pursue any *active* measures of treatment. There is general acceptance of the dictum that conservative treatment must be employed with but few exceptions in all these extrauterine septic infections following abortion. In a succeeding chapter the treatment of extrauterine infections will be fully discussed, with the consideration of such active measures as may at times be advisable.

It is with much hesitation that I undertake the discussion of the treatment of uncomplicated septic abortion. No matter how judicial an attitude one wishes to take, it is necessary for the sake of clearness, and for the sake of not leaving things at loose ends, to take a definite stand on certain points at issue. At the same time I feel as Kottlors does, who in his discussion of the subject quotes Plato: "Whoever of us has chosen the better part, God alone knows!"

Active Treatment.—Three decades ago, when septic infections were perhaps less frequent, any physician who failed to adopt active measures in treatment was considered guilty of professional malpractice. Even now, among the laity, there is a feeling that if portions of the placenta are retained, and bleeding and an odorous discharge are present, something should be done at once. Active treatment is therefore the easier path to tread. The fact that after the evacuation of the uterus, fever and bleeding often cease, also encourages the physician to adopt such measures. A further inducement to active treatment rests upon the undeniable fact that bacteria grow more rapidly in necrotic tissue than upon the healthy surface of the uterus. Another argument raised in its favor is that by means of uterine contractions, bacteria are pressed into the open wounds made by loosening placental pieces.

Under such conditions organisms are not infrequently found in the blood stream and in this location present the threat of a septicemia. Particularly if such an invasion of the blood stream is repeated does the danger of this complication become magnified. By the removal of this infectious material, undoubtedly such dangers are greatly reduced. The control of bleeding is an added reason in favor of active treatment. There can be no question that continued free bleeding from the uterus is no light matter. The resulting anemia leaves the patient in a less favorable condition to fight off any infection. Undeniably, we must also face certain practical difficulties, especially in

cases treated at home, that make a waiting policy difficult to enforce. Such in the main are the arguments favoring prompt evacuation of the uterus.

In recent years, while there has been some swing toward conservatism in treating septic abortion, we still find a large group of gynecologists favoring active measures. Some, such as E. Kehrer, who for a time favored conservatism, have turned again to the prompt evacuation of the uterus as preferable. A few more recent reports may be mentioned. Clauser (Padua) emphasizes the shorter hospitalization and lessened blood-loss attending active treatment. Even in the presence of an admission temperature he evacuates with the ovum forceps and curette. Grzankowsky and Kozlowski (Warsaw) curette early febrile cases, but in gestations of the second to the fourth month, use the finger for evacuating the uterus. Sternberg (Berlin) favors prompt instrumental removal of placental tissue. The use of the finger requires more dilatation, which, through the danger of cervical injuries, more than overcomes any advantage of palpating the interior of the uterus. Olow (Upsala) prefers immediate evacuation except in pregnancies beyond the fifth month. Vogt (Germany) considers active treatment better and employs the finger whenever the cervix is open as the simpler procedure. Simon (Munich) believes that every day's delay adds to the danger of spreading infection and hence recommends emptying the uterus with ovum forceps and curette at once. Among Americans favoring active treatment are Gellhorn who advises emptying the uterus even in the presence of fever, and Hirst, King, Baer, and Otto Schwarz, who consider the prompt removal of necrotic placental remnants a definite advantage to the patient. On the other hand, J. Whitridge Williams took the position that equally good results could be obtained by either conservative or active treatment.

Conservative or Expectant Active Treatment.—Hardly any gynecologist would recommend a strictly "hands-off" policy in the treatment of septic abortion. The evacuation of the uterus may be delayed but in the presence of profuse bleeding or in the case of persistent prolonged retention of placental tissue, no one would deny the necessity of instrumental or digital evacuation of the uterus. We can therefore more properly speak of "conservative" treatment as "expectant-active" treatment. Its advantages lie primarily in the fact that every intrauterine manipulation carries with it the risk of inoculating open wounds with infectious organisms. Surgeons have always maintained the principle of avoiding operation wherever possible in the presence of active infections.

In the vast majority of intrauterine infections the need for immediate intervention is not apparent. While bacteria may multiply, the patient's resistance to the infection is greatly increased as a rule by a few days of delay, and the encapsulation of the infectious material is furthered. The virulence of the organisms seems on the whole to be diminished by such a waiting policy. According to Winter's observations streptococci were often overwhelmed by the multiplication of other saprophytic organisms and were no longer found present in the secretions. The bacteriemia also disappears in a short time and the temperature gradually returns to normal. Absolute rest and limitation of examination are necessary to bring this to pass.

The infection is often not at all in the ovisac but in the cervical wounds produced by the unskilled criminal interference, so that the evacuation of the uterus would be of no value. Furthermore, the universally recognized principle that all manipulations are to be avoided in the presence of extension of the infection beyond the uterus, would make a few days of delay an added advantage. It has been repeatedly found that only by longer observation of the case can we with certainty exclude the possibility of such a complication. Those favoring expectant treatment claim that the dangers of severe hemorrhage have been exaggerated, for this accident is of rare occurrence. The value of bacteriological examinations as already discussed is undeniable, even though they should not entirely control our method of treatment. To obtain this information will, however, require several days for the growth of cultures. At the end of that time the question of active interference can be reconsidered with definite advantages to the patient.

In the experience of Martius (Goettingen) if the cervix is not yet dilated, conservative delay to await a drop in the fever will do no harm, and the cervix in the meantime may dilate. After a few days, gentle instrumental evacuation can safely be performed. In abortions after the third month the finger should be used to control placental removal. He advises that finger and instruments be used alternately in removing the placenta and not side by side. Never should the sharp curette be employed. According to Offermann (Königsberg) active treatment is definitely more dangerous than conservative or expectant treatment especially where criminal interference is strongly suspected. Singer (Hungary) employs ice-cap, medication and tampons as necessary, for 3 to 5 days; then empties with a dull curette, or, in more advanced pregnancies, with the finger. Kirstein (Germany) found that the average hospitalization of uncuretted cases was 15.4 days compared with 17.5 days where immediate curettement was

done. Von Franque emphasizes the fact that we can safely wait five days before interfering. He prefers however not to delay beyond this time in active treatment even if hemolytic streptococci are found. Bovin (Sweden) always waits six days after fever has ceased before doing a curettage. He found that in 94 per cent of his 894 incomplete febrile abortions hospitalization was not necessary for more than two weeks.

American literature contains many recent reports favoring conservative treatment. Hillis (Chicago) strongly urges awaiting five days of normal temperature in all septic abortions before emptying the uterus. W. O. Johnson (Louisville) waits for three days of normal temperature before interference. Metzler (Delaware) says that in the absence of severe hemorrhage in febrile cases, he employs expectant treatment until the temperature has been normal for 5 to 6 days. Watkins (Portland) found that in about two-thirds of his cases patients recovered without the necessity of invading the uterus. Witherspoon (New Orleans) found such disastrous consequences when active treatment was employed in septic abortion, that he urges a waiting policy and non-operative measures whenever possible. Curtis (Chicago) says in his "Obstetrics and Gynecology" that "in the presence of an active infection, irrespective of its origin, curettage or other instrumentation of the uterus must be avoided unless imperative." He especially warns against the dangers of a repeated entering of the uterine cavity, since the resistance to a spread of infection is decreased with each manipulation. Anspach (Philadelphia) says it is difficult to determine whether a septic case is limited to the uterus; hence he prefers to await a normal temperature before proceeding with active measures. Farrar (New York) recommends rest and ice-bag for five days before curetting.

Polak in his excellent monograph "Pelvic Inflammation in Women" states (p. 80): "Experience has taught us that any sort of trauma to the delicate granulation wall which is confining the infection within the uterus, opens avenues of extension, and that lateral parametritis is a constant sequel of attempts at digital or instrumental evacuation. It does no harm to remove sterile contents, but manipulation always spreads infection when the content is already infected."

A few special methods of conservative treatment in septic abortion are worthy of separate consideration.

Medical Treatment of Septic Abortion.—If the expulsion of the tissue or placenta can be completed without intrauterine manipulations, the course of septic abortion is simplified. Kessler gives 3 grains of quinine 5 times a day for the purpose. Habbe supplements a dosage

of 4 grains of quinine every half hour for four times with 1 c.c. hypophysin hypodermically. This helps to dilate the cervix and at times causes the expulsion of the ovum. Curettement, however, is usually necessary where only placental remnants are retained. Turenne and Irulegny (Uruguay) frequently effected spontaneous evacuation of the uterus by means of pituitary extract hypodermically. Bruehl reports on 119 cases of infected abortion, 39 treated by quinine alone and 80 in combination with gynergen with satisfactory results except where smaller placental pieces were retained. Sixty-five cases of induced or septic abortion were treated by Rovinskaja by the intravenous administration of 5 c.c. of a 5 per cent solution of quinine chloride, the same dose given intramuscularly, and 0.5 grain given by mouth. In three cases there was no result, in 37 cases there was complete spontaneous abortion, in 16 cases a few pieces of decidua remained and in 10 cases the cervix was opened so that removal of the placenta was easily accomplished. Heynemann warns against this intravenous administration of quinine. In general it would seem that in pregnancies after the third month if the major portion of the ovisac is still retained, we can reasonably expect in not less than half of the cases spontaneous expulsion of the uterine contents. This is best accomplished by the administration of 15 grains of quinine by mouth in addition to 1-2 c.c. of pituitary extract and 1 c.c. of ergot in hypodermic form.

Drainage Treatment (Fig. 54).—Zangemeister's suggestion of gauze drainage of the uterine cavity in infected abortion was employed by E. Krieger with excellent results. Gentle dilatation of the cervix up to 1 cm. if necessary, is followed by the introduction of a strip of gauze 8 cm. in width, soaked in alcohol, through the canal to the uterine cavity. This is renewed every 24 hours. This drain keeps the cervix open, provides escape of secretions and stimulates the uterus to contraction and expulsion of its contents. The average number of times the drain is renewed is eight. Out of 128 cases of septic abortion treated this way there was only one death (0.8 per cent), a 3 per cent morbidity, and an average stay in the hospital of 11 days. In 51 cases placental pieces were expelled in the process of treatment. G. Schwarz employed the same technique in 62 cases of infected abortion. In 40, nothing but the gauze drainage treatment was employed; there was no mortality, although in 12 hemolytic streptococci, and in several others, hemolytic staphylococci were present. Schwartz' average number of drainage treatments was six, and in one case the treatment was repeated twenty times. He varied the size of the gauze

strip in accordance with the size of the cervical canal and never employed force. The necessary stay in the hospital ranged between 15 and 20 days.

Nissen and Radmann employed the following technique in 77 cases. Disinfection of the vagina, digital cleaning and curettage of the uterus, irrigation with 2 to 3 liters of a fairly strong potassium permanganate solution, wiping out the uterine cavity, especially the tubal cornua with gauze and inserting a gauze drain soaked in tincture of iodine for two to three hours. There were two deaths, one from anemia and one from sepsis and the majority of patients could be discharged in from 7 to 9 days.

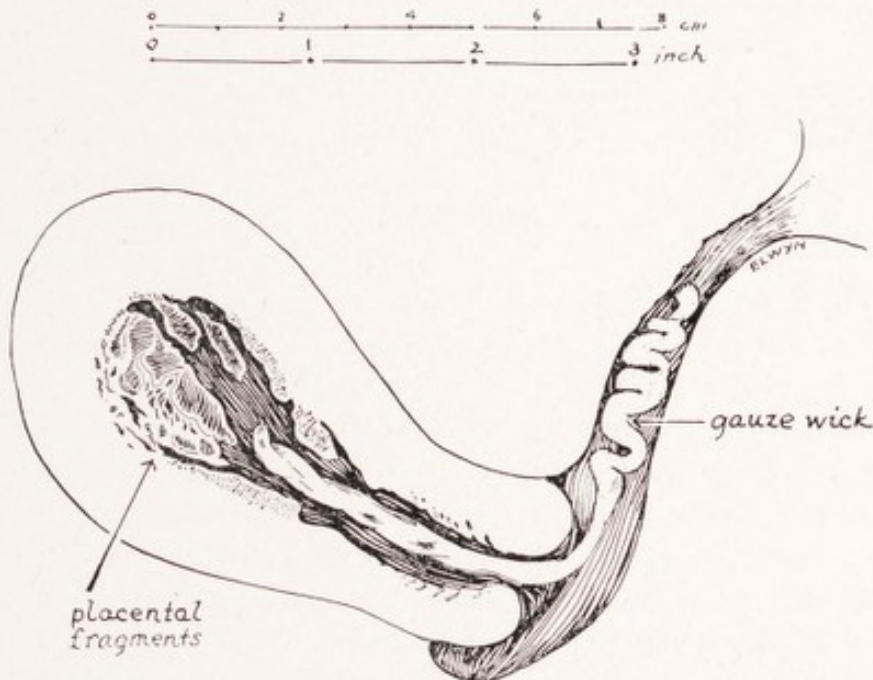


Fig. 54.—Gauze drainage treatment of septic abortion. The gauze wick gently introduced into the uterine cavity serves to keep it open and stimulates the uterus to expel its contents.

Intrauterine douches with Carrel's solution were employed by Salwen successfully in 9 febrile abortions having temperatures of 38.2°, to 40.8° C. (100.4° F. to 105° F). In America we find that Ill and Darnall both employ alcohol-soaked gauze drains while T. K. Brown irrigates the uterine cavity with 1-1,000 permanganate solution, and removes with a sponge stick any loose placental pieces that may be found, but does not follow this with drainage.

Charcoal Treatment of the Infected Uterine Cavity.—The favorable results obtained by Benthin and Geller with the use of charcoal sticks in cases of septic abortion have been corroborated by others, so that a brief mention of this treatment should be made. Charcoal has long been used in the treatment of wounds, even in olden times. Recently

the desirability of employing some agent that would act upon bacteria by its *physical* rather than its *chemical* properties induced a trial in septic abortion. Geller made tests of charcoal dissolved in saline solution, serum and defibrinated blood and found that charcoal sticks disintegrate rapidly in saline and bouillon and that if cultures of bacteria are added, bacterial death results.

Naturally such a carbon preparation must be as pure as possible. Nahmmacher recommends Merck's preparation of *carbo medicinalis*.

The effect of the carbon is to absorb toxins, dry out the tissues, and so produce a better defense reaction to bacterial invasion. It is claimed that it also mechanically blocks the open sinuses and prevents a spread of the infection. Nahmmacher employs charcoal pencils either before or after cleaning out the uterine cavity, according to the special conditions present. His technique is to expose the cervix with a speculum, catch the anterior lip, grasp a carbon pencil, previously dipped in sterile water, by means of a dressing forceps, and gently insert it beyond the internal os. According to the size of the uterine cavity and the severity of the infection, two or three carbon pencils are thus introduced. Generally one pencil, 3 cm. in length, will suffice. In order to prevent the escape of the charcoal paste that is thus formed, a thin strip of gauze is placed in the cervix for three to four hours. Nahmmacher, without recording the number of his cases, states that the temperature promptly drops and the odor of the discharge disappears as the infection subsides.

Hönig reported results in 210 cases treated with carbon pencils. Of these 169 were febrile abortions and 9 were complicated febrile abortions. Of the former group none died and a morbidity of 3.5 per cent was recorded. Since 6 out of the 9 complicated febrile cases died, he considers it of no value in this group. The absence of chills or prolonged fever in the septic abortions was particularly noted. R. Jetto in Italy corroborated the good results of carbon pencils in febrile abortion where the infection is still localized. B. H. Carroll of Toledo, U. S. A., writes favorably about his experiences with this method in 106 cases of abortion. He found it advantageous to empty the uterus before inserting the carbon pencils into the uterus. Sixty-eight febrile patients showed a morbidity rate of 8.8 per cent without any deaths. There was a 25 per cent shorter period of convalescence.

Summary of Treatment of Septic Abortion

Though realizing the truth of the old saying "there are many roads that lead to Rome," I nevertheless feel it my duty to point out the road that I would recommend in the treatment of septic abortion.

(1) The diagnosis of extrauterine complications is of the utmost importance; so important that a few days of delay are preferable to taking the wrong steps; for under no circumstances should we employ active treatment evacuating the uterus in the presence of an extension of the infection beyond the uterus.

(2) The agent producing the least trauma should be chosen in septic abortion. Hence medication in the form of quinine, pituitrin or ergot is indicated wherever it might help, as in cases of intact retained ovum or placenta, especially in the later months.

(3) A delay of five days in the evacuation of the uterus is almost always possible and does not harm the patient. During this interval many cases are terminated spontaneously and the remainder have a better opportunity to build up resistance to the infection. The temperature will often drop to normal. It is often advisable to wait even a few days longer.

(4) If the temperature has remained normal for three to five days, emptying of the uterus will expedite recovery and usually do no harm.

(5) Digital removal, preferable in many cases of afebrile abortion, is to be avoided in febrile cases, except perhaps where the major portion of the placenta, in pregnancies of four to six months' gestation, is retained.

(6) Instrumental evacuation of the uterus can be safely done at this time but the minimum traction and the minimum trauma must be employed. Dilatation of the cervix is rarely necessary after the period of expectant treatment has elapsed.

OUTLINE B. TREATMENT OF SEPTIC FEBRILE ABORTION

(Case considered septic if temperature above 38° C. [100° F.] persists over 24 hours.)

CONTENTS OF UTERUS	<i>First Twelve Weeks</i>		<i>Thirteenth to Twenty-eighth Week</i>	
	Fever Present	Fever Ceased	Fever Present	Fever Ceased
OVISAC RETAINED	Expectant treatment Quinine or simi- lar drugs	Evacuation with ovum for- ceps followed by blunt curette	Expectant treatment Quinine or similar drugs	Expectant treatment Quinine or simi- lar drugs; gauze pack if necessary
PLACENTA RETAINED	Expectant treatment	Instrumental evacuation by ovum forceps or blunt curette	Expectant treatment	Digital removal aided by ovum forceps
PLACENTAL REMNANTS RETAINED	Expectant treatment	Blunt curette	Expectant treatment	Evacuation with ovum for- ceps and blunt curette

(7) Wiping the uterine cavity with a tincture of iodine sponge, both before and after evacuation, reduces the chances of spreading infection.

(8) The sharp curette should rarely be employed in febrile abortion owing to increased danger of traumatism and risk of spreading infection.

(9) If *profuse* bleeding occurs, immediate evacuation of the uterus by the gentlest possible method is indicated, and the blood loss promptly replaced by blood transfusion.

(10) In the presence of hemolytic or anaerobic streptococci we should advise longer delay in cleaning out the uterus and the minimum of manipulation. In the presence of the Welch gas bacillus, however, a hysterectomy is sometimes necessary.

CHAPTER XII

OPERATIVE TECHNIQUE

THE VARIOUS TECHNICAL procedures employed to interrupt pregnancy are described under the head of Therapeutic Abortion. Here we shall consider only those measures that may be necessary when the abortion has already begun.

The first problem that comes up for discussion is whether to handle such cases in the home, at the office, or in the hospital. Since the physician must in every case of abortion strive to keep his name clear of any suspicion of malpractice, it is naturally preferable for him to treat every patient with this condition in a hospital, where records are kept and the presence of nurse or interne prevents any possible efforts at black-mailing by unscrupulous persons. It is relatively easy for a man in city practice to carry this out, but in a very considerable number of cases handled in country or small town practice this will not be feasible. Here the necessary procedures will often have to be carried out either in the doctor's office or at the home of the patient. Even under these conditions it would be best if the physician have some third person such as a nurse or assistant present at the time of the treatment. Kuhn believes that if curettement or removal of the placental tissue is necessary the patient should be transported to the doctor's office where work can be done under aseptic conditions more readily than in the home. We are, however, inclined to agree with Eberhardt, who points out the danger of stirring up infection by such an early transportation of patients. The risk of hemorrhage will also be increased thereby.

Nowadays, when every country doctor or small town practitioner must be prepared to handle obstetrical work in the home under aseptic conditions and has ready for such an emergency the necessary sterile articles and instruments, it should not be so difficult for him to handle an abortion at the home of the patient. In practically every case means will be at hand for sterilizing the necessary instruments. Medical supply houses now have available sterile gauze in all forms necessary for packing, and gown, gloves, safety razor, soap, alcohol and antiseptics have been brought along. A kitchen table covered with oilcloth, and leg holders or other simple contrivances to keep the patient in the lithotomy position, will ordinarily serve as an operating table, with better exposure than if the patient is handled in bed (Fig. 55).

Some physicians are apt to underestimate the risk of infection in these abortion cases. It is approximately ten times greater than at the ordinary childbirth, since in almost every case the uterine cavity must be invaded, whereas at childbirth this is rarely the case. The relatively high mortality following the handling of abortion cases by many physicians is largely due to their carelessness and ignorance of these inherent dangers.

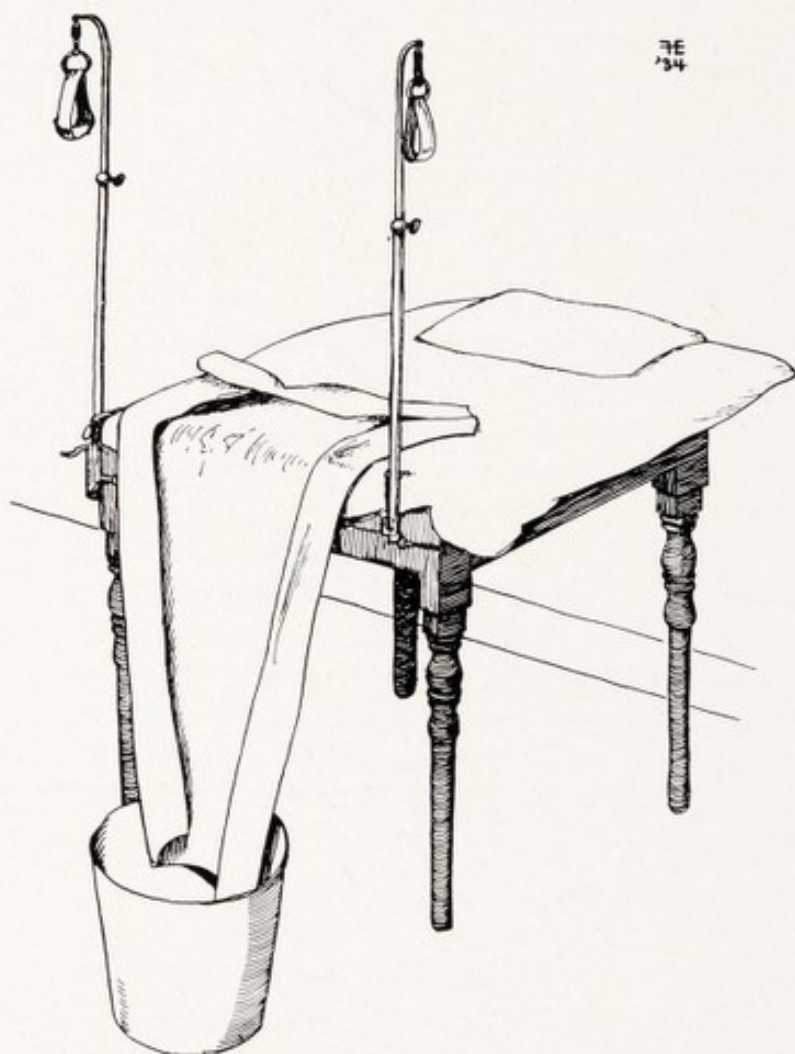


Fig. 55.—Improvised kitchen table for emergency treatment at home. (Redrawn from Crossen.)

Anesthesia

Except for the simple removal of the ovisac or retained placenta hanging within the cervix and upper vagina, some analgesia or anesthesia will ordinarily be required in abortion cases. Whether to apply local or general anesthesia must be decided in accordance with the particular conditions of the abortion. Owing to the increased risk of hemorrhage with general anesthesia, this should be avoided whenever pos-

sible. In pregnancies that are advanced beyond the third month, however, where intrauterine digital palpation and removal of placenta or ovisac are necessary, the complete relaxation of the abdominal walls under general anesthesia greatly facilitates the necessary manipulations and does not add materially to the risk. In most cases, however, this will not be necessary, since ample anesthesia can be obtained by the instillation of novocain in the broad ligaments, especially if preceded by twilight sleep or the barbiturates (Fig. 56). Only in the presence of infection is there a definite contraindication to its employment, since organisms may be carried by the needle into the neighboring broad ligament.

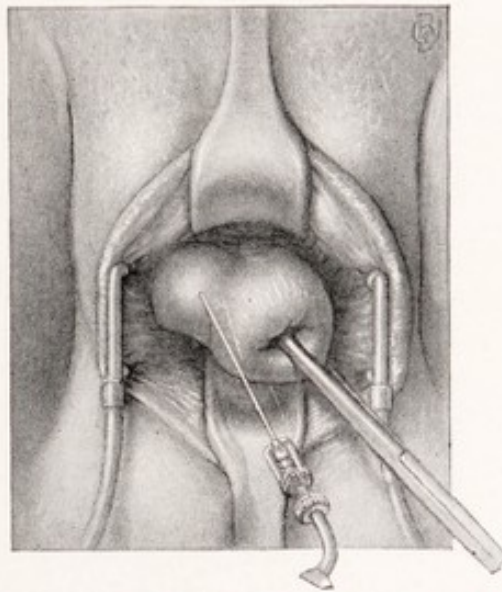


Fig. 56.—Local anesthesia for abortion treatment. Instillation of novocain solution into the base of the broad ligament. Both broad and sacro-uterine ligaments are infiltrated in this manner. (Farr: *Local Anesthesia*, Lea and Febiger, 1923.)

In German literature we find many references (Gellert, Schneider, Arndt) to the use of small quantities (10 c.c.) of a one per cent novocain solution for local anesthesia. The usual technique employed in this country is to inject from 2 to 4 ounces of a one-half per cent solution of novocain with the addition of two drops of adrenalin to the ounce. This gives much better results and is very effective in controlling any tendency to hemorrhage. The preparation of sterile novocain solution in ampoule form will permit of the wider use of local anesthesia in country practice and thus considerably reduce the risk attendant upon giving a general anesthetic in the home or office under unfavorable conditions.

The Russian Podsorow found in treating several hundred cases that his results were better when using larger amounts of weaker solutions of novocain, e.g., 60 to 150 c.c. of a one-quarter to one-half per cent

solution, as compared with 10 to 30 c.c. of a one-half to one per cent solution. In the latter cases anesthesia was longer in setting in, and less effective.

It is important in infiltration with a local anesthetic to inject one-fourth of the amount to be used into each broad ligament directly lateral to the cervix at the vagino-cervical junction, and one-fourth of the amount into each sacro-uterine ligament at the vagino-cervical junction directly over these ligaments. This emphasis on the use of considerable quantities of novocain solution in the sacro-uterine ligaments is based on the anatomical distribution of the sympathetic nerve ganglia situated there which must be deadened in order to produce satisfactory uterine anesthesia. A word of warning is also appropriate at this point against the injection of novocain solutions without first being certain by a slight to-and-fro motion of the needle that the fluid is not being directly injected into the uterine vessels.

Technique of Dilatation

The conditions under which additional dilatation of the cervix may prove necessary have already been discussed. The mechanical agencies that may be employed vary in accordance with the amount of dilatation necessary. In the earlier months this may be accomplished by means of metal graduated dilators, laminaria or intrauterine gauze packs. The advantage of the graduated dilators lies in the fact that such instruments are more readily sterilized and will produce dilatation in less time. The disadvantage lies in the tendency to produce cervical tears and the increased risk of hemorrhage where the dilatation has been brought about without accompanying uterine contractions.

Laminaria tents have been very widely employed in Germany and many other European countries but are not so popular in America. These tents consist of pencils of sea-weed which swell up in the presence of moisture and if placed within the cervical canal will slowly stretch this canal to two or three times its former diameter. They are usually made as a straight pencil but Niederehe has recommended curved laminaria to correspond to the utero-cervical curve, thus reducing the risk of cervical perforation (Fig. 57). Nussbaum has devised a similar curved laminaria with hollow center that permits the escape of secretions of the uterus.

A number of objections have been raised to the use of laminaria tents. If they slip out below the internal cervical ring, the canal will be dilated without effect upon the region of the internal os. If, on the other hand, the laminaria tent has slipped in too far, the external

os may be closed and interfere with the withdrawal of the tent. In cases of rather rigid cervix the laminaria may assume an hourglass shape with swelling above and below the constricted area causing considerable pain and difficulty in its removal. Schmidt cites a case in which a hysterectomy was necessary for the removal of a laminaria, and cases are on record where after a false cervical passage had been created in its introduction, the resulting swelling of the tent led to a tear with perforation into the cul-de-sac.

In this country where sterile gauze for intrauterine packing is readily obtainable, and the special instruments for packing in an aseptic manner available and more widely used, we find that this

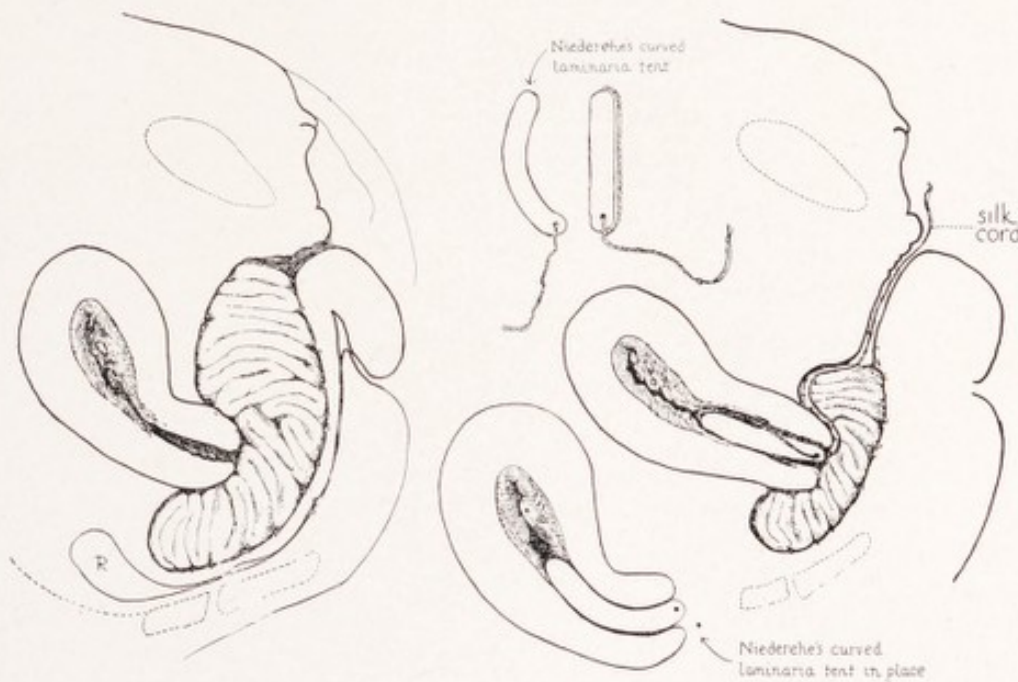


Fig. 57.—Dilation of the cervix with laminaria and vaginal gauze pack. The curved Niederehe and ordinary straight laminaria are shown side by side, and as introduced into the cervical canal.

method of producing or increasing cervical dilatation is very popular. Wherever intrauterine and intracervical gauze packing is employed extreme care must be observed that in introducing it the gauze does not come in contact with the external genitals of the patient. The width of gauze pack employed will depend upon the amount of dilatation. It will vary from one-half to two inches in diameter depending upon the case.

A serious objection to both the use of laminaria and gauze pack lies in the fact that blood and other secretions are prevented from flowing out through the cervix, and that this damming back of secretions predisposes to infection.

Concerning the technique of dilatation in the fourth to the sixth month of pregnancy, where the amount of dilatation required will be such as to permit the introduction of one or two fingers into the uterine cavity, considerable difference of opinion still prevails. Some German operators prefer to accomplish this by means of a special dilator called Metroanoikter. This instrument will be seen in Fig. 58. Schneider advises that it be left in the cervix for 6 to 18 hours before emptying the uterus. The danger of cervical tears by its use is considerable and has prevented its more widespread employment. A small Voorhees bag as described in the chapter under therapeutic abortion is more suitable for such cases.

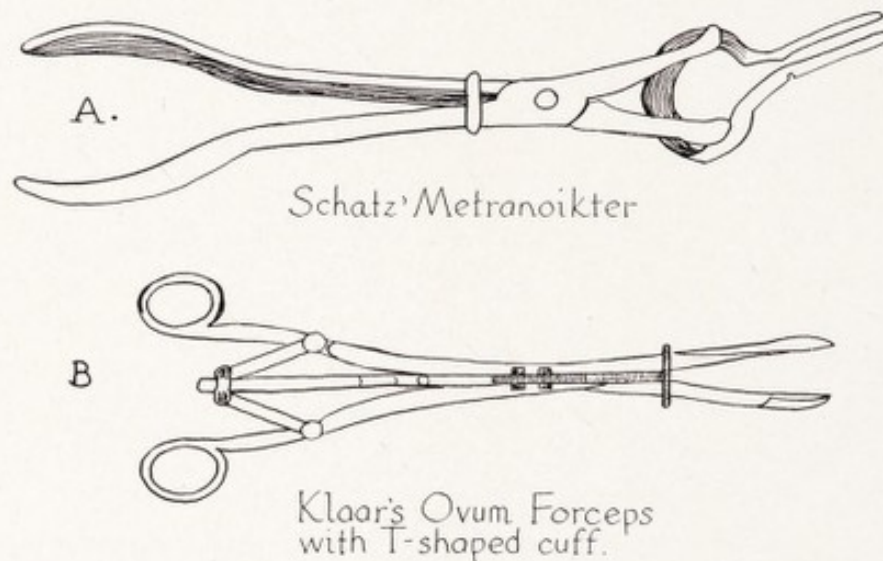


Fig. 58.—A. Schatz' metroanoikter with instrument used for introducing it into the cervix. B. Klaar's modification of the ovum forceps with crosspiece to limit the depth of introduction into the uterus and so prevent grasping a portion of the uterine wall.

Technique of Emptying the Uterus

If the retained material is lying within the grasp of the cervix and visible within the vagina after the introduction of a speculum, it can be grasped with an ordinary sponge forceps and readily withdrawn (Fig. 59). If on examination of the tissues it appears unlikely that any additional material is retained in the uterus, no further treatment will be necessary. Since it is always desirable to avoid entering the uterine cavity unless absolutely necessary, we can, before resorting to instrumentation, employ the method of expressing the ovum suggested by Budin in which the uterus is caught between the vaginal finger and the abdominal hand in a retroverted position and its contents milked out by pressure between the two hands (Fig. 60). A wide dilatation of the cervix and a loosening of the attachment of placenta or ovi-sac are prerequisites for the successful execution of

this maneuver. Under these conditions, as Budin expressed it, "the ovum will pop out of the uterus just as a pea does out of its pod." Should the ovum be large it may be necessary to break it into several pieces before expression will be possible.

A variation of this procedure suggested by Höning consists in keeping the uterus in an anteverted position and pressing with the vaginal fingers against the anterior wall (Fig. 61). In this position massage of the uterus can be more effectively employed.



Fig. 59.—Removal of loosened and partly expelled ovisac from cervical canal by means of two sponge forceps.

As analyzed in the previous chapter, the means for emptying the uterus are the curette, the ovum forceps and the finger. The indications for their use under varying conditions have previously been explained. Here we need mention only a few special points of technique.

Curette.—The ordinary Sims or Recamier loop curette, either the blunt or sharp form, is employed in curettement of abortion cases (Fig. 62). The blunt curette will usually suffice to loosen and remove the larger and more loosely attached bits of placenta (Fig. 63). At times, however, particularly if the loop of the blunt curette is rather

small, it will pass over the placental tissue without dislodging its attachment. For this reason I believe it better to employ a semi-sharp instrument such as is largely used in Russia and which has the advantage of a dull edge as against the ordinary round loop of the dull curette. In the matter of technique I think it well also to follow the Russians in employing a rather large size curette with long ovoid shape one and one-half cm. wide and three cm. long. While the in-

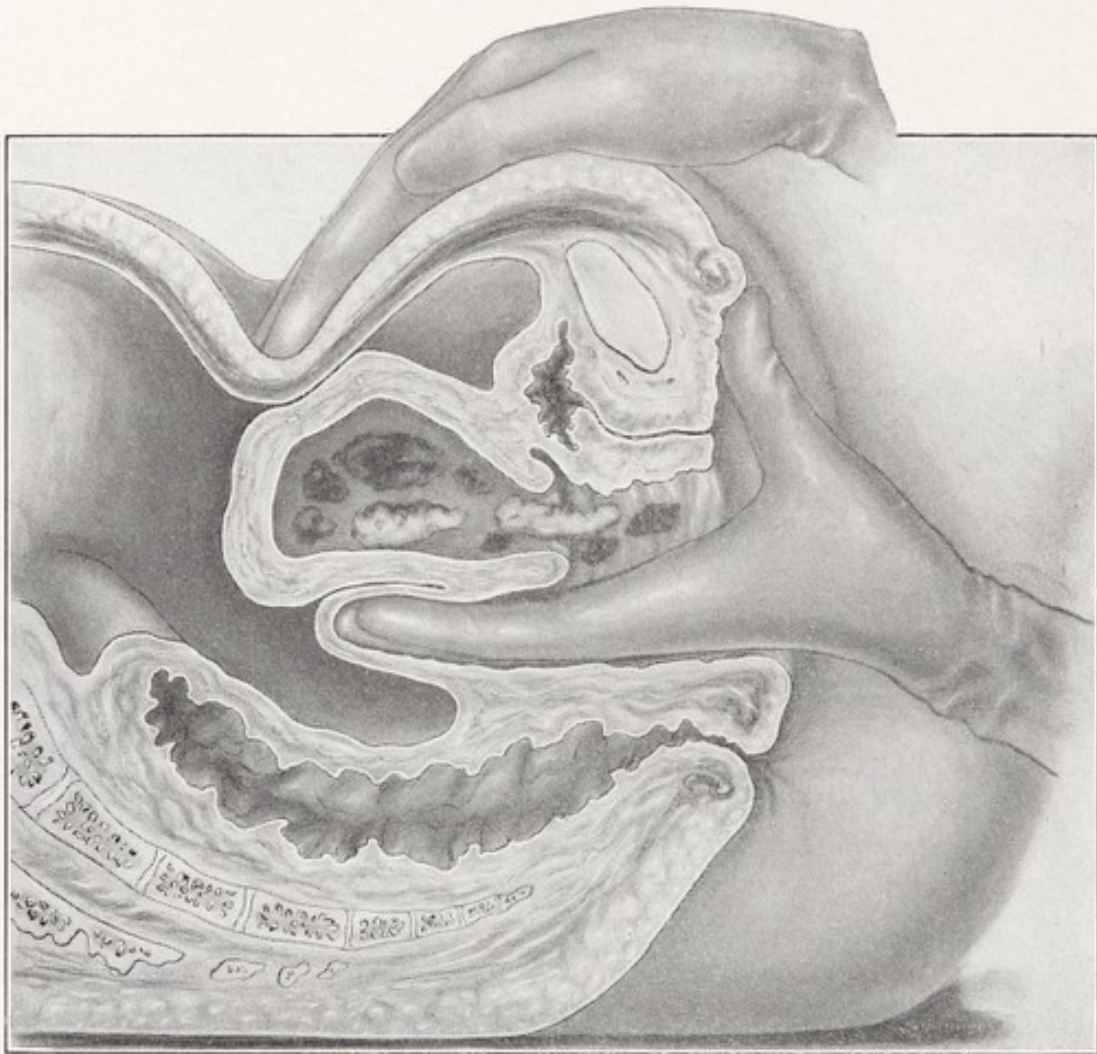


Fig. 60.—Budin's method of expressing pieces of loosened retained placenta from the uterine cavity with the uterus in a retroverted position.

troduction of such a curette requires slightly greater dilation of the cervix up to a 22 Hanks dilator, it is much less apt to produce a perforation of the uterus than the smaller more rounded curettes commonly employed.

Occasionally in abortion of younger ova, up to the eighth week, where the uterus contains very little material, mostly decidua, a large sharp curette can be safely employed and if gently handled will more

completely remove all placental material without risk of carrying away too much of the basic endometrial layer. In the handling of the curette, gentleness should be our guiding principle. Naturally a proper exposure of the cervix under good light and a thorough dilatation of the cervical canal is necessary for its safe use. The curette should be held like a penholder and introduced very slowly until it meets with the slight resistance of the uterine wall. Since we occa-

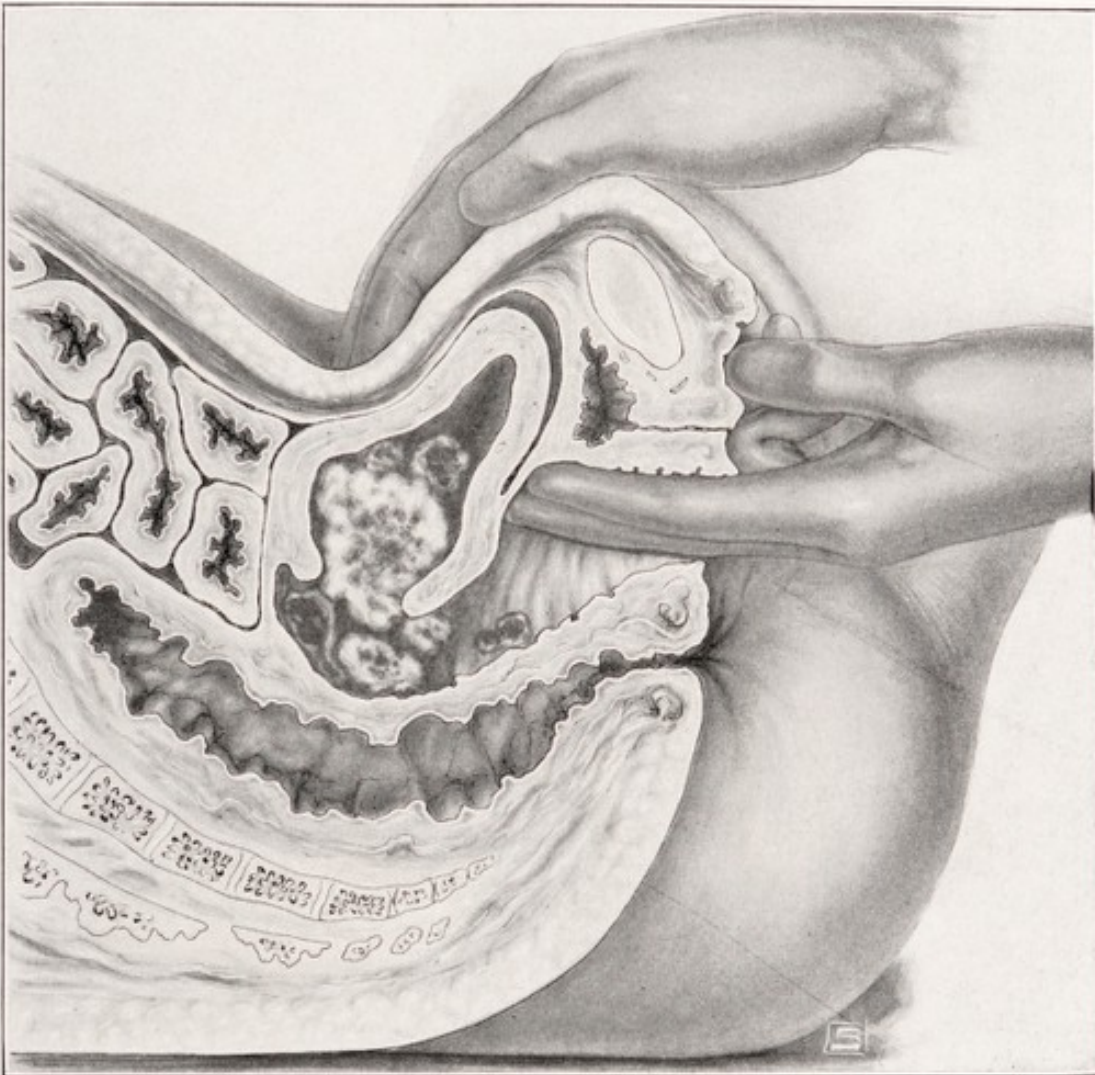


Fig. 61.—Hoening's method of expressing retained placental remnants from the uterus with that organ in an anteverted position.

sionally have relaxations of the uterine wall that prevent the ready recognition of resistance to the curette it is well to have a definite mark upon this instrument gauged by the bimanual examination of the patient that indicates the depth of the uterine cavity, beyond which the curette should never be pushed. In the downward stroke of the curette a little more pressure can be exerted since perforation will not be caused in this direction, but with each additional stroke

of the curette the movement upward should be slow and gentle, just as a rower feathers his oar (Fig. 64).

An ingenious contrivance in which the advantages of palpation are combined with those of curettement is the so-called thimble curette (Fig. 65). Described by Blond in 1927 it has been re-discovered and pre-discovered by various other men. It is slipped on the index finger and has a projecting scoop similar to a Chinese finger-nail with which placental pieces are detached from the uterine wall.

Ovum Forceps.—For the removal of large pieces of ovisac or placenta, the ovum forceps is better suited. This has been made in many forms, one of which is shown in Fig. 58. Klaar has devised such an ovum forceps with the addition of a T-shaped cuff that prevents the

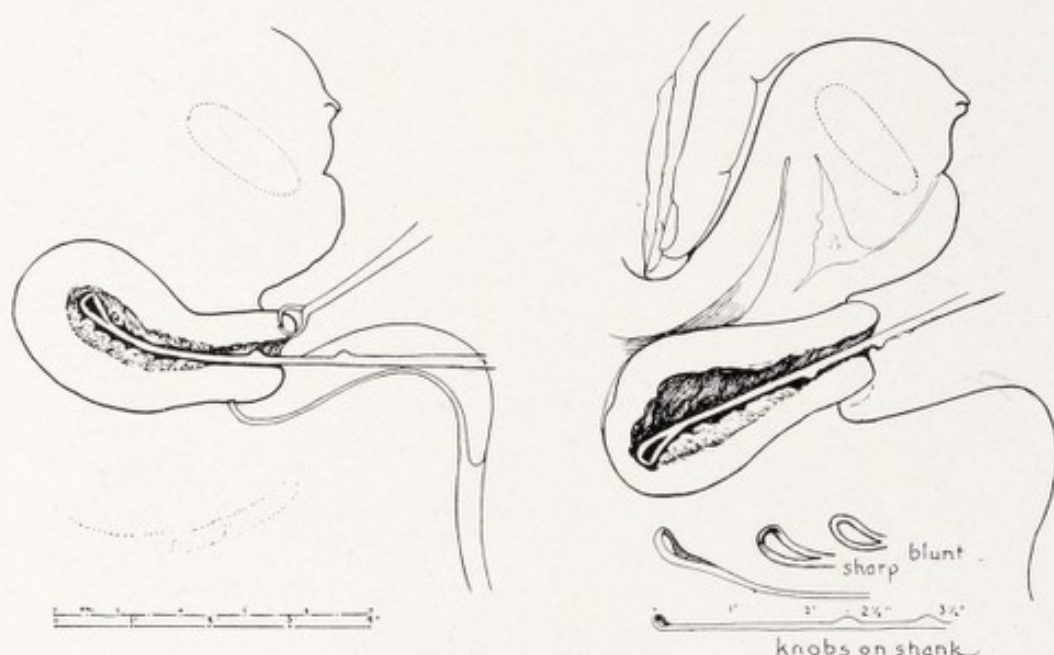


Fig. 62.—Use of the curette in abortion, showing various types of instruments and knobs to indicate the depth of introduction into the uterus.

introduction of the instrument beyond a point where its grasp is just beyond the internal os. By this means we can avoid any possible perforation but are able to grasp loosened placental pieces lying near the internal os. This brings up the question of handling the ovum forceps. The not infrequent perforations of the uterus following its employment are invariably due to bad technique. The ovum forceps must not be used to loosen tissue from the uterine wall but only to remove the already loosened pieces lying within the uterine cavity (Fig. 66).

In cases of abortion up to three or four months gestation, where the fetus and a portion of the placenta has already been expelled I have found it of distinct advantage to employ the ordinary *sponge*

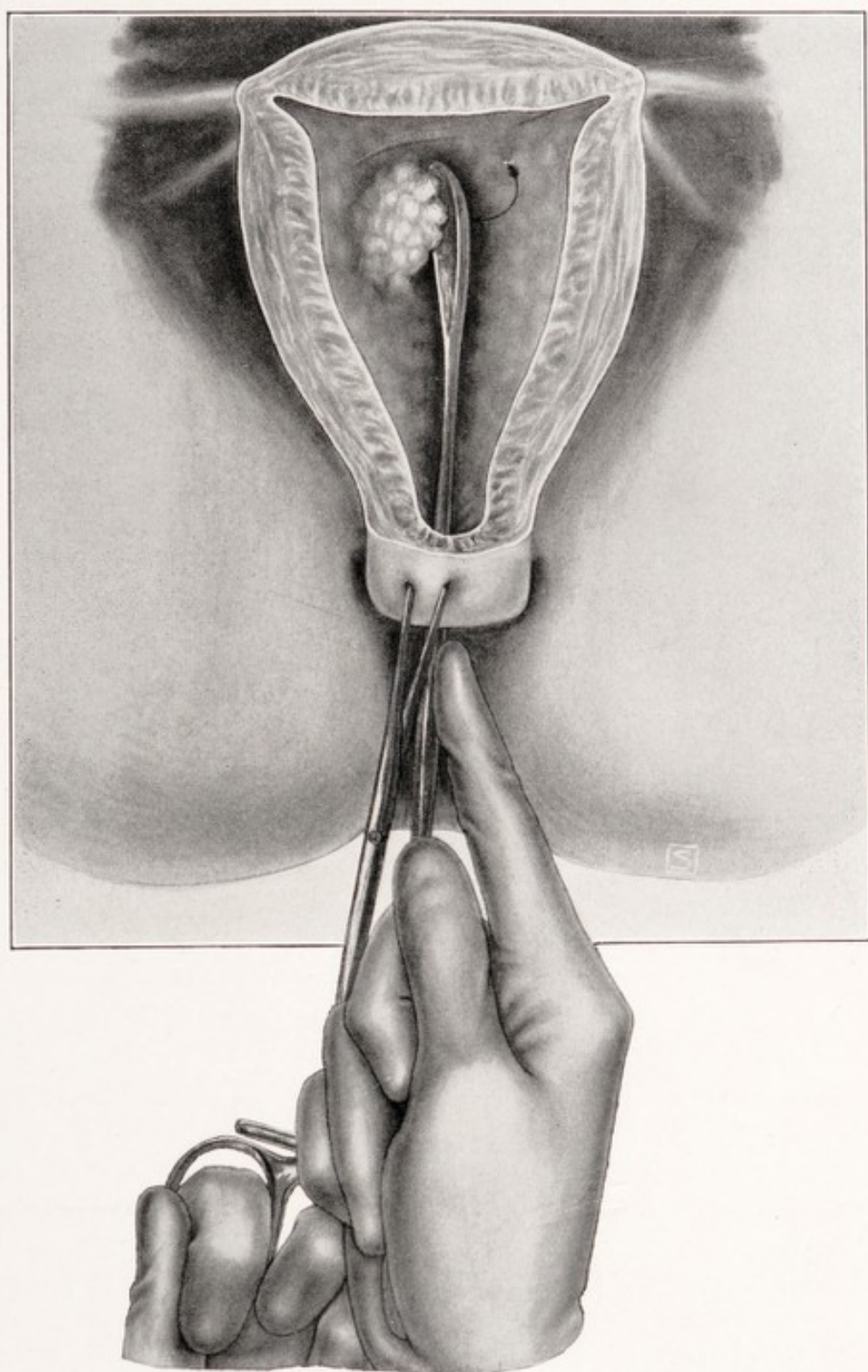


Fig. 63.—Large blunt spoon curette suitable for the removal of larger pieces of placenta in more advanced pregnancies.

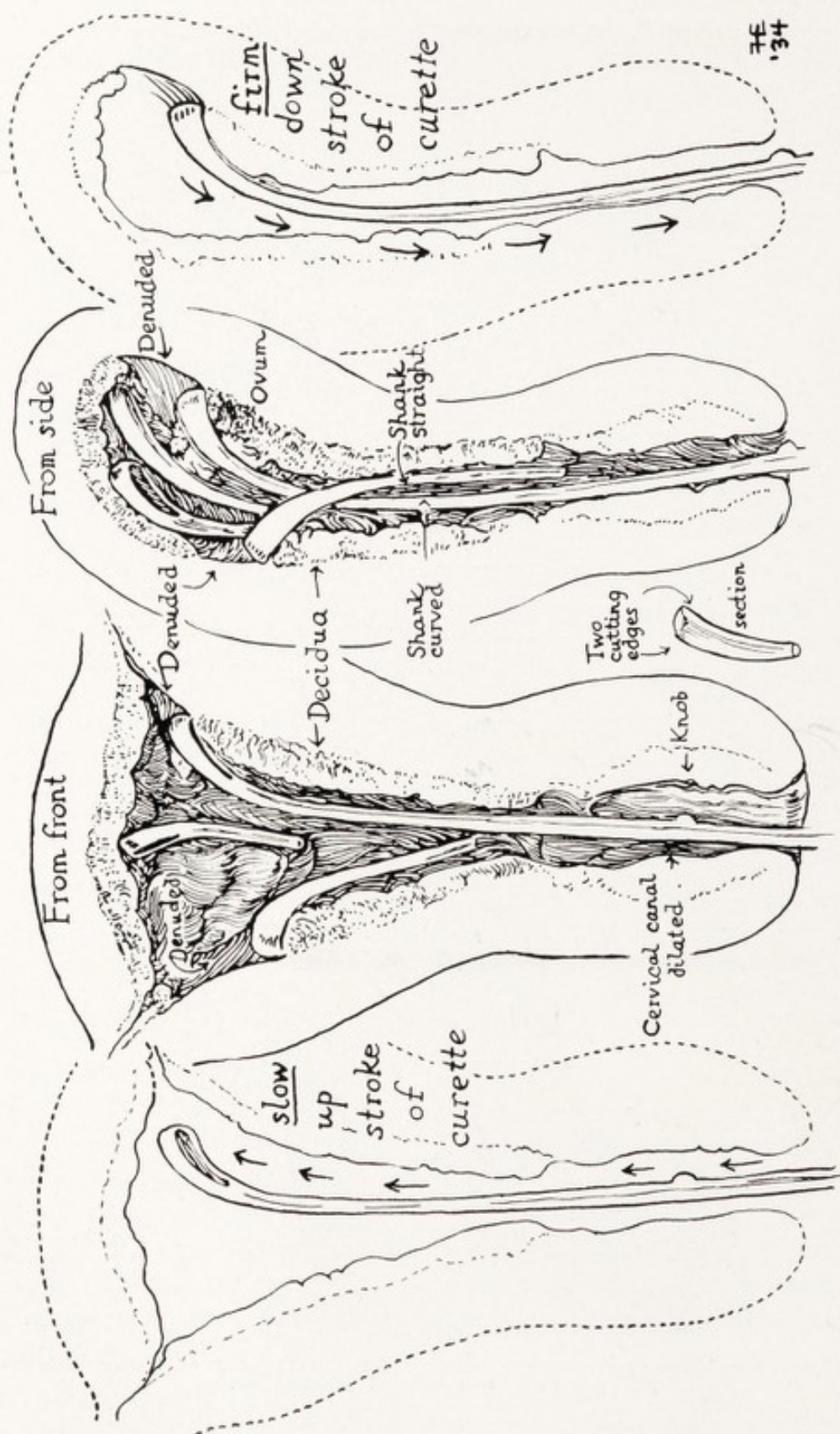


Fig. 64.—Technique of curettement. Notice the slow and careful *up* stroke and the *firm down* stroke of the curette and the modified curve of the shank to permit its use in various portions of the uterine cavity. (Dickinson.)

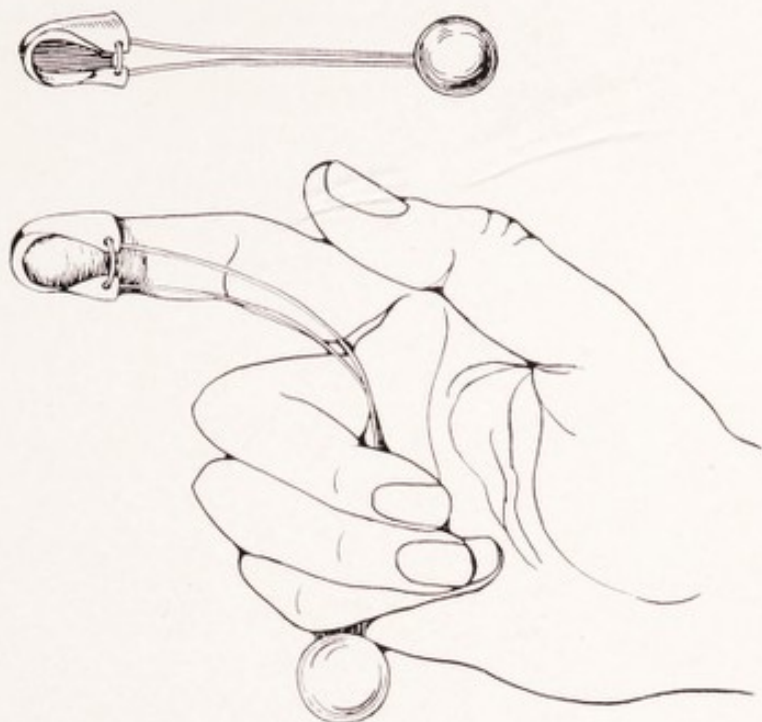


Fig. 65.—Blond's thimble curette for the palpation and removal of placental tissue from the uterus. The inner edge of the thimble has a scraping surface like a curette. By means of the cord and ball the instrument can be kept firmly in position at the end of the finger. The hand is shown uncovered, although a glove should be worn for such intrauterine manipulations.

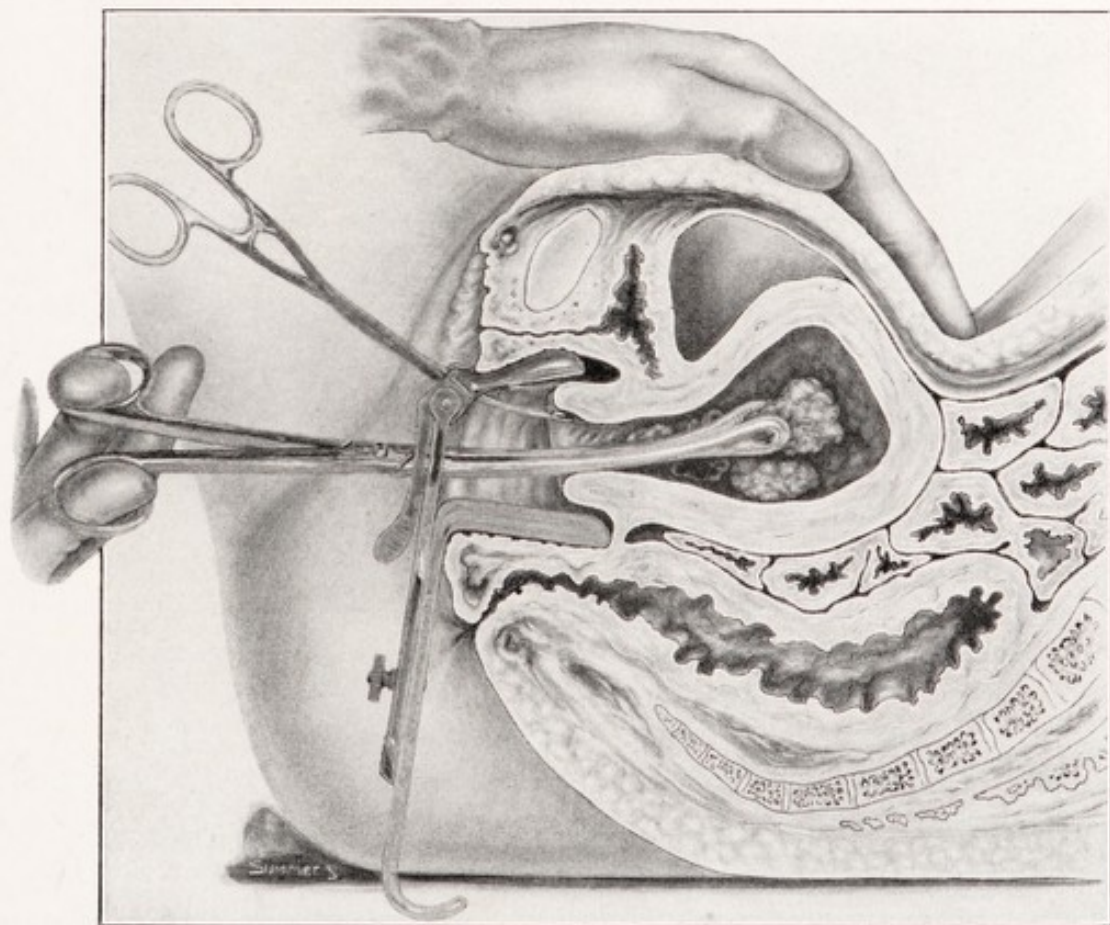


Fig. 66.—Ovum forceps removing loosened placental fragments from the uterus. Counter pressure by the abdominal hand over the uterus lessens the chance for perforation.

forceps for the purpose of loosening and removing placental tissue. Gordon in New York has made a similar recommendation. The sponge forceps combines the advantages of a blunt curette and an ovum forceps. It can be introduced without a great deal of cervical dilatation and when slipped into the uterine cavity can be opened up a distance of two or two and one-half inches. By a twisting motion within the uterine cavity, both blunt ring-like blades of the instrument pass over the surface of the uterine cavity and loosen retained bits of placenta. The fact that pressure is exerted at two points instead of

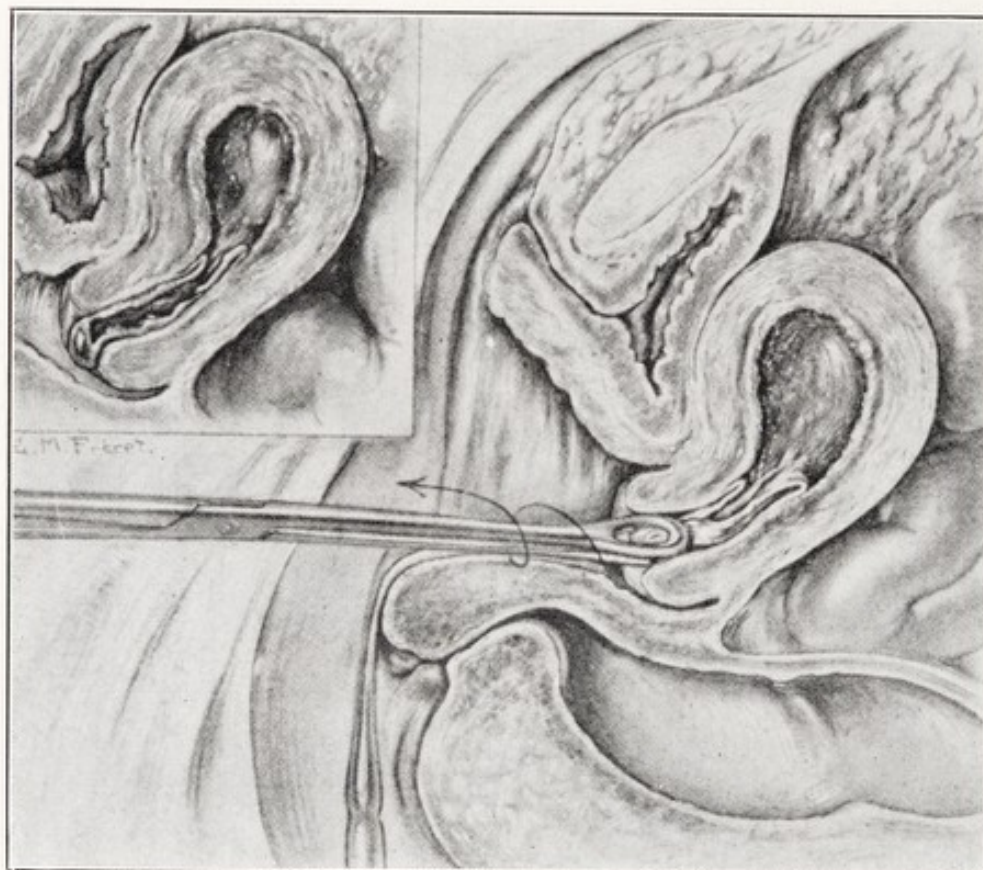


Fig. 67.—Use of the sponge forceps to loosen and extract retained placenta. (Gordon: J. A. M. A., 1924.)

at only one, as in an ordinary dull curette, reduces the chance for perforation. After making several such sweeping movements with the sponge forceps in the uterine cavity (Fig. 67), the instrument can be closed and the material already loosened withdrawn. I have been particularly well pleased with the simplicity of this technique and its effectiveness in thoroughly emptying the uterus.

Use of Finger.—In every case of abortion at three or more months, particularly in the woman who has had children, and whose cervix is readily dilatable, the use of the finger is invaluable both as an aid to the location of retained material and as a means of loosening that

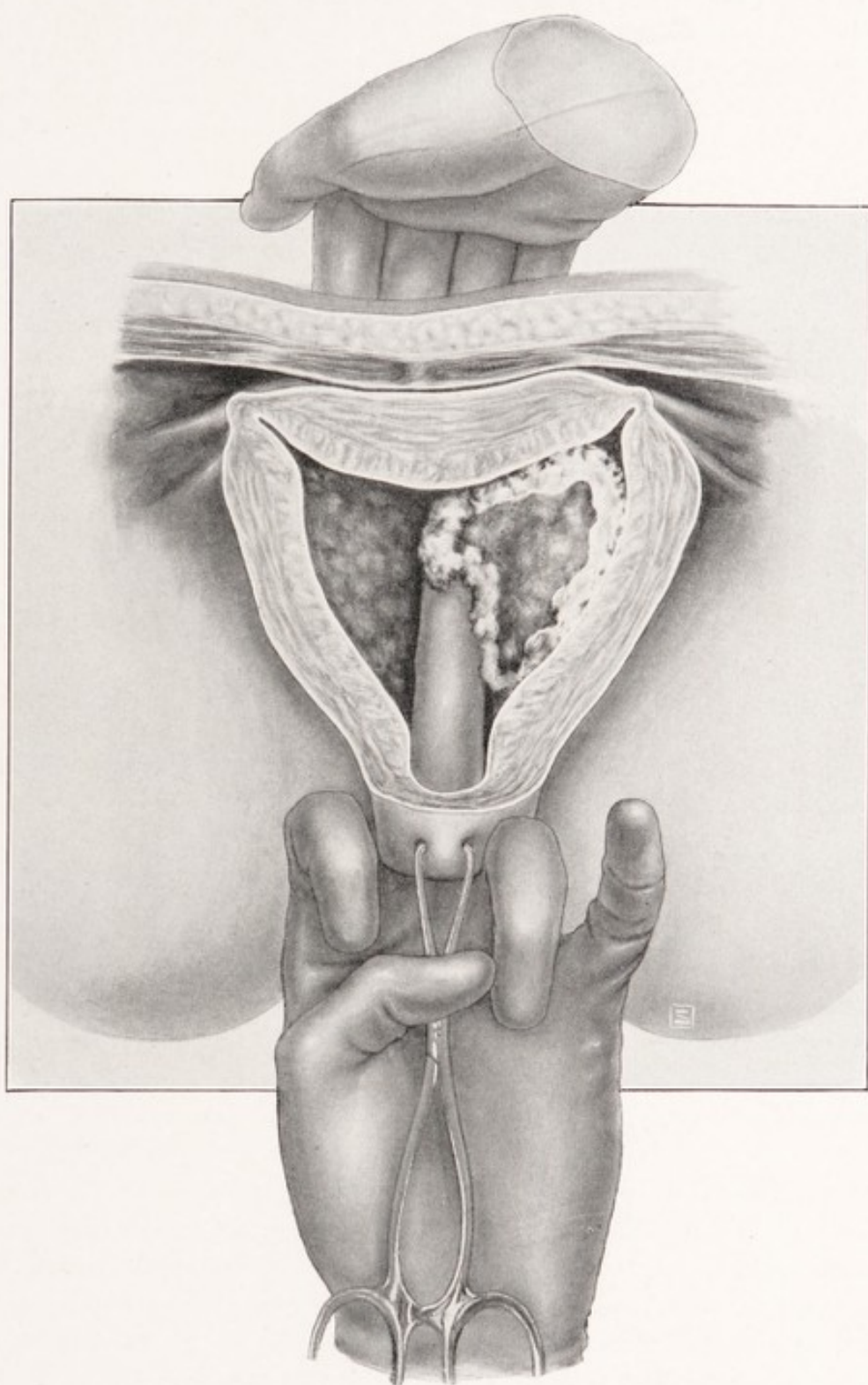


Fig. 68.—The finger as an aid in loosening retained placenta from its attachment to the uterine wall. The longer middle finger is introduced into the cavity and the abdominal hand presses down against the uterus from above, pushing the placenta against this finger until it is detached.

material from its attachment. The carefully trained gynecologist should have developed the sense of touch to such a degree that he may be said to have "an eye at the end of his finger." Even with the covering of a rubber glove and the slightly deadening constriction of the cervical ring, he should be able with a little training to distinguish retained placental tissue without difficulty. Naturally this technique is not acquired without a short period of apprenticeship, and I would suggest that anyone who has occasion to have many of these cases in his practice should develop the technique of palpating the uterine cavity with his finger. In the technique of palpation it is always important to press down upon the uterus with the other hand over the abdomen (Fig. 68). By this means the index finger can reach the furthestmost corner of the uterine cavity provided it is not over three and one-half to four inches in length. As a matter of fact, by this maneuver the fundus of the uterus is pressed down against the finger rather than that the finger actually is driven at the fundus. It will at times be possible for the finger to loosen a large piece of placenta and yet not entirely detach it from the uterine wall. In such instances if the finger is used as a guide, and an ovum forceps passed along side of it, the bit of placenta can be grasped by the forceps. Under such control it is perfectly proper to use the forceps for this purpose. The general rule, however, must be maintained that the ovum forceps is not to be used to *loosen* placental tissue.

In cases from the fourth month on, with a uterine cavity of four and one-half to six inches in length, the cervix should be more thoroughly dilated so that two fingers instead of one can be introduced (Fig. 69). Again we must emphasize the importance of using counter pressure upon the uterus from above. Only by rubbing the fundus of the uterus against the fingers can we hope successfully to detach pieces of placenta tissue. This technical point is not sufficiently emphasized in text-books. After such digital detachment of the remaining portions of the ovisac they can either be expressed by Höning's or Budin's method as already described, or, if this is not successful, they can be removed with the ovum forceps or sponge forceps.

In describing the technique of digital removal, Frieth stresses the importance of avoiding contact with vaginal secretions before introducing the finger into the cervix. To accomplish this, he catches the cervix with tenaculum forceps and draws it down to the vulva; then, using the middle finger to retract the perineum, he exposes the cervix sufficiently to introduce the index finger directly into the cervical canal. Relaxing the pull of the tenaculum forceps he now proceeds with bimanual digital loosening of retained tissue. Sellheim empha-

sizes the necessity of digital control in the more advanced cases. Even in expert hands, control by instruments is far more dangerous and less certain than control by the finger. He believes that an important preliminary step to such digital exploration of the uterus is the giving of an ampoule of 1 c.c. pituitrin or gynergen hypodermically, so that the uterus is firmly contracted and that the necessary manipulations are carried on with a minimum loss of blood.

He advises training students and practitioners in the technique of such digital intrauterine palpation by means of a course on the phantom. This should be made a part of the regular phantom course

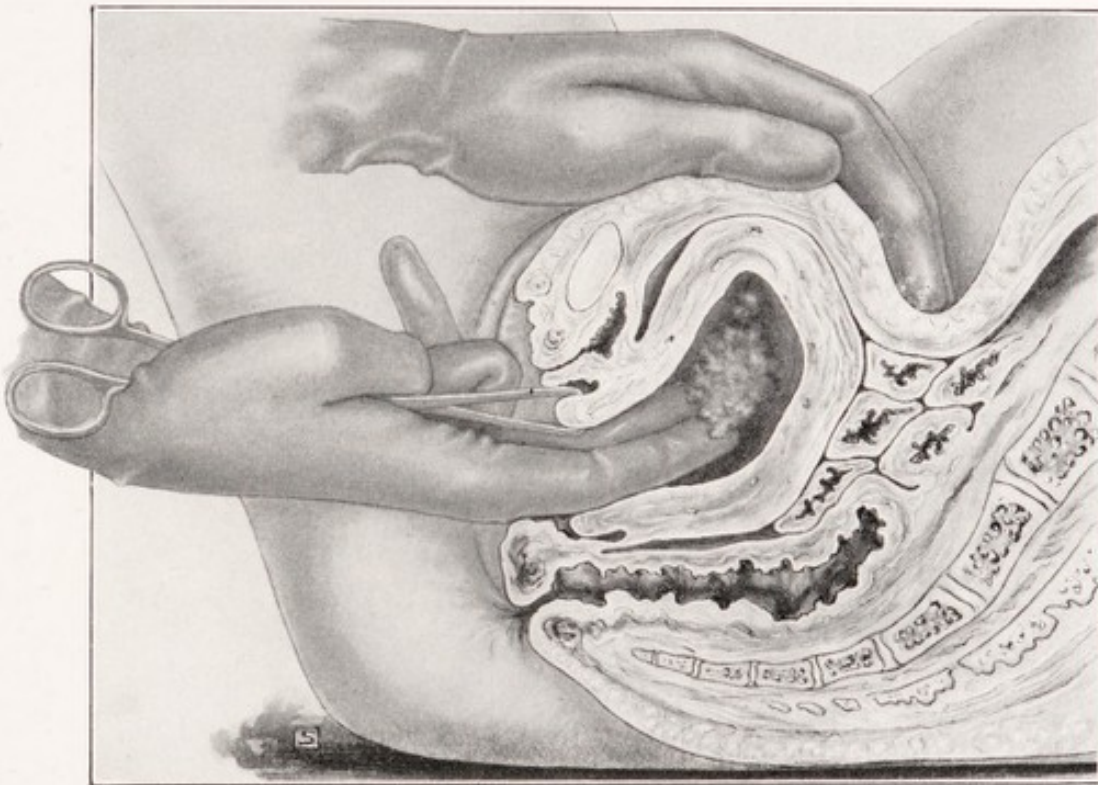


Fig. 69.—Two fingers used for removing retained placenta, when cervix is opened widely, in pregnancies of the second trimester.

in obstetrics given at medical schools. In Figs. 69 and 70 will be seen reproductions of the way in which the finger can be used as an aid in the handling of abortion cases.

Technique in Complications.

Under the head of perforation and septic infection will be found a description of the method of treating these complications. It will suffice to give under this head a few more detailed instructions regarding the handling of hemorrhage. Since a certain number of cases of fatal bleeding are recorded, and since the blood loss, even if not

fatal, is an important factor in reducing the resistance to infection, measures for the control of hemorrhage have considerable importance. Not the least of these is the preliminary injection of 1 to 2 c.c. of pituitary extract into the cervix approximately 1.5 cm. above the external os. Dorster, who recommends this procedure, stresses the importance of injecting this fluid into the tissue of the cervix, and not into the canal.

The technique of a careful *tamponade* of the uterus will be found in obstetrical text-books. Here we need stress only one or two points.

First, in the process of packing, the gauze should not come in contact with either the vulvar or vaginal surface, but pass directly through the cervical canal into the uterine cavity. This can be accomplished by the use of a Broadhead packer.

Second, it is important that both the size of the uterus and the amount of dilatation of the cervix shall have been determined by a previous bimanual examination, so that the size and length of the gauze strips necessary for properly packing the uterus can be gauged. Although in cases of hemorrhage it is important to act quickly, it is well to remember that a little less speed and a little more accuracy of application is preferable.

Third, it is important that the first layer of gauze be introduced as high as possible into the uterine cavity, and that in introducing additional layers of gauze, sufficient pressure is employed lightly to compress the gauze against the bleeding surfaces. Only too often the gauze is merely packed into the cervical canal, so that bleeding continues until the pressure of uterine contractions upon the clots forces the gauze pack out of the cervix again, and hemorrhage is renewed.

The last step is firm tamponade of the vagina, beginning in the posterior fornix and steadily lifting the uterus in order to drag on the uterine arteries. A Sims blade to retract the rear wall and a narrow elevator to retract the anterior wall are requisite, as no bivalve speculum gives complete access to deep recesses.

CHAPTER XIII

EXTRAUTERINE SEPTIC INFECTION

ONE OF THE MOST difficult problems in the whole treatment of abortion is to determine whether or not, in a given case, the infection has extended beyond the limits of the uterus. It is also one of the most important questions that must be answered, for, if the infection has become extrauterine, measures for the evacuation or treatment of the uterine cavity are usually contraindicated, since this treatment will probably still further hasten the spread of the infection.

In their extension beyond the uterus, the infectious organisms may follow one of three paths (Fig. 70):

(1) They may pass along the *lymphatics* to the cellular tissue of the broad ligament and pursue a subperitoneal path;

(2) They may pass through the *uterine wall*, or by way of the tubes, to the *peritoneum* and involve first the pelvic peritoneum and later the general peritoneal cavity;

(3) They may be carried along the *uterine veins*, producing a pelvic thrombo-phlebitis with extension later to other veins, or become scattered throughout the body in the form of a generalized bacteriemia or pyemia.

Any of these three paths may lead to a diffuse exudate or, if localized, may form a definite abscess cavity. Although often a combination of these paths may be followed, it will simplify a discussion of the subject to treat all three separately. We shall therefore divide our subject into:

- (a) Cellulitis
- (b) Peritonitis
- (c) Thrombo-phlebitis, or Bacteriemia (pyemia)

Cellulitis

At the onset of septic infection there is set up a defense reaction on the part of the body against the invasion of bacteria. In addition to the development of antibodies in the blood, this defense consists in an outpouring of leucocytes, and a fibrinous network that forms a resisting capsule or wall through which the organisms must penetrate in order to make deeper inroads upon the individual. Sometimes this capsule is broken by the patient through a forcible movement of

the pelvic organs in straining, vomiting or walking. More often it is breached by the manipulations (curettage, bimanual examination, instrumentation) of the over-anxious physician. Thus the bacterial invasion of the body may actually be stimulated.

Equally important with the amount and integrity of the defense is the strength of the attack. Bacteria show marked variation in virulence. At times their progress through the tissues of the body seems invincible. From the wound surfaces in the uterus they make

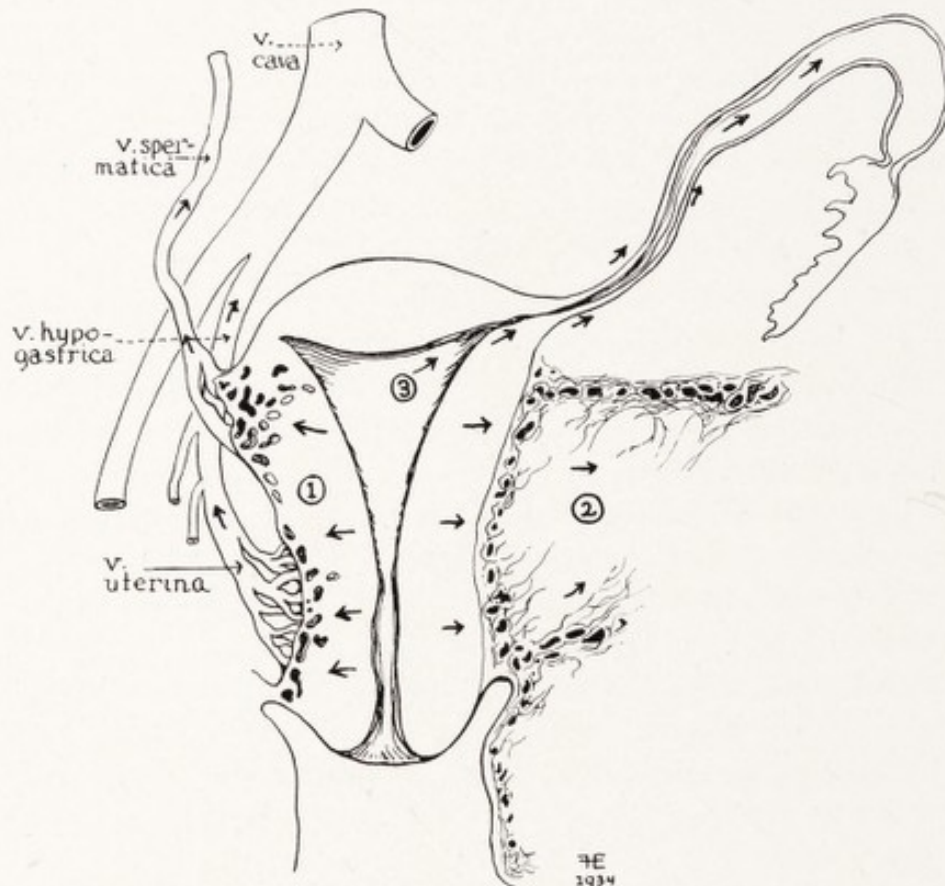


Fig. 70.—Spread of infection from the uterine cavity. (1) Veins. (2) Lymphatics. (3) Tubes.

their way along the lymph channels and, unless this path becomes blocked, extend through the wall into the loose connective tissue of the broad ligament, the sacro-uterine ligaments and the upper paravaginal tissues (Fig. 71). Where the cervix has been torn or injured, the point of entry for the bacteria is more direct, and the invasion of the broad ligament tissues occurs early. In fact, many a uterine infection would remain limited were it not for the passage of bacteria into the crevices of the cervical wounds and thence along the lymphatics to deeper structures. The parametrial exudate formed by this inflammatory reaction encases the uterus so that, upon vaginal exami-

nation, the entire vault seems roofed over with a dense infiltration that makes the palpation of more deeply situated structures impossible. Wherever loose connective tissue is to be found, along the round ligament, to all sides of the bladder and posteriorly around and behind the rectum, the bacterial invasion with its attendant outpouring of exudate serves to compress and immobilize the pelvic organs.

For the advancing subperitoneal type of infection, a common path is along the course of the ureter to the iliac fossa and upward extending retroperitoneally to the perinephritic region. As a rule this form

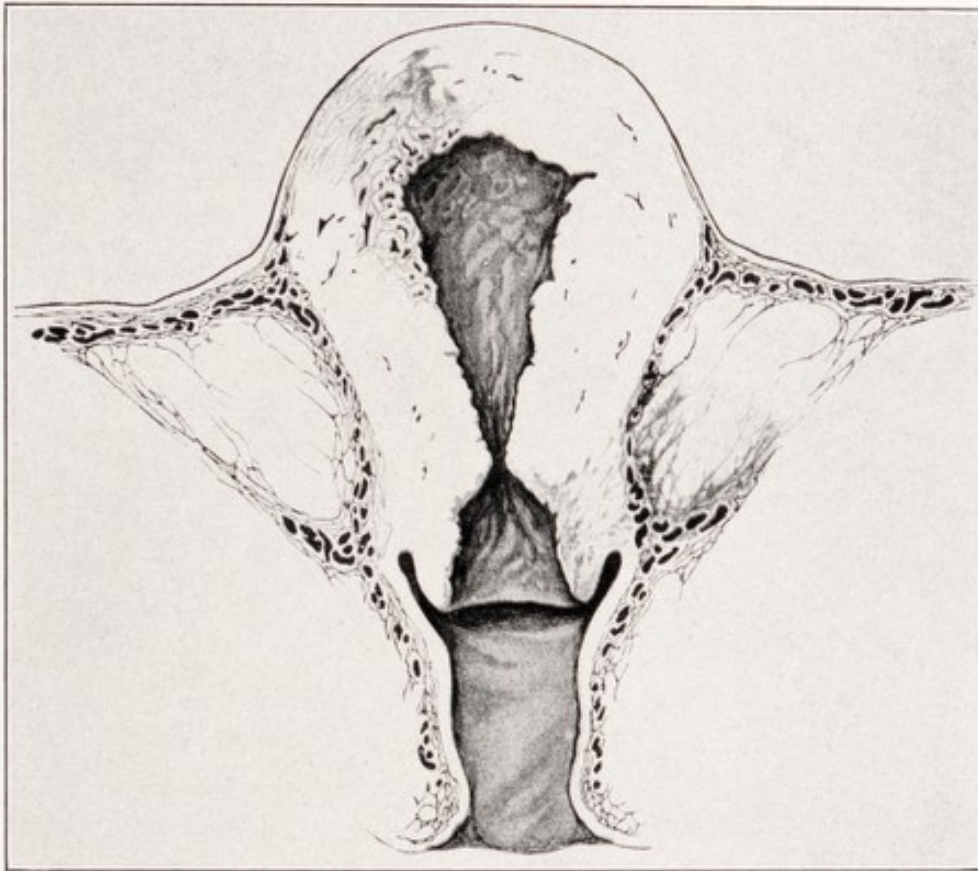


Fig. 71.—Extrauterine septic infection following abortion. The connective tissue of the broad ligaments and paravaginal area is invaded by way of the lymphatics of the cervix and uterine body. (Bumm.)

of parametrial extension is more marked on one side, and forms a mass readily palpable through the abdominal walls. The iliac fossa may be filled with a dense wooden exudate and not infrequently the process infiltrates forward beneath the abdominal wall. As an accompaniment of this exudate the blocking of lymph channels produces edema of all the neighboring organs. Whether the infection is more likely to be on the left or the right side has been debated, but a summary of the evidence points to about equal distribution between the two. In one-fourth to one-third of the cases the infiltration is double-sided.

Beside the symptoms of a spreading infection, we have in these cases of pelvic cellulitis marked disturbance of urination produced by the fixation and compression of the bladder. Pain and frequency of urination are pronounced and if the bacteria have invaded the bladder itself there is cystitis with burning and tenesmus. Perirectal infiltration produces pain and difficulty on defecation. Compression of the pelvic nerve-trunks by the infiltration often gives rise to excruciating pain radiating down the leg, and in cases of double-sided compression of the ureters we may have marked disturbance of renal function.

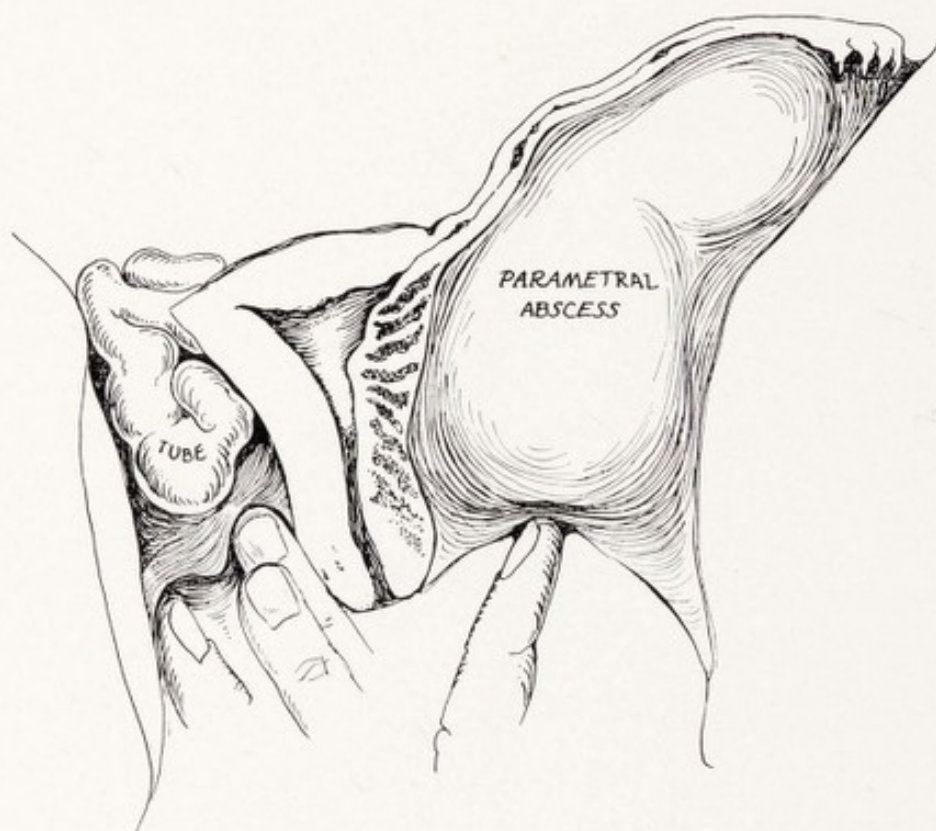


Fig. 72.—Parametrial exudate to the right of the uterus and a pyosalpinx to the left, showing points in differential diagnosis.

The differential diagnosis between a parametric exudate and an inflammatory swelling of the adnexa is often very difficult. In the latter case the symptoms of peritoneal irritation (vomiting, pain, distention) are usually more pronounced. Sigwart states that parametritis is more apt to be one-sided while the adnexa are more often both involved. From below a parametrial mass will usually be more dense and extend laterally from the cervix to the pelvic wall, presenting a slightly concave surface to the examining finger through the vagina, whereas the adnexal tumor will be more convex in its feel and be

partly separable from the pelvic wall (Fig. 72). Sigwart believes that after abortion true parametritis is less common than the adnexal swellings with surrounding exudate.

The course of pelvic cellulitis varies greatly. In general the prognosis as to life is fairly good compared with that in blood stream infections. Some of the cases undergo complete, if rather tardy, absorption. The majority however have a less favorable course. There may be prolonged invalidism extending over weeks, or even months. The patient is left with pelvic scars that distort the position of the organs, and produce radiating pains down the legs, dysmenorrhea and marked dyspareunia. Many of these women remain partly disabled for life. In other instances the exudate softens with the formation of an abscess, that rapidly increases in size producing elevation of temperature to 39° C. (102° F.) or higher with pain and pressure symptoms. A frequent site at which such an abscess points is over Poupart's ligament in the iliac fossa to one side or the other. At times the abscess is more deeply situated, and owing to its thick capsule its location may be difficult to ascertain until it breaks into the vagina, bladder or rectum. Perforation into the rectum is the most common and is usually preceded by the passage of quantities of blood and mucus with the stools until the abscess bursts and quantities of foul smelling pus are evacuated with the stools. The evacuation of the abscess will usually be followed by permanent relief, but not always, since the perforation is sometimes small, and the drainage incomplete.

In the treatment of pelvic cellulitis in the acute stage, nothing is indicated but rest, ice-caps, good elimination, a nourishing diet and such other measures as will build up the patient's resistance. All manipulation and unnecessary examination are to be avoided. As the process begins to subside we may start protein therapy with injections of sterilized milk, increasing gradually from 3 c.c. to 10 c.c. at a time, depending on the severity of the reaction produced. It is particularly in cellulitis that such protein treatment will materially shorten the period of convalescence. The interval between the injections is usually three to four days. Where an elevation of temperature and the pelvic examination point to the development of an abscess, we must open it with due regard to the attendant risk of penetrating the peritoneal cavity, the bladder, or the rectum in the course of this procedure. Drainage of such an abscess must be continued until there is no further discharge of pus and the abscess sac has been reduced in size.

Peritonitis

Three paths of invasion may be followed by septic infection in gaining access to the peritoneal cavity after abortion. One is directly along the wound made by some perforating instrument; a second is from the uterine cavity through the tube to the peritoneum; and a third is directly through the uterine wall along the lymph spaces to its peritoneal covering.

According to Sigwart, septic peritonitis associated with tubal infection is most often due to an abortion. Out of 69 autopsies for peritonitis reported by Halban and Köhler, the port of entry was found in 12 cases to be by way of the tubes; in 10 of the 12 cases it followed an abortion, and in only 2 a full-term pregnancy.

According to Curtis, ovarian abscesses are a frequent feature of post-abortion infection. These may attain a large size and be very stubborn. The tubes are attacked most often from without. The process begins as a peri-salpingitis with invasion of the tubal mucosa last if at all. The ends of the tubes are often sealed resulting in a hydrosalpinx, but on the other hand, sterility is less frequent than after gonorrheal infections, even though a large pelvic abscess has developed.

As to *perforation peritonitis*, there is great variation in severity depending on the nature of the infecting organism. In the case of staphylococci or colon bacilli the infection may remain localized, but in the presence of streptococci there is rapid diffusion with usually a fatal outcome. The path through the uterine wall usually offers considerable resistance to bacterial invasion, so that the organism that is capable of penetrating through the interstices of the fibro-muscular coat is certain to be a virulent one and once it attains the peritoneum produces a severe generalized peritonitis. Practically always in these cases we find it to be a streptococcus. It is amazing with what speed such an infection can produce a fatal outcome. There is usually no time for any accumulation of leucocytes, the uterine wall shows no trace of purulent material and the peritoneal cavity shows but a few flakes of fibrin in the serous effusion that contains myriads of streptococci. The serous coat of the peritoneum may in these cases still retain its glistening appearance. All in all, the peritonitis following an infected gestation is a more serious condition than that following surgical operations. Grekow reports a mortality of 53 per cent in peritonitis following obstetrical conditions, as compared with 40 per cent mortality following appendix peritonitis. Benthin found a mortality of 50 per cent in streptococcus infections compared with 25 per cent where staphylococci or colon bacilli were present.

Sigwart analyzes 36 cases of diffuse peritonitis recently treated in his clinic. Of these 20 followed abortion and only one followed full-term delivery. Of the remaining 15 cases, 9 complicated gynecologic operations and 6 were due to an appendicitis. Of the 20 cases of abortion peritonitis, 13 died, 8 women being almost moribund on admission, and the remainder dying in spite of operation. Only 4 of the 9 gynecologic cases died, and but one of the 6 appendix cases.

The fact that in abortion the septic organism is introduced from without, leaving no time for defense reaction by the body, is doubtless an important factor in the high mortality. There is also a lowered resistance to infection in pregnant women, as we have had occasion to notice in the high mortality from peritonitis in women who have had a grippe pneumonia. Where the septic peritonitis is associated with a blood-stream infection as well, the outcome is fatal almost without exception.

Occasionally the peritonitis becomes localized and may then form a definite abscess usually pointing in the cul-de-sac. This is a more favorable type although such a case may suddenly take a turn for the worse and the infection spread to the general peritoneal cavity. Sigwart reports nine such cases, eight of them following abortion, all of whom recovered following incision of the cul-de-sac (Figs. 73-76).

The clinical picture of septic peritonitis is usually well defined. There is severe abdominal pain, often double-sided with marked tenderness to pressure, rigidity of lower abdominal muscles, rapid pulse and prostration. At the onset it may be hard to decide whether the process is localized or already is making its advance to the general peritoneal cavity. On the appearance of hiccoughing and vomiting with tympanites and distention there can no longer be question of the diffusion of the infection. Rapid pulse and dry tongue are bad prognostic signs. The tenderness over the abdomen soon becomes so exquisite that even the weight of the bed clothes cannot be tolerated. There is persistent severe colicky pain as the intestines fill with gas which they are unable to expel. The vomiting soon assumes a fecal character and may in the final stages consist largely of a blood-stained material. With a rapid and feeble pulse, hurried shallow respiration, an anxious expression, sunken eyes, pointed nose, a dry cracked tongue, sweet-sour odor to the breath, and cold extremities, the end is near at hand.

Occasionally the picture is not so positive and leads to error. The absence of abdominal pain cannot exclude a peritonitis. Sigwart finds that with a rapid pulse, nausea, a dry tongue and prostration the infection may be widespread even though pain is not present. In

doubtful cases puncture of the abdomen is of considerable diagnostic value, since it will give direct evidence of a serous or purulent exudate in the peritoneal cavity. If a thin needle is employed, the risk in-



Fig. 73.



Fig. 74.



Fig. 75.



Fig. 76.

Figs. 73-76.—Steps in the incision and drainage of a pelvic abscess.

Fig. 73.—Incision through the vaginal wall with posterior lip of the cervix caught by a tenaculum forceps.

Fig. 74.—Blunt dissection of posterior vaginal connective tissue up to the abscess by means of scissors under guidance of the finger.

Fig. 75.—Plunging through abscess wall with sharp-pointed curved scissors.

Fig. 76.—Drainage of abscess with a T-shaped rubber tube. (Crossen: *Operative Gynecology*.)

volved is minimal. Even where but little material is obtained, microscopic examination may reveal the presence of leucocytes.

Another diagnostic help is the blood picture as shown by the Schilling count described before (Fig. 53). In two instances Schilling was able to diagnose a septic peritonitis in the absence of almost all clinical symptoms. In view of the fact that in abortion peritonitis there are many factors stimulating cell development in the bone marrow (pregnancy, blood loss, infection and toxemia) we find in it an unusually pronounced shifting of the blood picture to the left. Myelocytes are frequently found, especially juvenile forms; lymphocytes are lower than normal; eosinophiles are absent, the stab count is high, and the general leucocytosis as a rule is marked. We may, however, find a normal or even markedly low leucocyte count in individuals who show poor resistance to infection. This is usually a bad sign. Since in early cases the operative treatment may save the patient's life we should arrive at a positive diagnosis as quickly as possible.

Drainage.—In the treatment of septic post-abortive peritonitis, the value of surgical interference will depend largely on the type of infection. In the cases in which the uterine wall has been directly penetrated by the invading organisms, it is almost invariably true that the blood stream has also been entered and in such cases surgical measures are without avail to save the patient. In less virulent cases even though a diffuse peritonitis exists, we may still hope for recovery if complete drainage can be established (Figs. 77-78).

Sigwart recommends a small midline incision over the symphysis, associated with drainage openings in both flanks. To effect this he advises that a dressing forceps be introduced through the median incision beneath the parietal peritoneum to the flank, and the abdominal wall incised over the end of the forceps. Thereupon, a long rubber tube with many perforations is caught by the forceps and drawn through to the median incision. In similar manner a drain is placed to the opposite side. A third drainage tube is placed behind the uterus to the cul-de-sac. Before these tubes are inserted the purulent fluid is removed as completely as possible, and from 100 to 150 c.c. of ether are poured into the abdominal cavity. After the drains are in place, an additional 50 to 100 c.c. of ether are injected by a syringe through the tubes, care being taken to clamp off the lateral ends of the tubes, so that the ether does not escape too rapidly. The use of ether in this manner in addition to drainage apparently does no harm and in Sigwart's experience adds materially to the chances of recovery.

In twelve cases of post-abortion peritonitis operated on in this way Sigwart was able to save seven patients, making a mortality of 41 per cent. Other reports give a considerably higher operative mortality ranging from 65 to 78 per cent. Schaefer reported 75 cases of puerperal peritonitis of whom 10 were moribund and 39 hopeless on admission. Of the 26 remaining, 3 out of 15 patients subjected to colpotomy recovered, and 2 out of 11 laparotomies that were drained were saved, making a total of only 5 survivals among the 75 women. Chydenius reported that from 1925 to 1929 there were 1,267 abortions



Fig. 77.

Fig. 78.

Figs. 77, 78.—Drainage treatment of acute pelvic peritonitis.

Fig. 77.—Vaginal drainage of culdesac with gauze and soft rubber tubes.

Fig. 78.—Abdominal drainage of pelvis through a hard rubber tube. (Crossen: *Operative Gynecology*.)

with 32 cases of peritonitis. Out of 11 unoperated cases there was but one recovery, whereas out of 21 cases subjected to laparotomy, 9 patients recovered. Simple drainage gave relatively poor results, hence he added the removal of adnexa and uterine body, draining vaginally through the cervix. This operation done under ether narcosis took about one hour. The first series showed 2 out of 6 recoveries, which was increased to 6 out of 10 who recovered when the sigmoid was fastened down over the drainage area in the pelvis. Apparently many of these cases were rather mild infections. Only

3 out of 13 streptococcus peritonitis cases recovered. Möllenbeck reported 30 cases of peritonitis following abortion with 28 per cent mortality when the cul-de-sac was incised as against a 50 per cent mortality in cases of laparotomy.

Thrombophlebitis and Bacteriemia (Pyemia)

The invasion of septic organisms by way of the blood stream naturally presents the most serious and fatal condition (Fig. 79). This so-called "blood poisoning" is often so rapidly overwhelming that

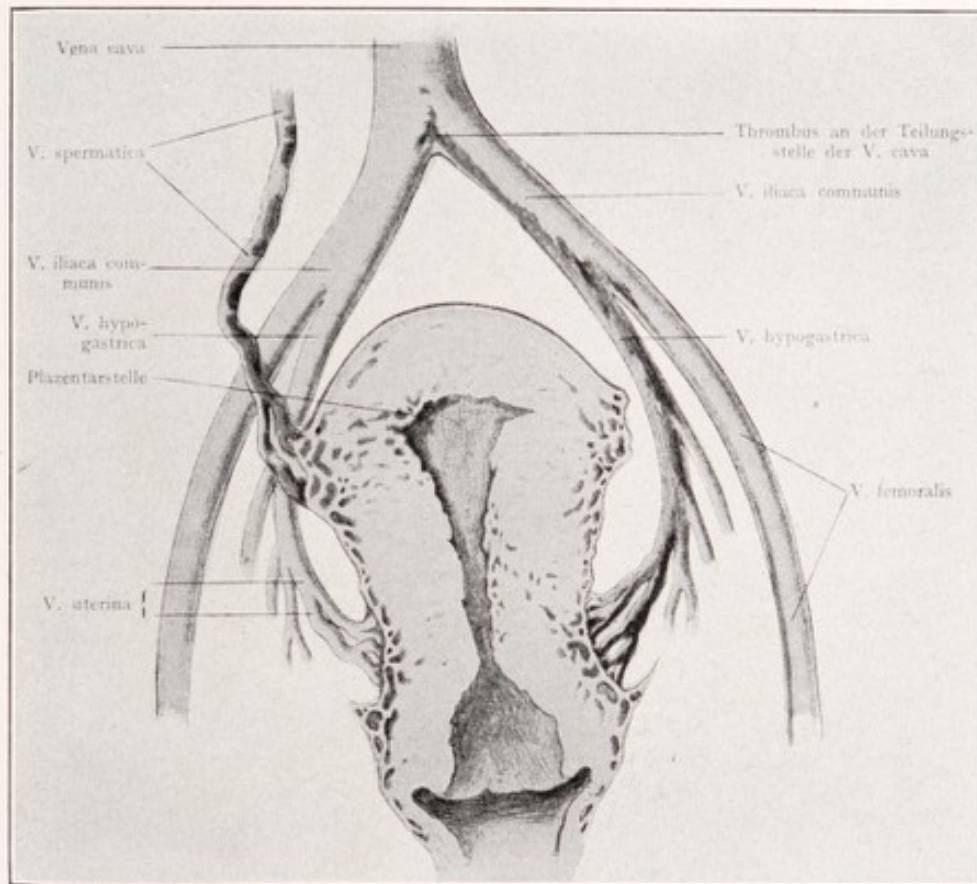


Fig. 79.—Septic thrombophlebitis, showing spread along ovarian veins on the left side and along the uterine veins to the vena cava on the right side. (Bumm.)

death ensues before any noticeable pathologic changes occur in the organs. Only the blood culture and the clinical history establish the diagnosis. These are the cases in which the blood produces no defense reaction in the form of a thrombus but serves rather as a growth medium for the organisms. The term, *septicemia*, should be limited to this group in distinction from the cases of *septic thrombophlebitis* and *bacteriemia* in which there are at least temporary limitations to the progress of the infection. The most common agent of this virulent infection is the hemolytic streptococcus.

In the process of invasion from the surface of the uterine wound we find that the necrotic material covering it contains innumerable saprophytes, while the deeper tissues including the venous thrombi contain usually many streptococci. It is the virulent organism that alone possesses the faculty of penetrating deeper into the maternal organism. In a sense, therefore, the endometrium serves as a filter holding back the ordinary sapremic bacteria.

Warnekros considers that only streptococci and staphylococci have the faculty of actually penetrating through the inflammatory exudate, getting into the veins and producing a thrombophlebitis. If the blood

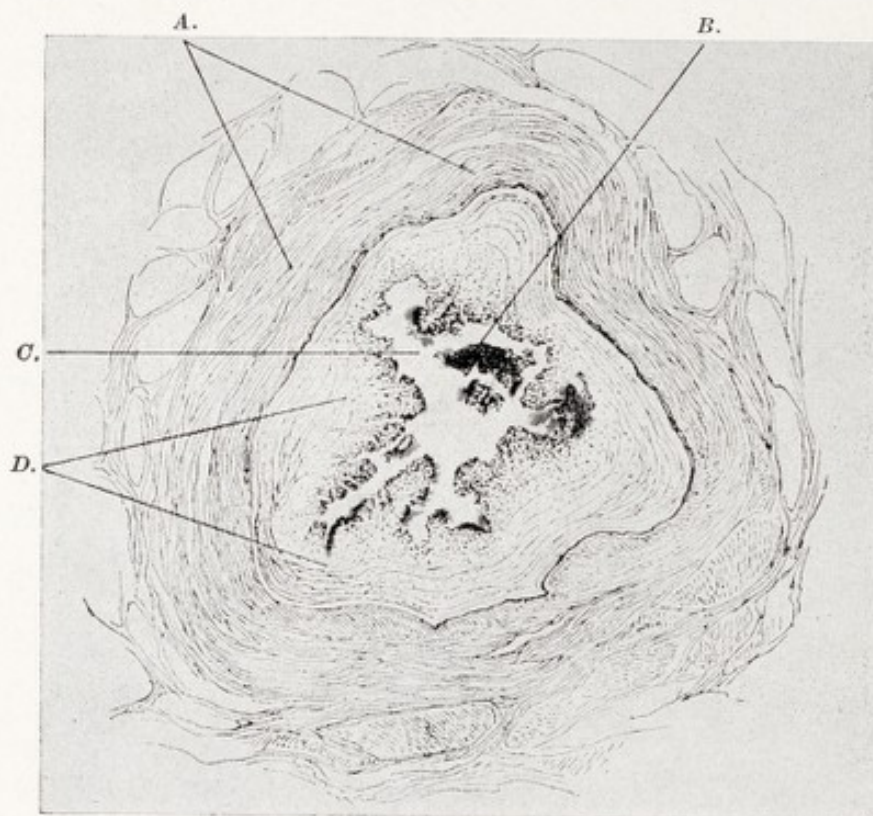


Fig. 80.—Cross-section of thrombosed vein. (Bumm.) A. Wall of vein. B. Loosened particles of thrombus. C. Liquefaction area. D. Thrombus.

culture is taken at the time of the pyemic chill these organisms will usually be found. In 12 fatal cases of pyemia he found streptococci 9 times and staphylococci 3 times.

Occasionally other organisms may be found associated with these cocci such as the *Bacillus aerogenes capsulatus*, the bacterium coli and Welch's gas bacillus (Fraenkel's *Bacillus emphysematosus*).

Whether in a given case there will be a spreading thrombosis or a purulent degeneration of the thrombus depends primarily on the virulence of the organism. In the less virulent cases there may be an encapsulated intravenous abscess (Fig. 80). I had occasion to operate

on such an encapsulated abscess, situated in the internal iliac vein, that presented a mass the thickness of a thumb and had been mistaken for an adnexal swelling (Figs. 81-82). This patient gave a history of an infected abortion three years previous to this operation.

While the thrombophlebitic process may be localized to one side it is quite common to find some involvement of the opposite side as well. The spread will be influenced somewhat by the location of the placental site. If the placenta is situated at the fundus the thrombosis will spread first to the ovarian veins, whereas a lower situation of



Fig. 81.—Low power section of a thrombosed ovarian vein with abscess formation following septic abortion; removed by laparotomy four months later. The walls of the vein are outlined by the elastic tissue stain. In the lumen of the vein can be seen clumps of pus cells.

the placenta predisposes to extension in the broad ligament veins. In the 82 autopsies for pyemia reported by Halban and Köhler the thrombosis occurred twice in the uterine veins (Fig. 83), 14 times in the parametrial venous plexus, 19 times in the ovarian veins, 4 times in the venae cavae and 31 times in various combinations of these veins.

Diagnosis.—The whole problem of the prognosis and treatment of this most serious condition is primarily influenced by difficulties in diagnosis; not merely difficulties in determining whether a throm-

bophlebitic process has taken place, but also difficulties in ascertaining the extent and multiplicity of the thrombi. Another complicating factor is that in one fifth of the cases of thrombophlebitis, according to Halban and Köhler, there is a simultaneous periphlebitis.

The diagnosis of a thrombophlebitis is usually based upon the occurrence of a sudden chill with elevation of temperature in a patient whose uterus has been previously emptied spontaneously or artificially. This is followed by an equally sudden drop in temperature, with cessation of the symptoms of prostration that accompanied the

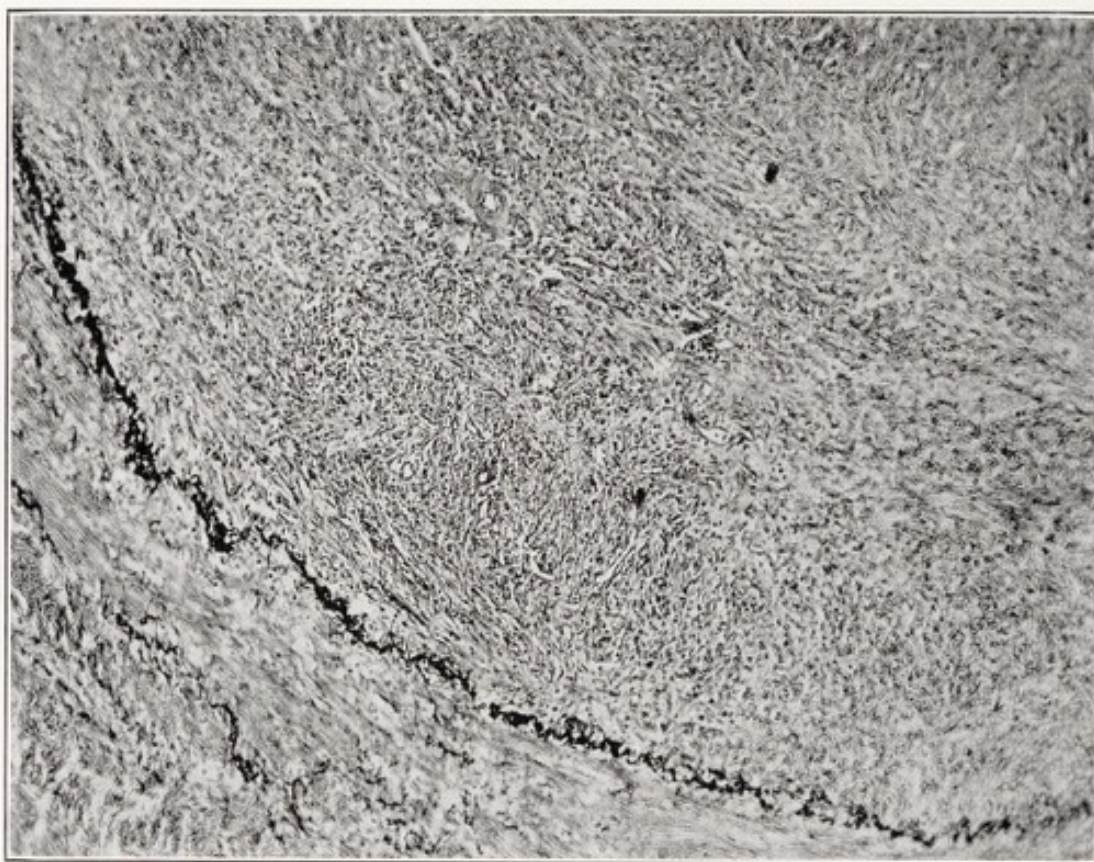


Fig. 82.—High power section of a portion of vein seen in Fig. 81. Note the organized thrombus infiltrated with leucocytes. Elastic tissue of vein walls is stained black.

fever. After a shorter or longer interval the chill and prostration may be repeated. Between the chills the temperature and pulse remain slightly elevated but the patient feels fairly comfortable. The course of the disease may vary from half a day to many months in duration. To make the diagnosis from the appearance of the first chill will lead to many mistakes since the absorption of fetid material from the uterine cavity will at times give rise to a very similar picture. In searching for other diagnostic signs emphasis is laid upon the palpation of thrombi in the broad ligament on vaginal examina-

tion. The thrombosed veins in the broad ligament will usually feel like earth-worms with occasionally a thicker strand of exudate surrounding it. Martens also claims that the thrombosed ovarian veins can be palpated through the abdomen over the brim of the pelvis. The certainty of the palpatory findings will vary in accordance with the case, but if present, such findings are an important auxiliary in



Fig. 83.—Streptococcic infection following abortion. Section of septic thrombus in wall of uterus obtained at autopsy.

the diagnosis. Stoeckel denies the possibility of recognizing thrombosis of the ovarian veins by abdominal palpitation.

In recent years the blood picture has been stressed as a diagnostic sign. In addition to a marked shift to the left in the Schilling count, Kriele pointed out that in the initial stage of a thrombophlebitis or pyemia we have a striking thrombopenia. Normally there are about 250,000 blood-platelets (thrombocytes) to the cubic centimeter of

blood. In cases of pyemia there is a drop far under 120,000. If the count of thrombocytes is not under 120,000 and there is only a slight lowering of the leucocyte count, the prognosis is good and the patient probably will recover. On the other hand, if the blood-platelets are reduced to the neighborhood of 60,000, Kriele considers the infection probably fatal. Thus far Kriele's observations have not received a careful check-up but they present a possible early prognostic sign of great value.

Prognosis.—Predicting the outcome of a pyemia presents many difficulties. There may be but one chill and no more. On the other hand, the chills may be repeated as many as 28 times, and still be followed by recovery. On the other side of the picture, Hannes cites a case in which there was a sudden chill on the seventh day post-abortum followed by a temperature rise to 41.6° C. (106.5° F) and death within six hours. The mortality figures given by Schroeder showed 92 cases of thrombophlebitis with 32 deaths. This, however, did not include 36 hopeless cases who died shortly after admission. Adding these we would have 68 deaths out of 128 post-abortive cases of thrombophlebitis. The analysis of Schroeder's cases showed the difficulty of setting the prognosis at the time of the first chill. The number of chills vary greatly, up to 49 in the fatal cases and up to 18 in the cured cases. It was nevertheless striking that with the elimination of the 36 hopeless cases 65 per cent of the remaining 92 were cured spontaneously without special intravenous treatment or ligation of veins. A somewhat similar report comes from K. Tietze and H. Plaue in which 141 cases are included, of whom 57 were post-abortive pyemias with 29 deaths or 51 per cent mortality. Of the remaining 28 post-abortive cases that recovered, 8 were serious, 4 moderately serious and 16 were light cases. Out of 5 patients in whom ligation of the veins was done for the pyemia, 4 died. In view of the relatively high percentage of spontaneous recovery (50 per cent) the authors question the advisability of other forms of treatment.

Ligation.—The question of whether to ligate the veins in these cases of thrombophlebitis has in the past few years become a very crucial one. Opposing the conservative views of most leading gynecologists, Max Martens and a few of his followers have proclaimed the value of ligation and supported their contentions with a considerable amount of clinical experience. Although the suggestion to ligate the veins in cases of infection had been made by various surgeons in the 19th century, it remained for F. Trendelenburg in 1902 to accomplish the first cure by this method of ligation. Since that time many surgeons have performed this operation for varying types of infection. Mar-

tens took up the procedure systematically in post-abortive pyemia and both by his practical experience and by his writings on the subject has become the chief protagonist of this method of treatment. According to Martens there is a general agreement that a septic thrombophlebitis requires ligation of veins to limit the infection. The various injections of antiseptic agents intravenously (rivanol, elektro-kollargol, argochrom, methelene-blue-silver, yatren) he states are of no avail. It is also false to claim that most pyemias heal spontaneously. Early ligation of the veins is alone effective. The claim by Herff that "each chill may be the last one" leads to dangerous procrastination. The ideal, according to Martens, would be to ligate before the first chill, for even the first chill may lead to a fatal metastasis of the infection. From the yearly average of 3,000 to 4,000 deaths from puerperal sepsis in Germany he figures approximately 1,500 to 2,000 cases of septic thrombophlebitis, in very few of which ligation of the veins has taken place. From Martens' personal results, 19 cures out of 29 operative cases (about 60 per cent), he figures that approximately 1,200 of these women could have been saved annually by ligation. Martens quotes Hinselmann as saying that whoever does not use this method of ligation has never tried it or has done so at the wrong time or in the wrong way. Schaefer's experiences corroborated to a considerable degree those of Martens. Only one out of 17 pyemias was spontaneously cured, 7 were cured following ligation, the remainder died. Sultan reported 3 cures out of 7 operated cases. The 4 fatal cases had extensive septic metastasis before operation.

In America, Huggins published 12 cases of ligation of veins with 6 deaths. He groups the cases into light, moderate and severe infections. In the light infection spontaneous cure will often result, in the severe infections the outlook is usually hopeless, hence he would restrict vein ligation to the moderately severe cases in whom the process after eight to ten days begins to become chronic but the general condition of the patient still remains good. An attempt to compile mortality figures was recently made by Hannes who reported 55 cures out of 111 operations, approximately 50 per cent. This compared with the figures compiled from previous reports by Sigwart of 48 per cent mortality in 208 cases and Polak's reported mortality of 52 per cent from 182 vein ligations, largely from American literature.

The conclusion is inevitable that with vein ligation not over one-half of the cases can be saved. This is far from encouraging. Against ligation the arguments raised are: (1) an extension of the thrombus beyond the ligature; (2) an extension along veins that were not ligated; (3) the danger of the operation itself; (4) the fact that the indication

for operation often cannot be set until too late. One cannot get away from the fact that the early operation recommended by Martens brings with it not merely the frequent reproach of having done an unnecessary operation, but also raises the question whether the operation may not actually have done the patient harm. The possibility of an early correct diagnosis of the thrombophlebitis may depend a good deal

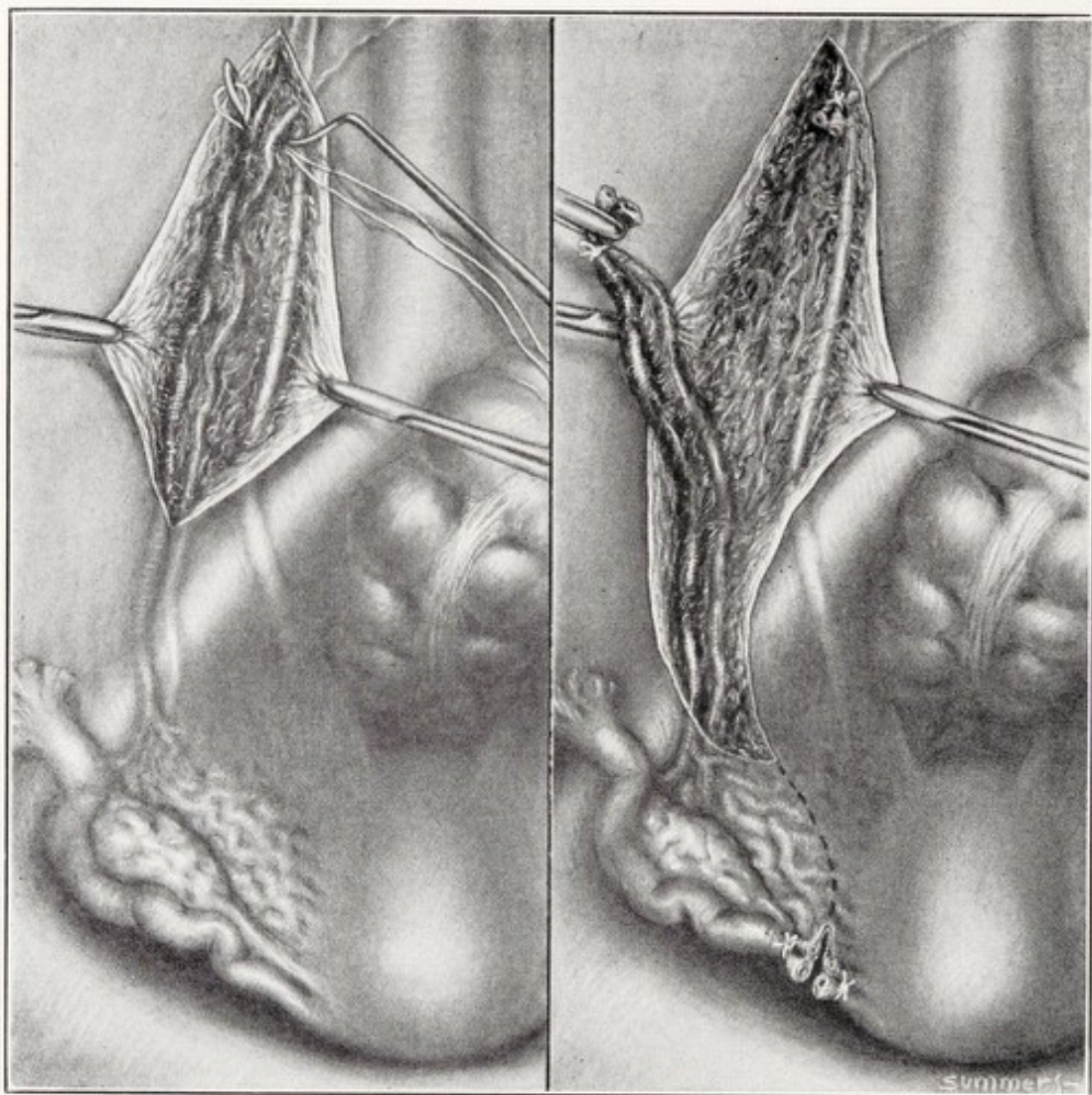


Fig. 84.

Fig. 85.

Figs. 84, 85.—Excision of thrombosed ovarian vein by transperitoneal abdominal operation.

Fig. 84.—Ligature placed above point of thrombosis including artery and vein.

Fig. 85.—After ligation the vessels are removed with tube and ovary of same side. (Crossen: *Operative Gynecology*.)

upon a further check-up of Kriele's thrombocyte count. Should this blood test give us dependable information, operative interference could be gauged more accurately. For the present, we do not feel that the operation of vein ligation can be generally accepted as the proper treatment for all cases of pyemia. Technically, the operation

presents many difficulties, and probably more harm than good would be accomplished except in the hands of a few well-trained and judicious gynecologists.

In the matter of technique a heavy silk is usually employed to prevent cutting through of the ligature. Only in the cases of the ovarian, is the removal of the diseased vein ever performed (Figs. 84-85). The ligation should always be done sufficiently high; if necessary, up to the vena cava itself. In other instances, ligation of the ovarian and internal iliac veins will suffice. Considerable difference of opinion has existed as to whether the transperitoneal or extra-peritoneal operation was preferable (Fig. 86). In favor of the direct incision it has been claimed that more accurate information was quickly obtained as to the location of the thrombi and the point necessary for ligation;

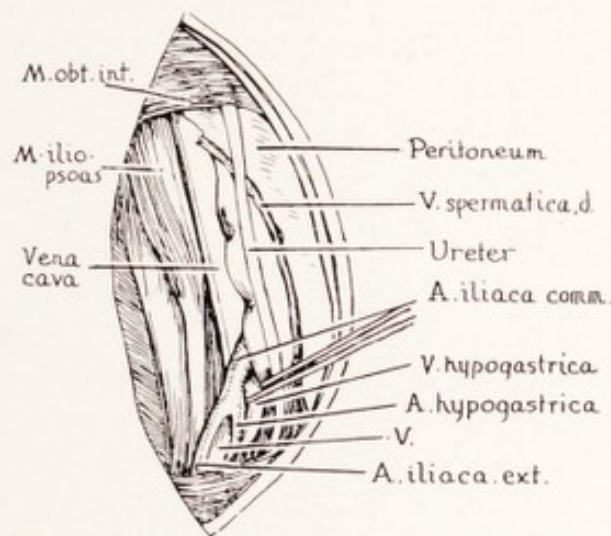


Fig. 86.—Anatomical relations of structures exposed by Martens' extraperitoneal operation for pelvic thrombosis. (Redrawn from Martens.)

also the fact that, particularly in abortion cases, the diseased adnexa can be removed at the time, if necessary. Against this method of operation, Martens and others claim the greatly diminished shock attending the extra-peritoneal procedure with lessened risk of post-operative peritonitis and ileus.

The technique of the extra-peritoneal operation recommended by Martens is as follows: An incision four inches long is made over McBurney's point, followed by separation of the internal oblique muscle. Then the peritoneum is pushed back over the iliac fossa until it exposes the ureter where it crosses the iliac vessels. The ovarian vein is higher than the ureter and is ligated after isolation. Then the internal iliac vein or common iliac or lower vena cava is isolated in accordance with the location of the thrombus, and ligated with heavy silk. It is better to start on the right side as the vena cava is

more accessible on that side. Always ligate above the thrombosis. Drain parametrial infections if found. It is well to attack that side first which seems most definitely involved. The opposite side should be ligated, if possible, but not in every instance.

To revert for a moment to other methods of treatment of pyemia besides ligation, we find that some men have faith in intravenous therapy, especially mercurochrome. Curtis thinks that there has been some improvement in the preparation of an antistreptococcus serum and that results with it are slightly more encouraging. He is opposed to ligation of the veins for pyemia and to hysterectomy for pelvic sepsis. Particularly does he dread the routine curettage of infected cases which only too often is responsible for the development of a septic thrombophlebitis.

All in all, therefore, in this group of generalized septic infected cases we must acknowledge the limitations of therapy at present available. The prevention of complications is more significant than their cure and can be best accomplished by a minimum handling of cases until acute symptoms have begun to subside. With good judgment in selected cases, I believe drainage of the cul-de-sac in peritonitis and ligation of the veins in cases of pyemia of moderate severity will improve our results. Our mainstay, however, for the present still is the building up of resistance to the infection by the patient herself and this can best be accomplished by rest, good nursing care, a nourishing diet, blood transfusion, and above all fresh air and sunshine. It remains for future investigators to give us an agent that will specifically resist and overcome the inroads of the streptococcus. Only then will we be able materially to reduce the mortality of the infections extending beyond the limits of the uterus after septic abortion.

CHAPTER XIV

PERFORATION

IN NO COMPLICATION of abortion can a mistake in judgment or technique on the part of the practitioner lead to more serious results than in accidental perforation of the uterus. Perforation is one of those misadventures that probably occur very much more frequently than the printed records would indicate. Most of the cases are never reported because, after all, it is usually the operator's fault, and not a pleasant thing to write about. You can hardly find a busy gynecologist who will not, when questioned, tell you of at least one such disagreeable experience. And how much more frequent must the accident be among the rank and file of practitioners, unaccustomed for the most part to the use of instruments, and taught for many years that "abortion ought to be curetted."

Perforation of the uterus or other organs, associated with abortion, is an accident limited largely to the past fifty years during which the instrumental evacuation of the uterus has become the prescribed treatment. Spontaneous perforation of the uterus in association with abortion is practically unheard of, except as it may in rare instances follow the necrosis and infection of a complicating myoma.

Frequency.—With each decade of the past fifty years the actual and proportionate frequency of this accident has increased, due, first, to the increase in the number of instrumentally induced abortions; second, to the proportionate increase in abortions handled by doctors as against those handled by midwives; and third, to the prevailing tendency to use instruments instead of the finger in emptying the uterus.

The *frequency* of perforations in the treatment of abortion has been varyingly estimated from about one in 150 to one in 1,000 evacuations of the uterus:

Rahm in Helsingfors reports 9 perforations out of 3,850 curettements for abortion (0.2 per cent or 1 in 425).

Heynemann in Hamburg finds one perforation for ever 200 instrumental evacuations of the uterus (0.5 per cent).

In Russia, Kakuschkin gives the incidence of perforations in instrumental abortions as 0.6 per cent or one in 160. Other Russian statistics gives figures varying from 0.2 to 0.7 per cent (1 in 800 to 1 in 140).

In 1932 Syrowatko (Russia) reported 22 perforations out of 21,420 legal abortions done in a period of three years. Where the doctors regularly trained in abortion operated, the incidence was only 0.08 per cent (1 in 1,250); whereas in 750 abortions done by substituting physicians there were 5 perforations, an incidence of 0.66 per cent (1 in 150).

Halban, in Vienna, on the other hand reported that out of 6,025 curetted abortions cared for in his clinic there were only 9 cases of perforation (0.15 per cent or 1 in 670).

If such percentages are obtained when curettements are done in well-organized hospital clinics, we can safely assume that in the much larger group of cases handled by the general practitioner, under far less suitable conditions of home or office, the incidence of uterine perforation is three or four times as great. The considerable majority of cases cited in various reports on perforation do not originate in the clinic but are sent in from the outside after accidental injury has occurred.

Of special significance is the fact that in the past twenty years there is ample evidence of the increasing number of these perforations. This is clearly shown in the accompanying chart (Fig. 87) of figures from the report of Herbig, in Hamburg, on the distribution of the 134 cases coming to the clinic from 1910 to 1923. Incidence is not shown here, as total instrumental evacuations are not given, but Heynemann's report (given in Table V) shows increase in both numbers and incidence.

TABLE V
INCIDENCE OF PERFORATION IN INSTRUMENTAL EVACUATION
(Reported by Heynemann: Zentralbl. f. Gynäk. 49: 1241, 1925.)

YEAR	(1) TOTAL ABORTIONS	(2) INSTRUMENTAL EVACUATIONS	(3) (4) (5) PERFORATIONS		
			NUMBER	PER CENT	RATIO ONE TO
1919	9,000	1,500	8	0.53	190
1921	12,000	2,000	7	0.35	290
1923	14,000	2,300	16	0.69	144

The *mortality* associated with perforation varies with the proportion of outside cases coming to the clinic. In the Russian abortaria where legalized instrumental abortions are performed under hospital conditions, a relatively small percentage of perforations end fatally, even

when associated with severe injury and hemorrhage. On the other hand Bumm, in Berlin, reports 4 fatalities out of 12 perforations.

Peham and Katz in their monograph on perforation record 86 deaths out of the 100 perforations they describe. The vast majority of their cases failed of recognition at the time of the injury and hence developed a generalized infection.

INCREASE in PERFORATIONS, 1910-'23
HAMBURG, 134 CASES.

F.H.E.
1935

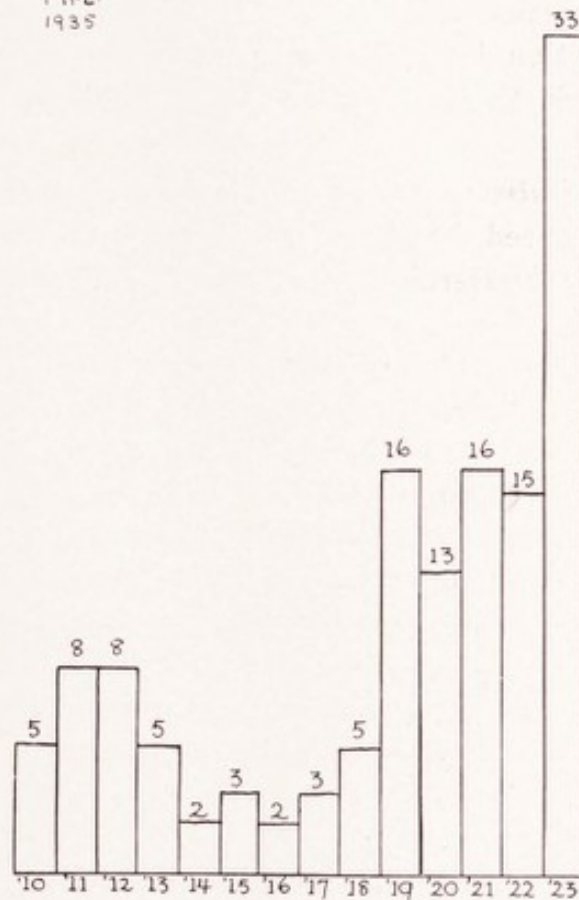


Fig. 87.—Graph of incidence of perforation in abortion cases from 1910 to 1923 in the city of Hamburg reported by Herbig. Noteworthy are the decrease during the war years and the pronounced increase in the succeeding five years.

In Herbig's report 35 out of 134 died, equivalent to 26 per cent. In the compilation of Liepmann and Wels, 83 out of 266 with perforations died (31 per cent). Koblanek reports 22 deaths in 39 cases (55 per cent).

These figures justify the conclusion that *perforation of the uterus occurs about once in every two or three hundred evacuations of the uterus; and that every second or third perforation ends fatally.*

The agent most frequently responsible for this injury, it must be confessed, is the physician. The midwife and lay abortionist are

relatively less often responsible, for they are usually content to rupture the membranes and instil some fluid into the uterus. Of course such measures have other dangers attendant upon them such as infection and embolism, but perforation is less often a result. In Liepmann's latest monograph he reports 21 out of 23 perforations done by physicians. Herbig in the report on 134 perforations found 99 done by physicians, 27 by abortionists and patients, and 14 uncertain. Zangemeister's percentages are: 72 due to doctors, 17 due to midwives and the laity, and 11 due to the patient herself. Similarly, we find in the Peham-Katz monograph that 71 of the 100 perforations resulted from instrumentation by physicians. In the case of the legalized abortions in Russia the perforations were all done in the clinic by physicians.

Analyzing the *instruments* responsible for the perforation we find that in those produced by physicians the curette is by far the most common offender. In Herbig's report the following appears: curette, 40 times; dilators, 28 times; finger, 5; laminaria, once. In perforations done by patients, 16 out of 18 were due to the use of syringes, and where abortionists were responsible the syringe was employed in all 5 cases. Peham and Katz stress the fact that where the finger is used for evacuating the uterus perforation is extremely rare and cites Fromme's compilation of 322 perforations, 97 per cent of which were due to instruments and only 3 per cent due to the finger. In Joseph's series the 23 perforations made by physicians were due to the sound once, the curette 8 times, dilators 7 times, and ovum forceps 7 times. The last named produced the most serious injuries. Schreiner describes a case in which a patient used an intra-uterine syringe the stem of which broke off after penetrating into the cul-de-sac. Liepmann and Wels reporting on 153 cases give perforation as due in 31 per cent to the abortion forceps; in 28 to the curette; in 18 to dilators; in 13 to a catheter; in 9 to the sound; and in 3 per cent to the finger.

In the accident of perforation an important factor seems to be the conditions under which the evacuation of the uterus is attempted. With poor illumination in the home or office, with a patient only partially anesthetized, if at all, and with the physician, often poorly trained, and under nervous tension in the midst of the bloody procedure, it is really a wonder that perforation does not occur more frequently than it does! Such an evacuation, which involves groping around blindly in the recesses of the uterine cavity with an instrument, is in many ways more dangerous and more difficult than a laparotomy done under the favorable illumination of the operating room.

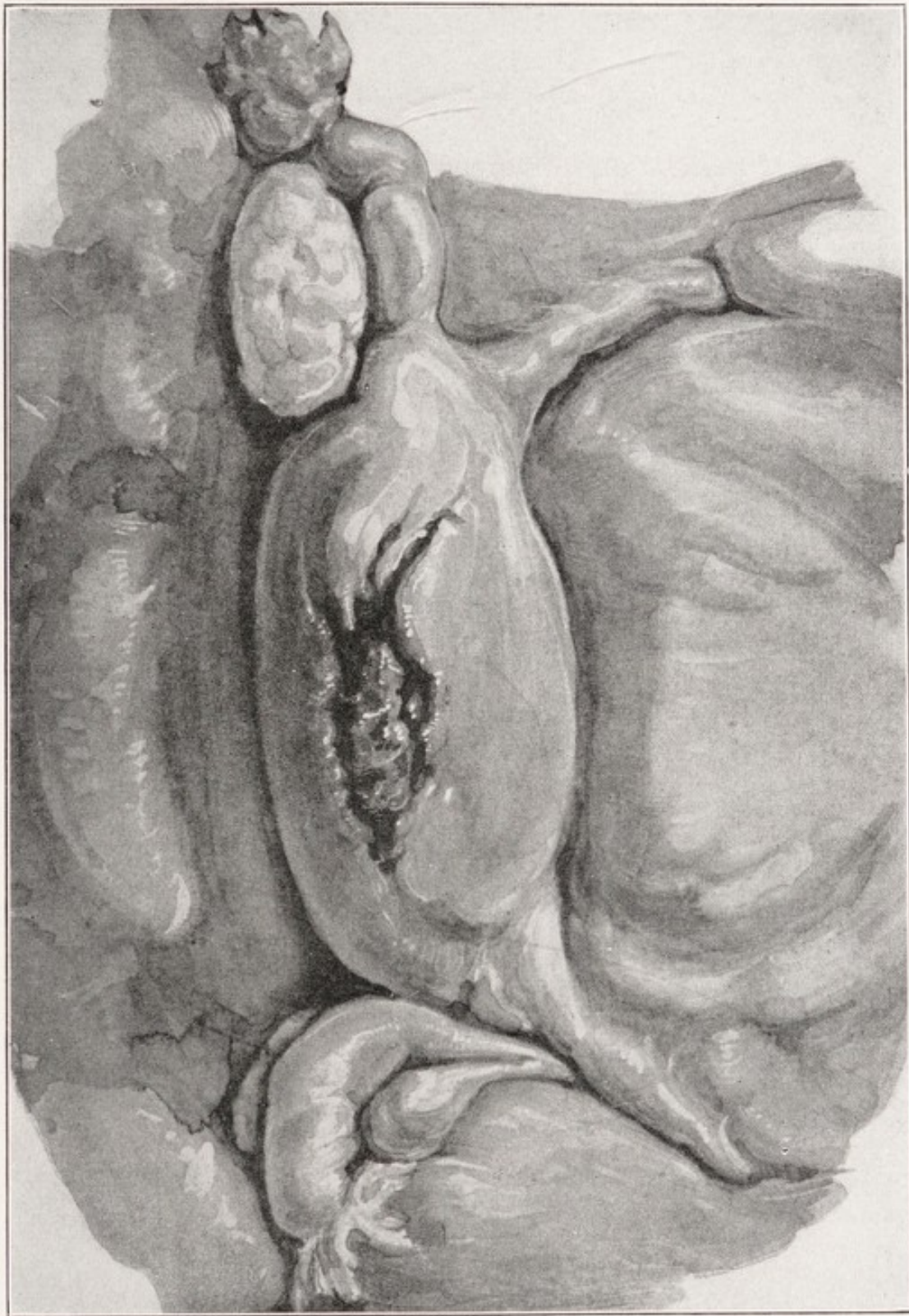


Fig. 88.—Autopsy findings in perforation of the uterus. This patient was cured in the office of a physician five days previous to her death from peritonitis. (Liepmann: *Die Abtreibung*, Urban und Schwarzenberg, Wien, 1927.)

The mistake most often made is in proceeding with evacuation before the cervix has been thoroughly dilated. In early abortions done on primigravidae dilation is difficult and false passages may readily be made. Liepmann in his monograph "*Abtreibung*" gives many excellent pictures showing the manner in which perforation may occur (Figs. 88 and 89). In 67 out of the 100 cases recorded by Peham



Fig. 89.—Huge perforation of the uterus produced by ovum forceps with fetus and placenta extruded into the abdominal cavity. (Liepmann: *Die Abtreibung*, Urban und Schwarzenberg, Wien, 1927.)

and Katz the cervical canal had not been thoroughly dilated before evacuation of the uterus was begun. In other cases the dilators were not properly gauged in relation to the depth of the uterine cavity so that the instrument was passed through the uterine wall into the peritoneal cavity. A hypodermic of 1 c.c. of pituitary extract given just before operation contracts the uterus and lessens risk of perforation.

It has already been shown how frequently the curette is the offending instrument. Where a blunt curette is employed, it may carelessly be pushed too high into the uterine cavity and make a hole through the soft relaxed walls of that organ. Dickinson's curette has notches like a uterine sound to indicate the depth of penetration of the instrument. More readily is such an injury accomplished with a sharp curette scraping around the fundus, especially if the pregnancy has advanced beyond the twelve-week period of gestation.

Most serious of all are the injuries produced by grasping instruments such as the ordinary dressing forceps and ovum forceps. Too often the maxim has been forgotten that such instruments are only to be employed as a means of removing already loosened pieces of the ovisac lying free in the uterine cavity. Instead of this it happens not infrequently that such grasping instruments, handled blindly, catch first portions of the uterine wall and then, as the evacuation proceeds, enter through such open or weakened spots into the abdominal cavity where omentum or pieces of the intestine are pulled down, bruised, crushed or actually torn off under the impression that they are portions of the ovisac (Fig. 90).

In general the *injuries* thus made can be divided into:

- (1) those situated outside of the peritoneal cavity;
- (2) those that perforate the peritoneum; and
- (3) those that after peritoneal perforation also damage other organs lying within the pelvic and abdominal cavities.

In Liepmann's cases he reports under the first of these groups 26 perforations into the broad ligament and one through the cervical canal. Under the second group he has no case, but under the third head he includes 25 cases of intestinal injury, 2 cases of omental injury, and 2 cases each in which the tube and ovary were crushed. In the compilation which Liepmann and Wels gathered there were 55 injuries to the small intestines and 25 injuries to the large intestine out of 266 perforations. In Herbig's report cited by Heynemann there were, out of 134 cases, injuries in the following locations:

Parametrium	26	Omentum	2
Intestine	25	Ovary	2
(small intestine, 18; sigmoid, 4; rectum, 2; descending colon, 1)		Tube	1
Mesentery	6	Tube and Ovary	1
		Cervix	1

Zangemeister found that in 45 per cent of perforations there were associated injuries to the intestine, mesentery, omentum, adnexa or bladder.

Conditions.—Among the factors predisposing to perforation are first, conditions of the uterus altering its position or the shape of the uterine cavity; and second, those in which there is no uterine pregnancy.

With a *retroverted uterus*, an instrument may be inserted in the

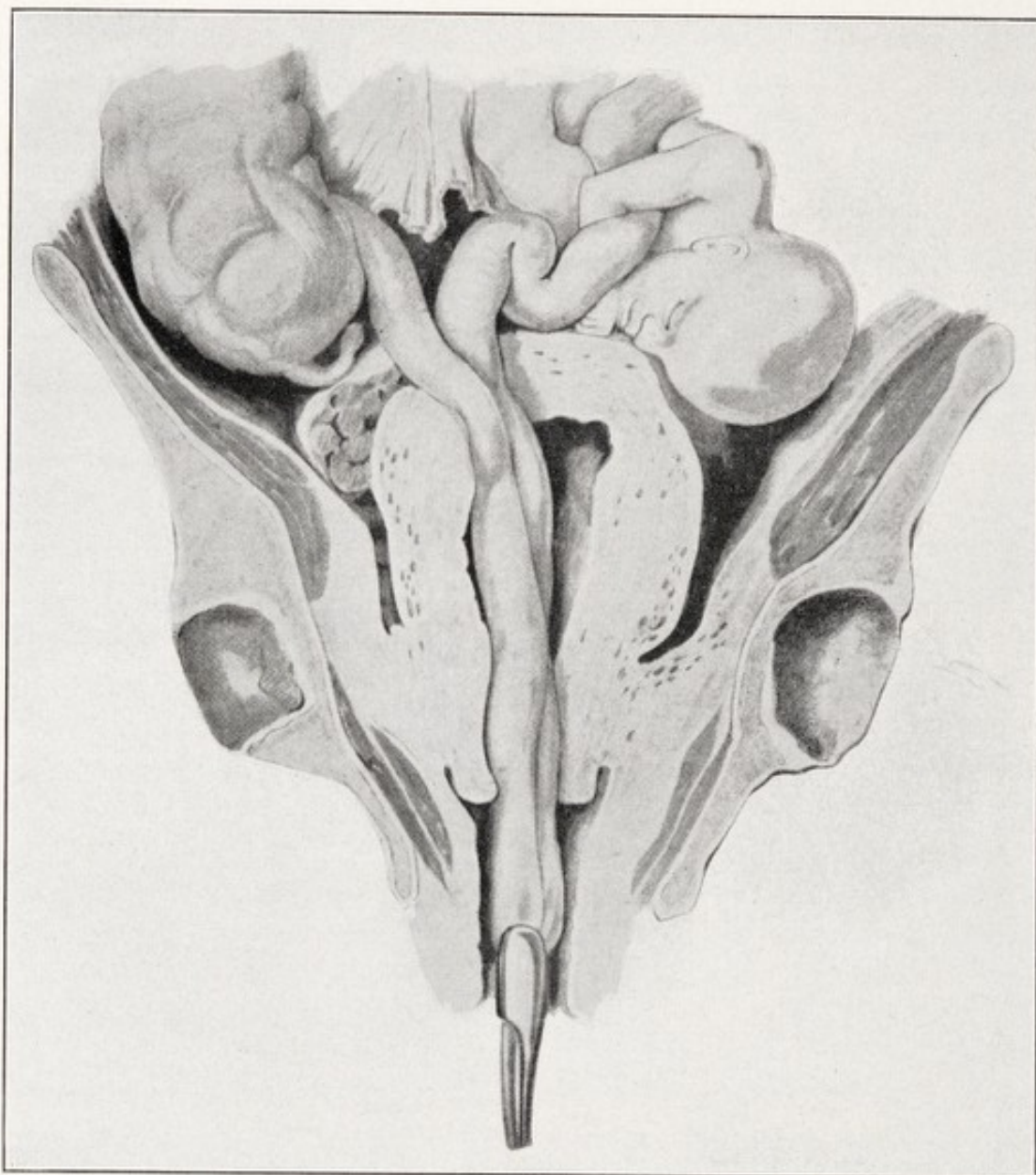


Fig. 90.—Intestinal injury associated with perforation of the uterus. With insufficient cervical dilatation an ovum forceps was introduced into the uterus; tissues were grasped blindly, producing a perforation through which the four months' fetus slipped into the abdominal cavity, while the forceps pulled down a loop of the ileum, ripping it from its mesenteric attachment. (Liepmann: *Die Abtreibung*, Urban und Schwarzenberg, Wien, 1927.)

wrong direction and thus produce an injury before the condition is recognized. In the sharp *anteflexion* of certain primigravidae a false passage may be formed by the dilator with a perforation into the cul-de-sac (Fig. 91). Certain cases of arcuate or septate uterus are

also very deceptive inasmuch as the curette first passes into one and then the other horn and the distance cannot be accurately gauged. Finally a submucous fibroid may so distort the shape of the uterine cavity that injury may readily be done with the evacuating instrument.

Cases in which *no uterine pregnancy* exists are not at all uncommon. Neugebauer has tabulated a long series of such perforations. In one set there was no pregnancy at all and in the other it was tubal. In either event in spite of the fact that the uterine wall has considerable thickness, the operator is so baffled by the fact that he cannot seem to get out the ovisac that he plunges deeper and more recklessly

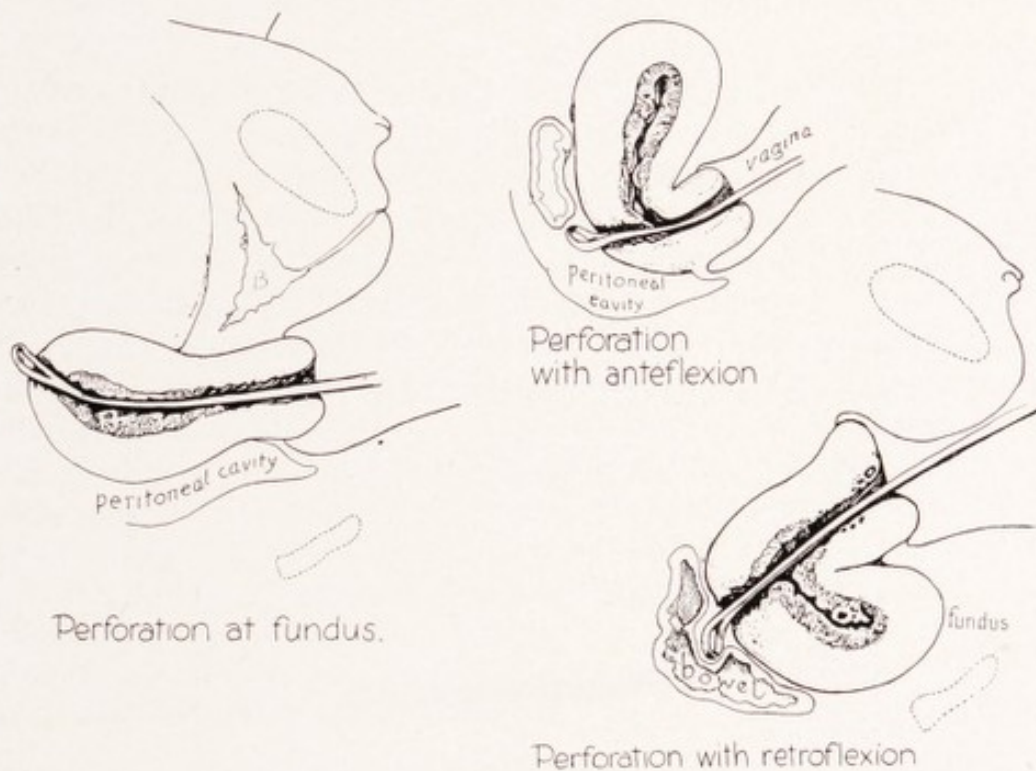


Fig. 91.—Diagrammatic sketch showing different methods of perforation with the curette according to the position of the pregnant uterus. (Dickinson.)

until finally his efforts are rewarded by being able to pull down something which may prove to be the omentum or intestine. Naturally the cases in which an ectopic pregnancy exists, usually go into shock as a result of these rough procedures with rapid and excessive intra-peritoneal bleeding. The fatalities in this group, owing to failure to recognize the true condition, are unusually high.

Where intra-uterine treatment is instituted in cases of unrecognized ectopic pregnancy, Zeitlin reported uterine perforation in 8 per cent. Out of 28 uterine perforations reported by Smirnow, two were in patients with ectopic pregnancy.

Prompt *diagnosis* of the perforation is of the greatest importance. Even in the hands of well-trained obstetrical surgeons a perforation will at times occur, but if the accident is promptly recognized and the necessary operative measures undertaken, few fatalities result. Naturally the most significant symptom is that the instrument passes beyond the estimated depth of the uterine cavity. A second symptom is shock and evidence of internal bleeding.

Treatment.—The care of perforation varies greatly in accordance with the character of the injury and whether or not it is done under clean conditions. In cervical injuries Gardlund advises immediate repair, incising the cervix up to the point of injury and suturing the wound edges.

There is considerable variation in the treatment of simple perforation. Barsky, following other Russian writers, recommends conservation of the uterus especially in younger individuals; and considers that not even a laparotomy is necessary in some cases. On the other hand in perforations done outside of the hospital the danger of infection necessitates prompt surgical intervention. Rahm (Helsingfors) performed eight laparotomies for perforation with one death. In three instances a hysterectomy was done; in five the perforation only was repaired. Nordio reported six cases with two fatalities and recommends extirpation of the uterus instead of attempting to repair. Michelson advises that in every case of perforation into the abdominal cavity a laparotomy should be done. Joseph, on the other hand, thinks that in uncomplicated perforation conservative observation is justified before deciding on operation. In 18 out of 23 perforations operated on promptly, there was no mortality. Wels insists that if there is any intestinal injury a hysterectomy is preferable owing to the danger of infection. He cites Schweitzer who found a mortality of 11 per cent where the uterus was left, compared with only 3 per cent where the uterus was removed. Injuries to the intestine greatly increase the mortality, as Zangemeister shows, with figures ranging from 20 per cent mortality in small intestinal injury to 70 per cent mortality in cases with damage to the large intestine.

The time that elapses after perforation until treatment is instituted greatly influences the final outcome. Every patient not already hospitalized must be sent to a hospital at once. Bardenhewer in Berlin was able to save all of the 21 cases of perforation sent to his hospital within three hours of the time of injury. In 8 cases the perforation occurred at the conclusion of the uterine evacuation. In these patients with the uterus empty, conservative treatment with ice-cap, rest in bed for five days and ergot was employed. Only 3 ran a slight

temperature and all were discharged by the eighth day. In 3 instances although the uterus was not entirely emptied, the perforation tract could be located with a sound and curettement completed with avoidance of this false passage. In the 10 remaining patients a laparotomy was done because a grasping instrument had been employed, or no exact data concerning the nature of the perforation could be obtained. In 6 suture of the perforation sufficed, combined once with repair of an intestinal injury. In the other four a high amputation of the uterus was done. Bardenhewer stresses the difference in management between injuries caused by a curette and those caused by an ovum forceps. The former may be treated conservatively, the latter always require laparotomy.

Illustrating is the accompanying Table VI from Heynemann on Herbig's 134 cases at the Hamburg clinic:

There seems no doubt that all these reports are more favorable than actual conditions. Fatal operative cases are less apt to be reported than those in which, in spite of serious injury, the outcome has been favorable. Peham and Katz, whose series comprised 86 fatal cases out of 100, found that the cause of death was in 72 instances peritonitis or general septic infection. In only 10 cases was hemorrhage the cause. These authors stress the fact that the mortality increases with each hour that operation is postponed after the perforation has oc-

TABLE VI
PERFORATION TREATMENT AND RESULTS IN 134 CASES

(Reported by Heynemann, Halban-Seitz, *Biologie und Pathologie des Weibes*, Vol. 7, p. 585.)

TREATMENT	(1)	(2)	(3)	(4)
	TOTAL CASES	RECOVERED	NUMBER	PER CENT
Total -----	134	99	35	26
Expectant -----	16	13	3	19
Operative, total -----	118	86	32	27
Vaginal:				
Repair -----	6	6	0	0
Hysterectomy -----	1	1	0	0
Abdominal:				
Tamponade -----	7	4	3	43
Suture -----	35	31	4	12
Supravaginal hysterectomy	20	14	6	33
Complete hysterectomy ---	49	30	19	39

curred. For with each hour of delay the incidence of peritonitis rises. Kronman advises a laparotomy, even if there is already evidence of peritonitis, followed by drainage. The mortality, however, must be extremely high. I recently had occasion to operate upon such a case, to which I was called thirty-six hours after the perforation when the patient was in shock. The perforation was in the fundus and there had been considerable intra-abdominal bleeding. The abdomen was distended at the time of the laparotomy; some plastic exudate had already formed about the intestines but there was no intestinal injury. In spite of repair of the uterus, drainage and supportive treatment, the patient died of a peritonitis thirty-six hours later.

If the perforation is into the broad ligaments instead of into the peritoneal cavity, the result is usually a large hematoma between the layers of the peritoneum (Fig. 92). Treatment, according to Lesnoi, may be either conservative with ice-caps and opiates or, if the bleeding is more extensive, will require laparotomy, opening the broad ligament, emptying and suturing the wound.

Intestinal injuries vary greatly in their extent, and sometimes apparently hopeless cases may recover if good surgical judgment is employed and the patient shows the necessary resistance. Süssmann reports a case in which a large piece of the recto-sigmoid was torn off. An artificial anus was made. The patient recovered and several months later a piece of small intestine was used to reconnect the descending colon and the rectum and close the artificial anus, with complete recovery. A similar case was reported by Aubert.

Occasionally the perforation is not in the uterus but in a neighboring organ such as the bladder or rectum. In the past year I had occasion to operate on a patient who developed a recto-vaginal fistula following an evacuation of the uterus for a three months' miscarriage. The history indicated that some grasping instrument had been employed to remove placental tissue and that the necrotic posterior vaginal wall had been pinched off by mistake. When I saw the patient, a hole large enough to admit a thumb was found in the recto-vaginal septum about 4 inches from the vaginal outlet. The repair of this fistula was extremely difficult but accomplished at the second attempt. The subsequent almost complete vaginal stenosis was corrected by a vaginal plastic, with such success that within one year the patient again became pregnant and was successfully delivered at term after bilateral perineal incisions to protect the recto-vaginal septum.

End Results.—When the patient has recovered from the perforation, either with or without operative intervention, there may result

sequelae that materially affect her general health. It is not unusual to open the abdomen for chronic pelvic infection and find in addition to the thickened adnexa an old perforation wound in the uterus in which a bit of omentum is lodged. A careful history will then disclose some previous instrumental interference. At the point where such an injury to the uterine wall has occurred healing is imperfect. The down-growth of the uterine mucosa along the tract leads to condi-

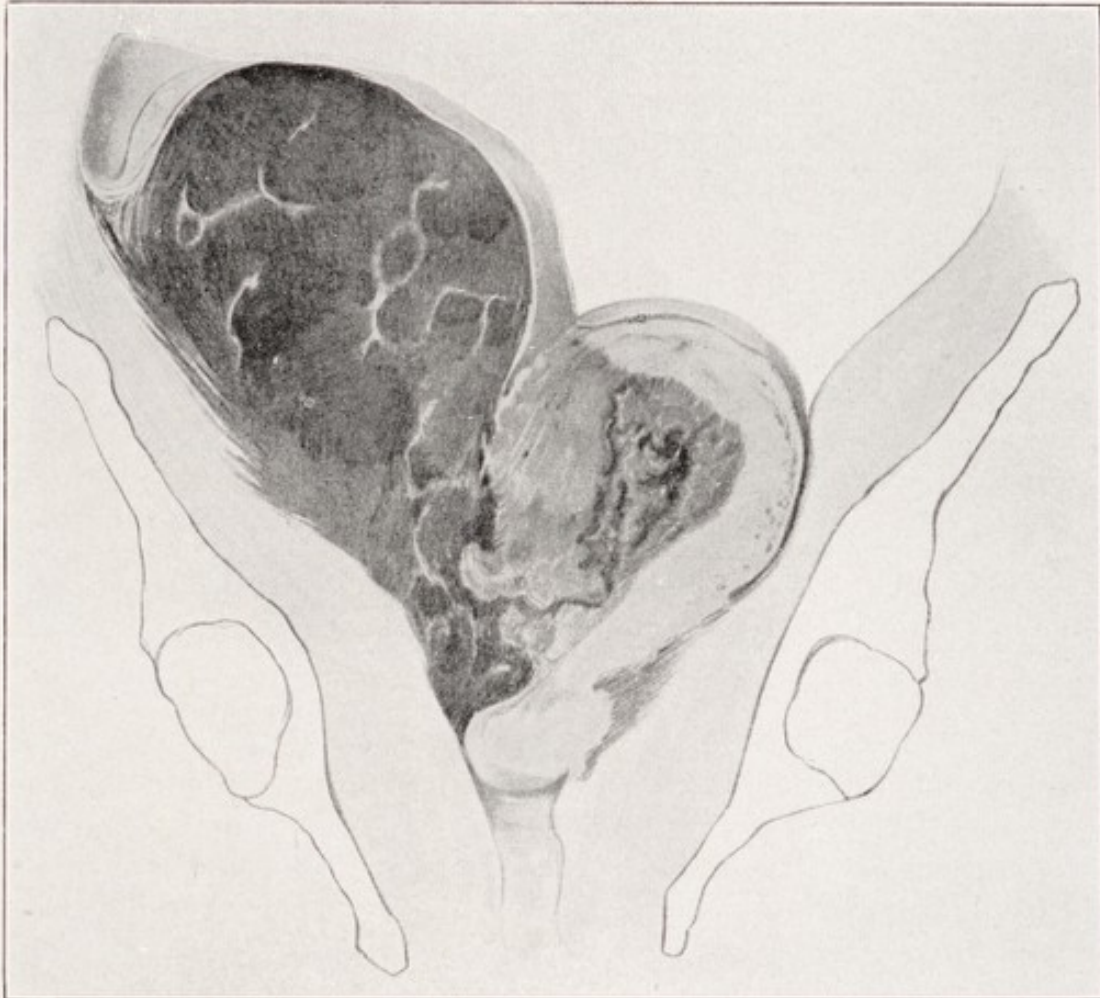


Fig. 92.—Hematoma of the broad ligament, following rupture of the cervix due to forcible dilatation with a bi-pronged instrument. (Liepmann: *Die Abtreibung*, Urban und Schwarzenberg, Wien, 1927.)

tions resembling a poorly healed Cesarean scar. Often there is no definite history of such a previous perforation, so that if a pregnancy follows, the patient may go to term and in the process of labor a rupture of the uterus at this point may occur. Several cases of rupture of the uterus following perforation have been reported.

Nor are cases unusual in which the instrument used for interrupting pregnancy has slipped through the perforation wound into the peritoneal cavity. Katz in 1922 collected 54 cases in which this accident

occurred. After the immediate localized peritonitis has subsided, the agent, whether it be bougie, catheter, a pencil or some form of needle, becomes encapsulated. The patient may for months or even years suffer from this localized infection. At times the foreign body lies in the pelvic cul-de-sac and can then be readily removed by incision from below. More serious are those cases where it has become lodged in the abdominal cavity. Such bodies have occasionally been found high under the liver. Where the subsequent removal necessitates a laparotomy, the danger of a generalized infection upon opening such an abscess cavity is very great.

Even where the perforation is attended by immediate laparotomy and the patient recovers, there may be serious after-effects. If any appreciable portion of the small intestine has to be removed, there is marked disturbance of nutrition, with diarrhea and emaciation, that may end fatally. In other cases the passage of food through the alimentary tract may be retarded; there may be partial obstruction and other similar complications.

Prevention.—Keeping in mind the relative frequency, the high mortality and the many attendant complications, the *prevention* of perforation needs the most careful consideration. Not that anyone would maintain that every perforation is preventable, for I have already referred to cases occurring in the hands of able men, in well-organized hospitals. The vast majority, however, are unquestionably due to faulty technique, and particularly to the fact that the evacuation of the uterus is so commonly regarded as a minor procedure that can be done by any practitioner under the most unfavorable situations at the office or in the home. According to Peham and Katz the two most common causes are: (1) insufficient dilatation of the cervix before beginning the evacuation and (2) the failure to employ the finger wherever possible as the evacuating agent. As to the latter there is room for argument, for Heynemann believes that in cases of previous criminal intervention, the finger is more apt to spread infection to neighboring structures than is the curette or ovum forceps. It cannot, however, be denied that 95 to 98 per cent of perforations are due to instruments and only 2 to 5 per cent to the finger (Fig. 93). Heynemann also points out that with the use of the finger a general anesthetic must be employed, adding greatly to operative risk in these exsanguinated patients. Furthermore he claims that bacteria are more readily carried into the uterine cavity with the finger than with the curette. Granting that all these contentions are to an extent true, I am convinced that in every case where the gestation has advanced beyond the tenth week, the uterine walls are so soft and the

amount of tissue to be removed so considerable that the careful use of the finger as a means of loosening placental tissue or as a guide to the use of instruments is far safer.

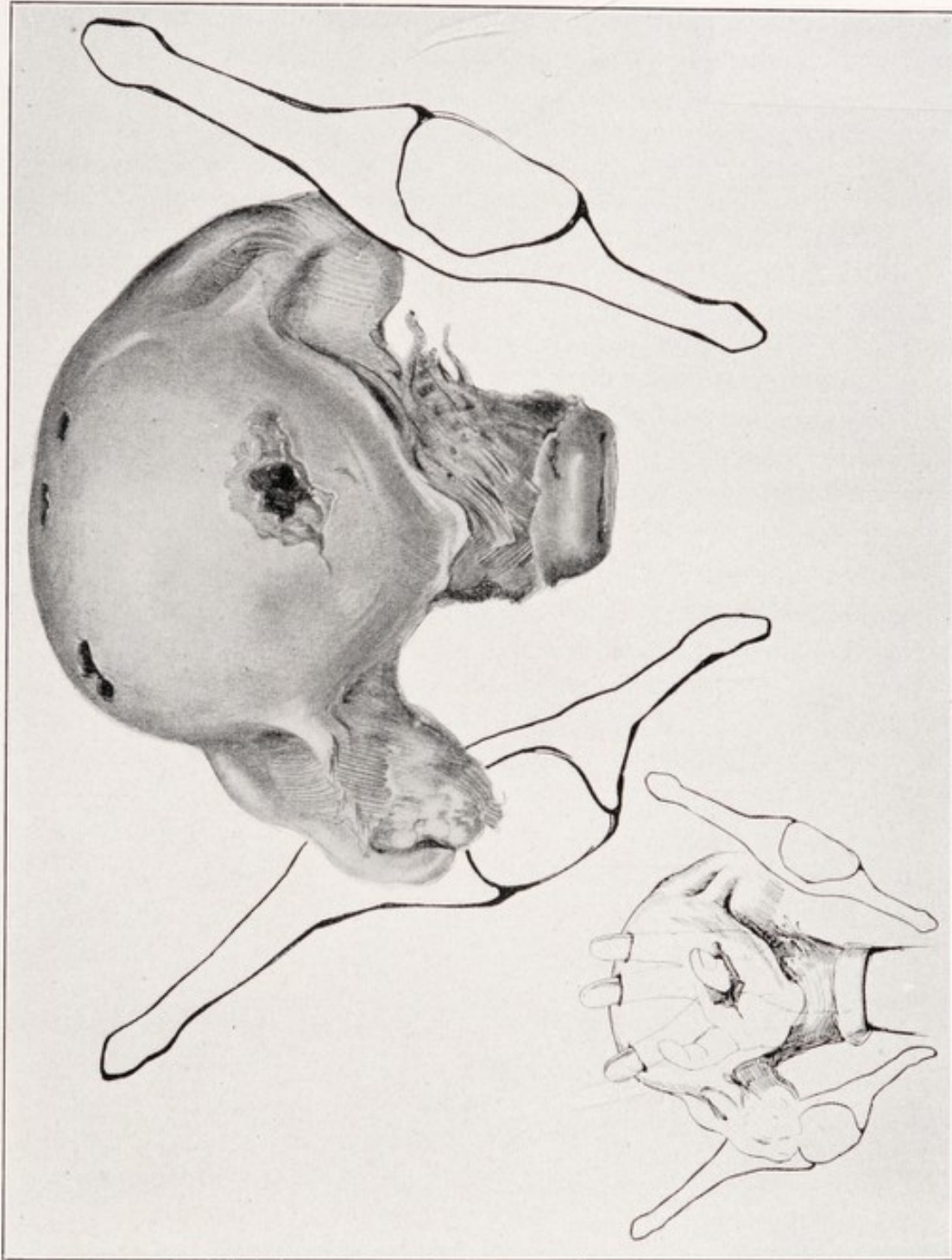


Fig. 93.—Multiple perforations of the uterus produced by the hand of the operator. This unusual accident must be attributed to unwarranted roughness on the part of the physician and unusual friability of the uterine wall. (Liepmann: *Die Abtreibung*, Urban und Schwarzenberg, Wien, 1927.)

Bumm emphasizes the dangers in the use of the ovum forceps. These forceps must never be used to loosen tissue from the wall, but only to grasp and withdraw already loosened bits of the ovisac. He

also stresses the importance of an open cervical canal before beginning the evacuation. Krupsky advises carefully introducing the ovum forceps to the fundus, then withdrawing it slightly, opening it and sweeping around before grasping the object within the cavity. Only by such technique can we avoid grasping a portion of the uterine wall. If it should have grasped the wall, this will be noticed by a definite tug on attempting withdrawal.

Runge underscores the careful measurement of the uterine cavity, avoiding the introduction of dilators or curette beyond the estimated distance. He said that a perforation may perhaps be forgiven, but the introduction of forceps beyond the depth of the uterus to a distance of 20 or 30 centimeters and pulling down a piece of intestine is unforgivable.

Liepmann is convinced that the frequency and high mortality of perforation are largely due to improper training of the average physician in the inherent dangers of instrumental evacuation of the uterus and a failure to employ to the fullest degree the clinical and hospital facilities available for such patients.

Summary

To summarize the precautions necessary for the prevention of perforation of the uterus, let us remember:

- (1) Give a hypodermic of pituitrin before beginning any evacuation.
- (2) Empty the bladder and again determine the position and exact size of the uterus by bimanual examination.
- (3) Dilate the cervix, when necessary, slowly and without force, measuring the distance of introducing the dilator each time.
- (4) In abortions of less than eight weeks' gestation, use a curette or ovum forceps gently, carefully measuring depth of entrance.
- (5) Use ovum forceps only to remove already loosened pieces.
- (6) In abortions over eight weeks' gestation, if much material is retained, dilate to introduce finger and remove the abortion products under guidance or with the aid of the finger.
- (7) Except in emergencies, evacuate a uterus only in a hospital under proper surgical conditions.
- (8) Only a physician with proper obstetrical training is qualified to evacuate the uterus in cases of abortion.

CHAPTER XV

OTHER COMPLICATIONS OF ABORTION

BESIDE SEPTIC conditions and perforation, various other complications occasionally attend or follow abortion. The more noteworthy are:

- (1) Prolonged retention of fetal parts or placenta.
- (2) Fatal hemorrhage.
- (3) Gangrene of the extremities.
- (4) Abortion in double or septate uterus.
- (5) Inversion of the uterus with abortion.

Prolonged Retention of Parts

Not infrequently in the absence of marked infection the uterus is so inactive that portions of the ovisac are retained for long periods of time. Neugebauer in a monograph on "*Fremdkörper des Uterus*" has cited many instances of the tolerance of the uterine cavity for such material. Geisenhofer (1924) relates instances of the retention for several years of fetal bones when the abortion occurs in the fourth to the sixth month of pregnancy. The soft parts undergo liquefaction necrosis but the bones dig their way into the uterine wall and are not expelled (Fig. 94). The fetal skull may at times remain intact, and in Volkman's case was retained for seven months. Fetal bones were removed by Oldag four and eleven months, respectively, after an abortion. Both patients had a persistent bloody discharge. A large portion of the placenta may at times retain a slight attachment to the uterine wall sufficient to prevent complete necrosis. Such placental tissue gradually becomes fibrotic and as in Guillemin's patient may remain within the uterus as long as eighteen months. Such pieces of placenta are grayish in color and have the consistency of a myoma, for which they are sometimes mistaken.

Fatal Hemorrhage

The severity of bleeding has a fairly constant relation to the period of gestation in which abortion occurs. While severe hemorrhage is of more frequent occurrence than in full-time deliveries, fatal bleeding is less common. In a certain number of instances, however, bleeding

may be so persistent that death ensues. Out of 4,595 abortions in Bass' report from 1917 to 1926 two such fatalities occurred. To the six cases reported by Heynemann, Federlin could add twelve deaths from hemorrhage following abortion, including 3 cases of Schneider; 2 each of Bass and Latzko; one each of Kiefer, Hammerschlag, Heinsius, Oing, Mandelbaum, and one of his own. In most of these curettage was done without previously fortifying the exsanguinated patient with a blood transfusion. With the increased facilities for transfusions in a well-regulated maternity hospital, such deaths should be almost certainly preventable. Only where patients cannot be trans-

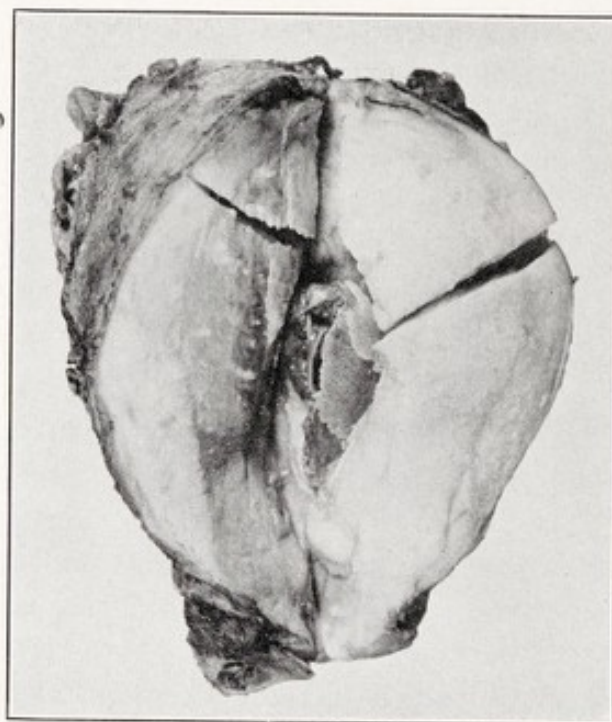


Fig. 94.—Uterus containing fetal bones, removed 11 years after an induced abortion of four and half months' gestation. (Case of Dr. F. R. Smith, *Am. J. Obst. and Gynec.*, December, 1933.)

ported to a hospital, or in rural districts, will fatal hemorrhage at times be unavoidable.

According to Nevermann, the incidence of hemorrhage as a cause of death after abortion is 2 per cent. In Kief, Magid recorded four deaths from hemorrhage in 33,000 abortions in eighteen years. These reports come from hospitals and probably underestimate the total number of these deaths. The report on maternal mortality in New York City from 1930-1932 showed twenty-seven deaths from hemorrhage out of 357 abortion deaths, 258 of which occurred at the patient's home. This would make an incidence of 7.5 per cent deaths from hemorrhage.

While the flow of blood is in almost every instance outward from the uterine cavity, it may happen that the uterine end of the tube is exposed by the loosened decidua and blood may flow through the tube into the peritoneal cavity. Sampson has shown that such intra-

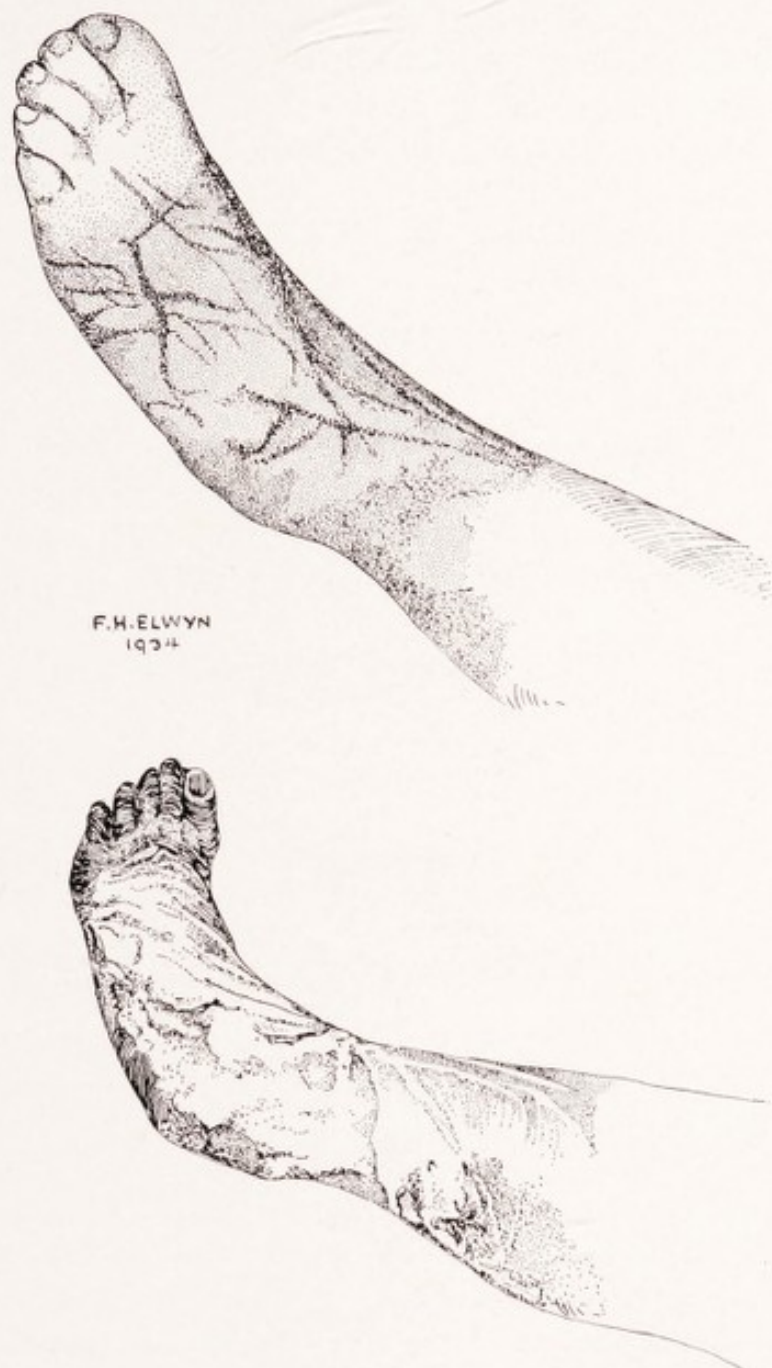


Fig. 95.—Gangrene of the leg after postabortive thrombosis. The upper drawing shows early changes; the lower one shows later pronounced necrosis. (Redrawn from Halban-Seitz.)

peritoneal oozing of blood may occur at menstruation. In the case reported by Downing 300 c.c. of blood was in the pelvic cavity at operation. This patient survived.

Gangrene of the Extremities

Unilateral gangrene of the lower extremity is usually due to a septic thrombus. Symmetrical or bilateral gangrene is usually the result of an overdose of ergot. Von Pall reports a fatal case of rapid gangrene of the leg associated with septic embolism in the femoral artery following criminal abortion. He advises amputation of the leg, since Zweifel found that out of 30 cases without amputation all died, whereas in 24 cases with amputation 18 were saved. Where such gangrene is part of a generalized sepsis, however, such radical measures are hardly justified (Fig. 95).

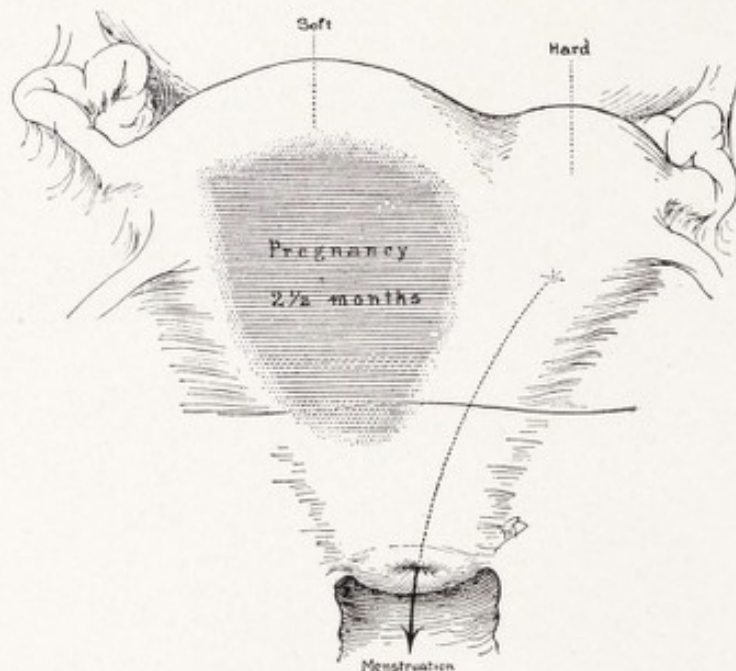


Fig. 96.—Bicornuate pregnant uterus, a complicating factor in the diagnosis and treatment of abortion. (Kelly: *Operative Gynecology*.)

Symmetrical gangrene of the lower extremities occasionally follows upon the use of large amounts of ergot or its derivatives. Heyer (1927) decided that in his case there must have been a previously existing tendency to spasm of the blood vessels. Only one c.c. of gynergen given hypodermically and twelve tablets of this drug given over four days' time resulted in gangrene of both feet requiring amputation just below the knee to save the patient's life. Septic embolus was excluded by the subsequent pathologic examination. The case of De Senibus (1928) ended fatally even though ergot was promptly stopped at the first sign of gangrene.

Abortion in Double or Septate Uterus (Fig. 96)

The tolerance of the pregnant uterus to instrumental interference is at times amazing. Repeatedly we see that in spite of a fairly vigor-

ous use of the curette the attachment of the ovisac is missed and the pregnancy continues to develop. This is particularly likely to occur in the case of bicornuate uterus with a single cervix, in which the curette slips into the non-pregnant horn of the uterus. Even an

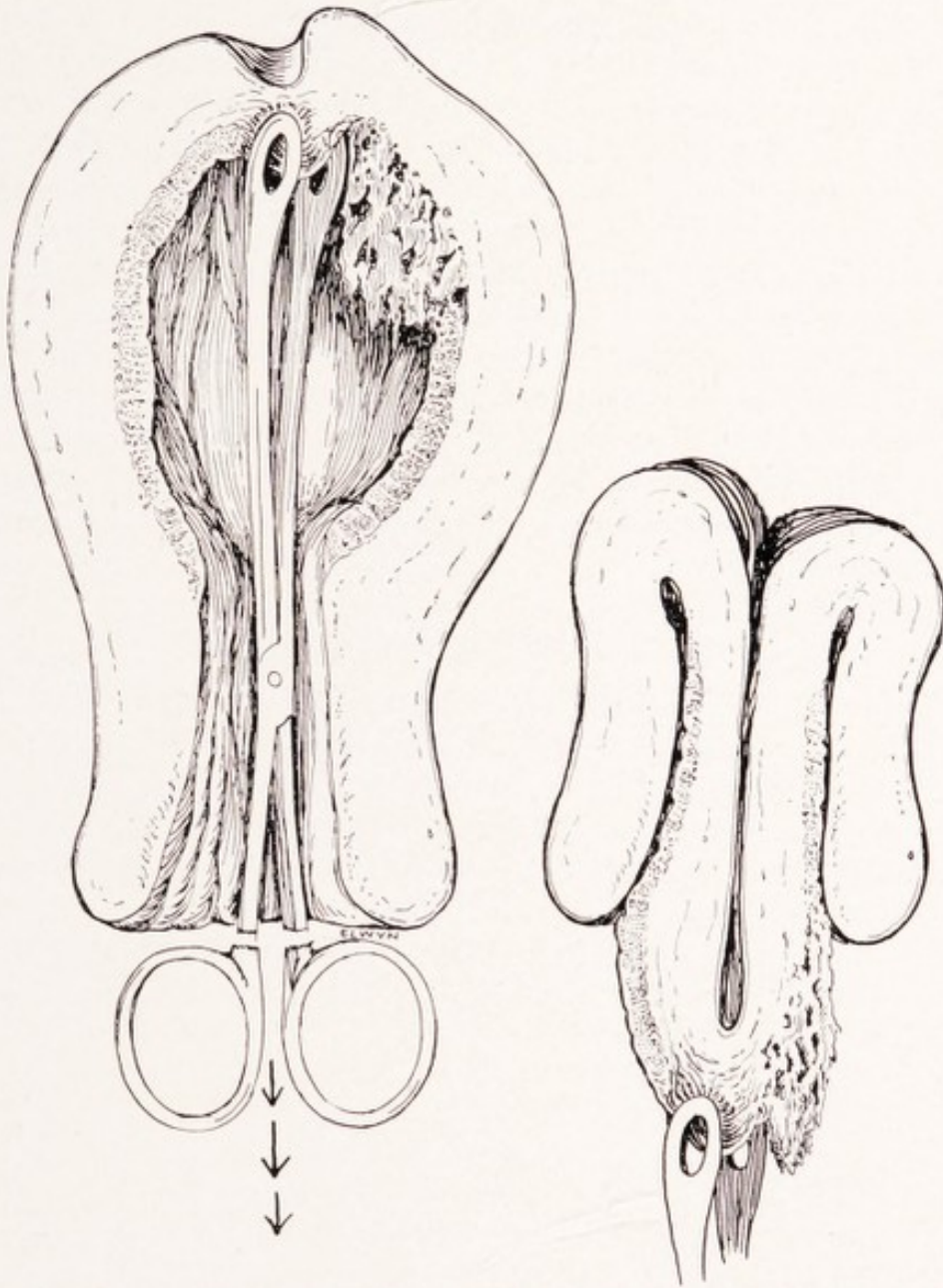


Fig. 97.—Inversion of the uterus produced by the faulty use of the ovum forceps in retained abortion. In the left-hand figure the forceps is grasping the soft uterine wall, indenting it; in the right-hand figure the inversion has been completed with the placenta still attached to the uterus.

arcuate uterus with septate cavity will permit continuance of development although the entire decidua is scraped away from the non-pregnant side. In the case of Itzkin two curettements were done at intervals of four weeks without effect and the pregnancy finally was

interrupted at the third month by other means. He believes the non-irritability of the double uterus to be due to separate contractility of the two halves. Esch's patient was curetted three times and subsequent lipiodol injection of the uterine cavity showed a septate uterus. Interesting also was the case described by Garfunkel in which both horns of a double uterus contained a pregnancy. One was removed by a dilatation and curettement but the other pregnancy continued to develop until four weeks later when it too was removed in similar manner. R. Falk reports a similar case: pregnant for the third time, with heart disease as an indication for therapeutic abortion, dilators were used and a ten weeks' ovum extracted with ovum forceps, the cavity curetted, and a gauze drain left in the cavity for twenty-four hours. No pains or bleeding followed, but two months later a pregnancy of four and one-half months was diagnosed. The diagnosis of a double uterus with twin pregnancy was made at this time. Prolonged repeated bag dilatation finally opened up the canal on this side and a fetus corresponding to five months' gestation was extracted. Digital palpation revealed a thick septum separating the two cavities extending to the cervix.

Inversion of the Uterus with Abortion

If the ovum forceps is improperly used, we may have a resulting inversion of the uterus as in the case reported by Dunkel. He suggested a modification of the forceps to prevent this accident, but Zangemeister in discussing this case emphasized that the ovum forceps should be employed only to remove already loosened bits of placental tissue, and never to pull such tissue from its attachment. Perforations are apt to result from such a mistake and occasionally an inversion of the pregnant uterus may take place especially if the cervix is widely dilated or torn (see Fig. 97).

CHAPTER XVI

MISSED ABORTION

THE TERM "MISSED ABORTION" was first employed by Duncan in 1874 to describe that group of cases in which the ovisac was retained for some time after the death of the fetus. Long before this time, however, we find descriptions of cases of missed abortion classified as false conceptions (*De conceptu fatuo*). Confusion also arose between these false conceptions and submucous pedunculated fibroids of the uterus, and in 1686 we find an interesting frontispiece (Fig. 98) to Lamzweerde's "*De Historia Molarum*," in which the doctors are debating concerning the possibility of a pregnancy in their patient, one of them stating: "I have faith in her virginity (*Virgini fidem dedi*)."

While some objection has been raised by Nürnberger and others to the use of the expression "missed abortion," no better name has thus far been suggested, and I have therefore preferred to retain it. What a significant part of all spontaneous abortions is to be included under this head can be seen by the fact that Litzenberg, in his interesting chapter on abortion written for Curtis' *Gynecology and Obstetrics*, has devoted about one-third of his space to this subject. I agree with Litzenberg in his statement that it is a much neglected subject.

An attempt to define the limits of retention to which missed abortion may be applied leads to many difficulties. Fraenkel included only those instances in which the ovum was retained beyond the normal termination of the pregnancy. Such a definition would limit it to a relatively small number of molar pregnancies and is not generally accepted. On the other hand, Litzenberg placed an arbitrary limit of two months after the death of the fetus, as the borderline between abortion and missed abortion. The statement made by Rhodes, that the fetus is usually aborted a few days after its death, is certainly not true. Seitz and Streeter both find as a result of their investigations that an interval of four to six weeks usually elapses between fetal death and abortion. Streeter's statement is as follows:

"Among our records are 437 cases of retention of the dead fetus for which there were reliable histories of the menstrual age. Retention was calculated on the basis that the discrepancy between the menstrual age and the age according to size, represents the approximate lapse of time between the death of the fetus and the time of its expulsion. In this way it was learned that the dead fetus is ordi-

narily retained about six weeks, the retention being somewhat shorter in the earlier and somewhat longer in the later weeks. In exceptional cases retention may be greatly prolonged (missed abortion)."



Fig. 98.—Frontispiece from Lamzweerde's "History of Uterine Moles." In the foreground the doctors are debating, and one of them is saying, "I have faith in her virginity." On the sick-bed lies the patient, who has just expelled a submucous myoma resembling a molar pregnancy, and declares: "In what manner this fetus developed I do not know." (Enlarged from original.)

(Carnegie Inst. Year Book, 1931, Report Dept. Embryology, p. 15.)

I cannot see that we are justified in drawing any hard and fast line, and believe that we should include all cases of fully retained ovisac

under this head. The clinical symptoms and pathological changes are more pronounced where the retention has been more prolonged, but are not essentially different.

Etiology

The causes that underlie prolonged retention of the ovum may be sought either in the uterus or the ovum itself.



Fig. 99.—Missed abortion. Hemi-section of uterus containing a four months' fetus and placenta, removed because of maternal tuberculosis. Although the lower half of the uterine cavity is filled with a blood clot, the cervix is still undilated. (Washington University Department of Obstetrics.)

According to Von Graefe, the prolonged retention is due primarily to a decrease in the irritability of the uterus (Fig. 99). As evidence of this he calls attention to the fact that in such individuals dilatation of the cervix by instruments, laminaria or gauze pack, usually fails to bring on uterine contractions. This may however be true in many

instances where no missed abortion is present. Fraenkel believes that prolonged lactation tends to produce such sluggishness of the uterus. Chronic endometritis and chronic metritis have also been considered as possible causes. The inclusion of retroversion of the uterus as an etiological factor seems a bit far-fetched.

Since in many of these cases there occurs a blood-tinged, often brownish, vaginal discharge, with backache and slight cramping, pointing to a threatened abortion, a number of these patients are kept in bed under sedatives for a week or two, and the tendency to retention of the ovisac is increased thereby.

A possible explanation seems to me to lie in the very gradual changes that bring on fetal death in these cases, and the continued activity that persists in the fetal membranes. In this way the ovum does not react upon the uterus as a foreign body and hence contractions are not aroused. Modification of the endocrine secretions that occurs in these patients may have a sedative effect upon the uterus. According to Schaeffer the intrauterine retention of abortion ova arises from the fact that up to the fourth month of pregnancy the circulatory system in the fetal membranes is relatively greater than in the embryo. As a result of this the death of the embryo produces relatively minor disturbances in the maternal decidual circulation. The basal portions of the ovisac are nourished and conserved for some time and the reaction of the uterus is therefore not what it would be to a foreign body such as a completely separated ovisac.

Equally difficult of explanation are the factors that finally bring on uterine contractions and expulsion of the ovum after the prolonged retention. Low grade infections, associated with the slight cervical dilatation and the bleeding that often occurs, have been given as a cause. Pressure against the internal ring of the cervix, or against the paracervical ganglia, as explained by E. Fraenkel, may possibly be a factor. Again we look to endocrine factors for explanation. The fact that the endometrium will in cases of prolonged retention become completely restored and that expulsion of the abortion sac will often occur simultaneously with the first return of menstruation points to an ovarian follicle secretion as the cause of returning uterine irritability.

Frequency

Until recently, missed abortion was considered sufficiently uncommon to justify case reports from time to time in medical literature. Up to 1896, Von Graefe had collected 70 cases, and E. Fraenkel brought the number to 105 in 1903. After more attention was paid to a careful comparison of the embryo and its sac with the clinical his-

tory of a patient, it became evident that missed abortion was really a very common occurrence. Both Williams and DeLee state this in their text-books; and Litzenberg stated that he had seen 23 such cases. In my private practice in the last five years, by far the greater number of abortions were spontaneous, and in not less than a quarter of these the sac had been retained for some time after fetal death. In at least a tenth the retention was long enough to justify classification under the head of "missed abortion."

Pathology

In the chapter on pathology of abortion, we have described the changes occurring in retained placenta. In many ways the changes that are found in the ovisac of missed abortion resemble these. The placenta is usually hard, dried, shriveled and tough, and has a yellowish white color. Infarets are numerous. Here and there a small, sub-chorionic hemorrhage can be seen. Naturally the changes are more pronounced in cases where the ovum has been retained a longer time.

Histologically, we find in the placental areas, inter-villous spaces filled with partly hyalinized blood. The chorionic villi show mucous and hyalin degeneration, and the epithelium covering them is in part missing (Fig. 100). In some areas, however, the syncytial covering is absolutely normal, and shows evidence of recent growth. Calcium deposits occur first in the surrounding layer of blood fibrin, later involving the tissues within the villi.

In 1901, in connection with a study of mole pregnancy, I stressed the fact of continued placental vitality after the death of the embryo. This was criticized at that time by many writers, in spite of the work of Mall, Grosser and others, upon which it was based. Since then the evidence of such placental vitality has accumulated, so that it is accepted by all embryologists. The fetal epithelium, which is most active in this process, shows numerous fresh syncytial buds. Only the Langhans layer shows evidence of obliteration. In the connective tissue of the chorionic villi, we note in some areas absence of blood vessels. Of special interest are the changes occasionally found in which these villi become markedly edematous so that even in the gross examination they can be seen as minute vesicles, not unlike those found in hydatidiform mole. As seen in Fig. 101, the histologic picture is also very suggestive of such a possible malignancy, although the proliferation of fetal epithelium is much less pronounced in these cases of missed abortion. I cannot agree with Thelin, who fears the development of a chorio-epithelioma and advises active treatment in

all cases of missed abortion. There is no clinical evidence substantiating the fear of this complication, even where the abortion was retained for a long time.

The decidua, which is amply nourished by maternal blood, retains its vitality for a long time. Here and there we find areas of necrosis associated with partial detachment of the placenta from the uterine

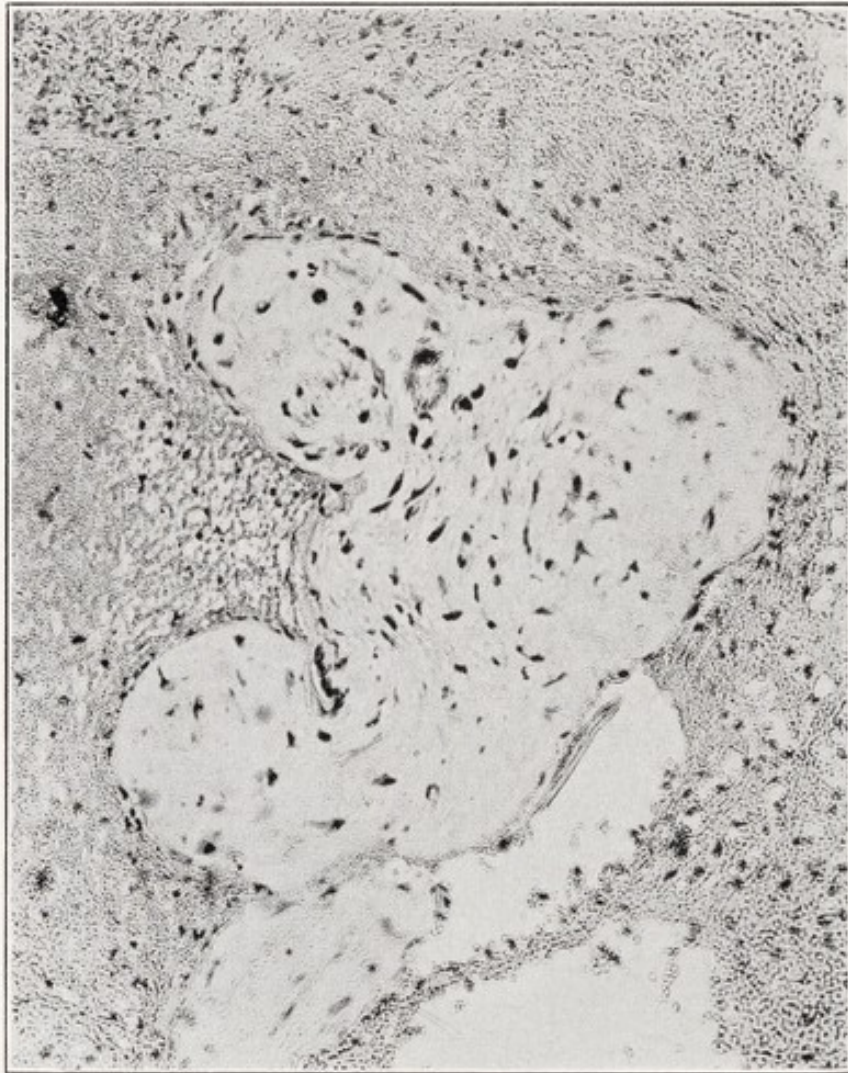


Fig. 100.—Microscopic section of degenerated chorionic villi in missed abortion. The connective tissue has a glairy appearance and the syncytium is almost entirely gone.

wall. The blood vessels of this decidual layer are greatly dilated. Where the retention of the ovisac has extended over a period of months, we find a tendency of the endometrium to regenerate over a large area of the uterine cavity (Fig. 102). Stieve and Fuge describe the histologic picture in a case of missed abortion in which the uterus was removed. They found the uterine mucosa completely covered by epithelium, but still rather flattened and thin, with glands running

parallel to the surface. The uterine wall showed evidence of involution as after delivery. Rosenstein found degeneration of the uterine

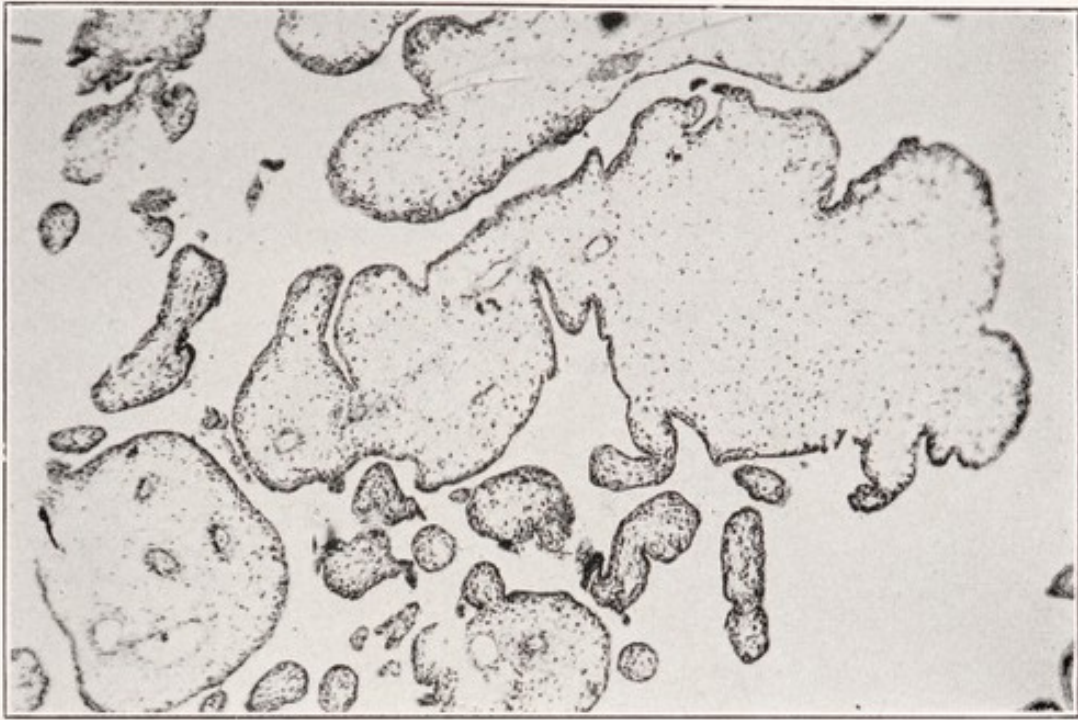


Fig. 101.—Section of hydropic chorionic villi occasionally found in missed abortion and molar pregnancy. They resemble in some ways the villi found in hydatidiform mole but show no such proliferation of the trophoblast layers. (Compare with Fig. 114.)



Fig. 102.—Missed abortion with early fetal death. This drawing shows the regeneration of almost the entire endometrium with the retained ovum remaining attached to one point of the uterine wall. Menstruation may return at this stage.

blood vessels and the neighboring wall. It is probable that these degenerative changes, together with an inability of the uterus to undergo

further involution, are responsible for the tendency to severe bleeding after the removal of such a retained ovum.

Coming now to the changes in the amniotic cavity, we find that in many cases associated with the continued growth of the fetal membranes after embryonal death, there is a definite increase in the size of this cavity, and an early hydramnios (Fig. 103). In discussing hematoma-mole formation, this matter will be given further consideration. Even though in the early stages of retention, there is at times such an increase in amniotic fluid, it is universally true that in

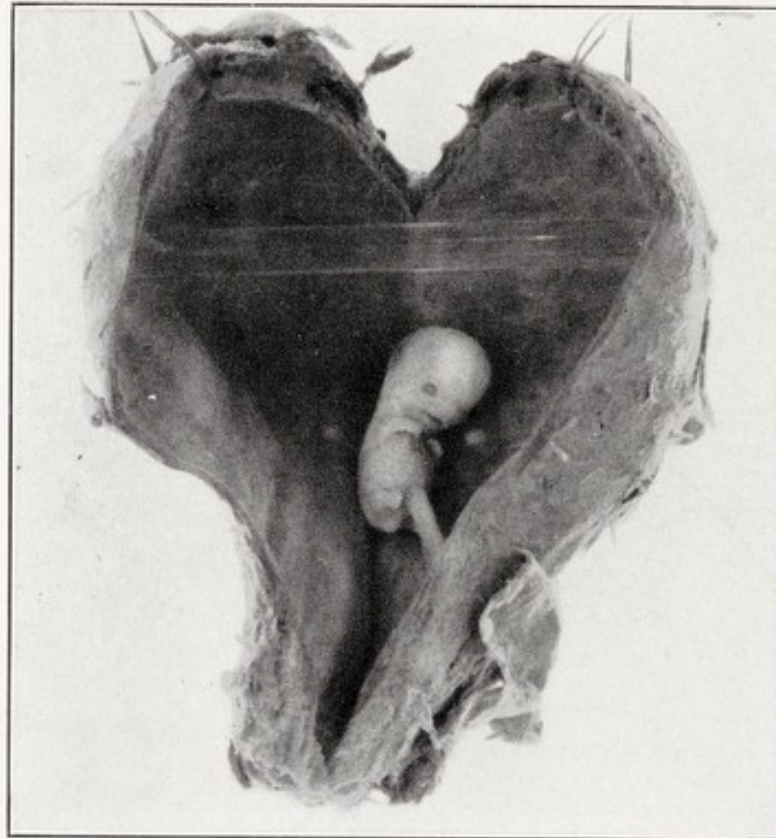


Fig. 103.—Hydramnios ovum in missed abortion, showing relatively large amniotic cavity with pathologic embryo attached by a stump-like cord. (Washington University Department of Obstetrics.)

longer periods of retention, especially in pregnancies of over three months' development, the absorption of amniotic fluid is so pronounced that the embryo is often directly compressed by the surrounding placenta. Sometimes only a few drops of fluid are present.

Concerning the pathology of the ovum in retained abortion, we must fall back largely upon the fundamental work done by His and Mall in the first decade of this century. In Mall's *Human Embryology* (Chapter 9), he gives in great detail the important changes occurring in these embryos. The greater part of this pathological material was sent to him, not by physicians who were in search of normal fresh

specimens, but by midwives who sent all types of abortion ova to his collection at Johns Hopkins. Embryos that were recently dead, or alive at the time of abortion, were translucent so that blood vessels could readily be distinguished. Those that were pathological had a dull gray color and were somewhat amorphous. Mall says:

"Embryos that die suddenly are usually aborted at once, and if they are not they macerate and disintegrate, but do not continue to grow in an irregular fashion as do pathological embryos. The latter become rounded, grow into nodular or cylindrical forms, but do not die immediately. Judging by the well-preserved state of the tissues so frequently encountered, especially the epidermis, I am inclined to the belief that they lived up to the time of the abortion. However,

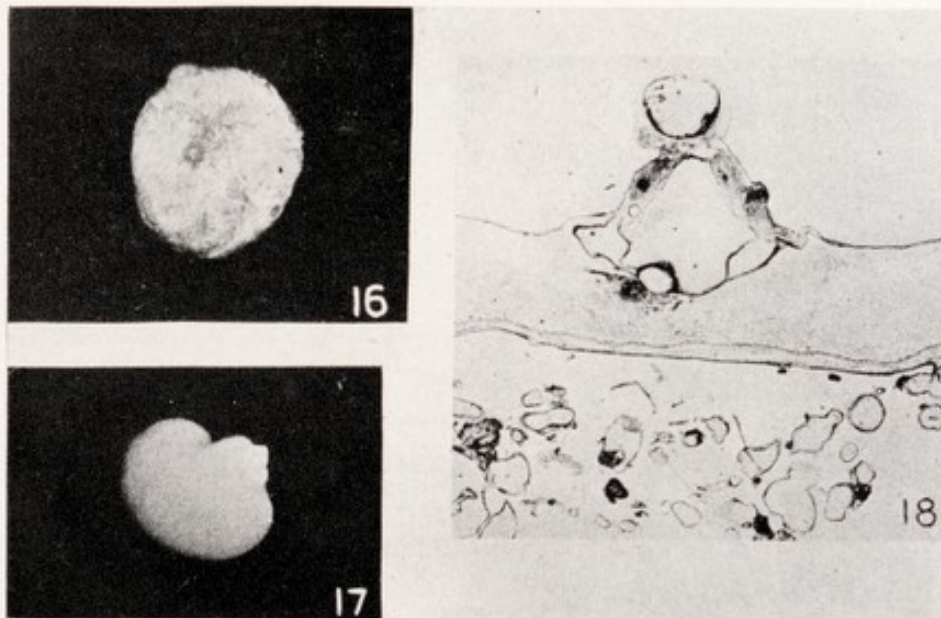


Fig. 104.—The blighted ovum. No. 16 shows an unusual nodular form. In No. 17 we see a kidney-shaped pathologic embryo. No. 18 shows the microscopic cross-section of a vesicular embryo attached to its chorionic membrane. (Mall and Meyer, Carnegie Contributions to Embryology, 1921.)

viewed with the naked eye, the embryo is usually opaque, the borders of the internal organs are quite obscure and no blood vessels are seen through the skin. Furthermore, the sharp outlines of the branchial arches, head, hands, and feet are often wanting; the embryo is not dead, but has grown in an irregular way, just as do fish, frog and bird embryos when experimented upon."

These changes are noted early in retained embryos. Hock, in an embryo retained ten days in the uterus after fetal death, found regressive changes in various organs, with round-cell infiltration, but evidence of continued tissue growth even after death. Autolysis is at the bottom of these changes, in the opinion of Umbach. This writer believes that the round cell invasion does not come from either ma-

ternal or fetal circulation, but that these cells are really altered organ cells, since they are not found in either the placenta or the cord. The structure of the organ is often lost by this autolytic change. The absence of any circulation in these retained ovisacs, according to Umbach, is demonstrated by the absence of calcium deposits in them, even where retention for many months has occurred. In autolysis of organs the end-products of the changes remain stationary owing to lack of circulation. Some organs look like lymph glands and stain poorly.

Mall calls attention to the large number of these cases, 28 per cent of his series, in which *an embryo was completely lacking*. In over half of these with absent embryo, no amnion was found. Mall divides his pathological ova under four heads:

“Group I.—In the first group are the vesicular forms in which the main remnant of the embryonic mass is composed of the umbilical vesicle. In some of them the amnion is formed and in others it is destroyed entirely.

“Group II.—In the second group there is neither amnion, embryo, nor umbilical vesical; only the chorion remains. This group must have formed from that variety of Group I in which there is no amnion present. Vesicular and solid moles may arise from this group.

“Group III.—In this group the embryo was destroyed after the amnion had been formed; usually it lines the chorion. All stages of the complete destruction of the embryo are found in this group, from a necrotic, granular mass to a vesicular ovum lined by the amnion with but a very short stump of the umbilical cord left.

“Group IV.—The embryo is present in this group and is more or less degenerated. In case it is much degenerated it may produce a nodular embryo of His or an amorphous embryo of Panum.

“Usually after the fifth week it is quite easy to recognize the stage in which the embryo became pathological. The younger ones correspond with His's abortive, atrophic, or degenerated forms, the older ones often with his cylindrical forms. I have found it more convenient to arrange them in weeks according to the age of the embryo at the time the pathological process began. The embryos of any given week may contain any of His's atrophic forms according to the extent, degree, and duration of the pathological process. It is noteworthy that there are so few pathological embryos of the fourth week in my collection, while relatively there are four times as many in His's collection. Just the opposite is the case with the vesicular or nodular forms. It may be that I have had a tendency to class with these

embryos those that he classes with the nodular form. The vesicular are intermediate between ova with pathological embryos of the fourth and fifth weeks."

In the accompanying Table VII will be seen the distribution of 159 pathological ova according to these groups, and also the condition of the chorion.

TABLE VII

DISTRIBUTION OF PATHOLOGICAL OVA IN COLLECTION OF 434 SPECIMENS

Length Crown to Rump, and Condition of Chorion

(From Mall: Human Embryology, 1910, p. 224)

GROUPS OF OVA	(1)	(2)	(3)	(4)	(5)	(6)
	LENGTH CROWN TO RUMP (MM.)	TOTAL		CONDITION OF CHORION		
		NUMBER	PER CENT	NORMAL	PATHO- LOGICAL	NO RECORD
Total Cases	—	159	100	19	113	27
I. Vesicular Forms ----	—	19	12	6	11	2
II. Without Amnion or Embryo -----	—	29	18	6	22	1
III. Amnion, no Embryo..	—	15	10	3	11	1
IV. Embryos, 4th to 10th Week: -----						
4th -----	2.5	4	3	0	3	1
5th -----	5.5	18	11	1	11	6
5.5th -----	8	21	13	0	15	6
6th -----	11	13	8	0	10	3
7th -----	17	27	17	1	23	3
8th -----	25	10	6	2	4	4
9th -----	32	2	1.4	0	2	0
10th -----	42	1	0.6	0	1	0

Symptoms and Clinical Course

It is the rule that shortly after fetal death there occurs a slight bloody discharge and a few cramp-like pains suggesting threatened abortion. Rest in bed and sedatives will usually cause these symptoms to disappear. Then the patient goes about her usual duties with an occasional brownish tinge to the vaginal discharge, but oblivious of the fact that the pregnancy is not advancing. After a lapse of weeks, or even months, the patient becomes conscious that something is wrong, owing to the absence of enlargement or the failure to feel life. If fetal death occurs after the fourth month, the cessation of fetal movements will be noted. In some instances, she may mistake the recurring bleeding for irregular menstruation, believing that after

all she may not be pregnant. Litzenberg says that these patients have increasing invalidism, loss of weight, chilliness, a foul taste in the mouth and a bearing down weight, "like a stone in the abdomen." He even speaks of grave anemia and mental derangement in these cases of retained abortion. I have not seen any such severe symptoms from retained abortion, nor can I believe that they are very common.

The symptoms, as described above, are characteristic of the neglected cases. If the patient consults her physician early in pregnancy or at the first onset of bloody discharge, and careful re-examinations are made at intervals of two to four weeks, it should be possible to recognize most of the cases of retained abortion within one to two months after fetal death.

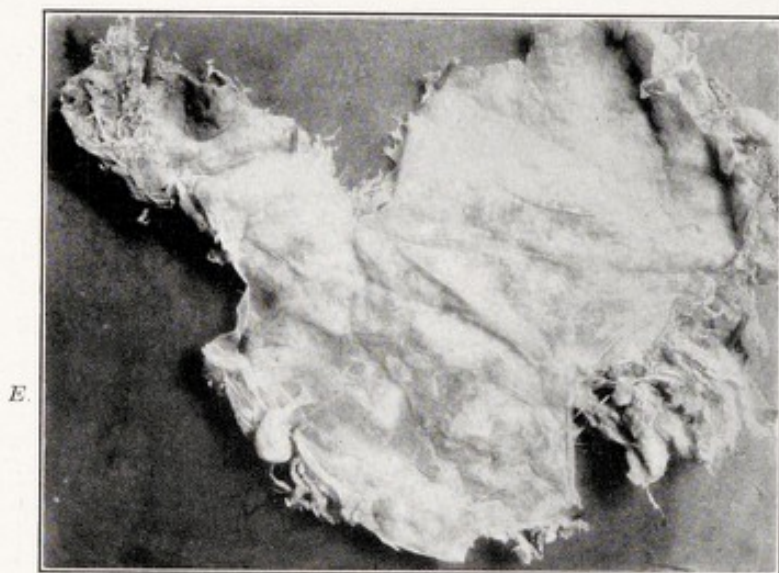


Fig. 105.—Hydramnios ovisac, 9 cm. in diameter, with 8 mm. embryo. For the history of this case see accompanying text. *E.* Embryo.

A typical illustration of a case of missed abortion is quoted from my former monograph (p. 154):

"M. W., twenty-three years of age, had been married five years. No previous pregnancy. For several years she had had leucorrhea, backache and dragging pains in the pelvis. Menses regular, three or four days in duration, painless. Last menstruation in the middle of September. In October she had typical morning sickness. No symptoms on the part of the breasts. When she came to me on February 11th, she said she had had some bleeding and abdominal pains for the past week. In the past two days bleeding had been more severe, and accompanied by clots. Examination showed a uterus somewhat softened, corresponding in size, however, only to about a two months' pregnancy. She was ordered to rest in bed and was given sedatives, but the following day, five months after the last menses, the intact

ovisac was expelled. The measurements taken before preservation showed the greatest diameter of the ovum to be 90 mm., the length of the embryo 8 mm. (Fig. 105). The placental site had not yet been established, villi being found in all portions of the ovum. The decidua was lacking in the area near the point of insertion of the umbilical cord. The embryo was well preserved, but deformed. It dated from the end of the first month. The ovum corresponded in size to two and one half months. The pregnancy continued for five months."

The course of missed abortion varies in its duration from one or two months to one or two years. The cases mentioned in previous chapters, in which only fetal parts were retained in the uterus are not to be included under this head. As a rule, if the retained ovisac has not been expelled spontaneously within a few months, the patient will insist that something be done to evacuate the uterus, and very often the wishes of the patient will be re-enforced by the recurrent, sometimes hemorrhagic, uterine bleeding.

Diagnosis

The difficulties of accurate diagnosis of missed abortion are very great. In women with moderately thick abdominal walls, it is often impossible to determine with any accuracy slight changes in size and consistency in the uterus. If we have not examined the patient before the abortion has begun, we may even find it impossible to decide the question of a pregnancy. The differentiation between a submucous myoma and a retained abortion is not an easy matter. In the history of the case we may also encounter difficulties. Mianna reports a case of six months' amenorrhea, in a woman forty years old diagnosed as beginning menopause. At the seventh month a bloody discharge suggested further examination, and an ovisac weighing 30 grams was extracted with ovum forceps. There was no visible embryo in the amniotic cavity when the specimen was opened. Mention has already been made of the use of the pregnancy and female sex hormone tests in determining the question of fetal death. Wilson and Corner report two cases of missed abortion in which the Friedman pregnancy test was of diagnostic value:

"(1)—Four months pregnant (test positive); three months later, no change in size of uterus (test negative); removal of mummified fetus and infarcted placenta by vaginal hysterotomy.

"(2)—Three and a half months pregnant (test positive); 3 weeks later, bleeding (test negative); two months later, no growth (test negative); uterus emptied and dead ovum and infarcted placenta found."

In pregnancies near term, these writers found that in spite of a dead fetus the test was positive.

Complications

In spite of the prolonged intra-uterine retention, we do not ordinarily find any complicating factors in the way of infection of the adnexa or parametrium. Of unusual interest are the cases in which in spite of the retention of the abortion ovum, a new pregnancy has occurred. While extremely rare, they are of such interest in the whole problem of abortion that some of the recent reports are worth citing. In the case reported by Jorgen Lovset, a thirty-year-old patient had five previous children. Her last menstruation was February 5, 1931; on March 31, the uterus was the size of a two months' pregnancy; on June 16 there was a hemorrhage with expulsion of a five weeks' fetus in an unruptured ovisac. In spite of this, examination showed that the uterus still reached to the umbilicus. Shortly thereafter, a placenta corresponding to a four months' pregnancy was expelled with empty ovisac. This placenta was very hard, and showed no evidence of a cord insertion or fetus; it had numerous infarcts. On the other hand, the fetus in the intact ovisac was certainly recently dead, and only 1.5 or 2 cm. in length. Lovset explains these findings as follows:

The first fetus must have died and been completely absorbed, while the placenta continued to grow. About a month or two after the death of the first fetus, the patient again conceived, and after the lapse of five weeks, the new pregnancy aborted and the older placenta was also expelled.

Even more interesting is the case described by N. K. Forster. His patient was a II-para, twenty-eight years of age. Her last menstruation was April 16, 1927. By August 30, 1927, the fundus of the uterus was near the umbilicus. A blow upon the abdomen in September was followed by slight uterine bleeding. Fetal movements were not felt at the expected time in September, and in October the uterus was definitely smaller. In January, 1928, three months later, however, the uterus was again larger and in March the patient stated that she had felt life for two weeks. The expected date for confinement was figured, therefore, for June 22, and labor was induced at this time. In spite of rupture of the membranes, progress was so slow that in view of some evident abnormality, a Cesarean section was done. A child of 6 pounds 14 ounces was delivered with placenta. Inspection of the uterus showed a small, greenish sac still present. This sac

contained a dead, partly macerated fetus of about five months' gestation, flattened in shape, attached to a flat placenta with many hard, obliterated cotyledons.

Treatment

Whether expectant or active treatment will be employed in these cases of retained abortion depends somewhat upon the length of retention, and the mental reaction of the patient to the fact that she is carrying a dead ovum. Ergot, quinine and pituitrin can, of course, be given, but usually have very little effect because of the sluggishness of uterine contractions. Even the introduction of a gauze pack into the lower uterine segment and cervical canal will at times fail to bring about the expulsion of the ovum. Koek advises a waiting policy in missed abortion, since in his experience we can count on spontaneous expulsion within three months' time. If the pregnancy is not over two months' duration at the time of fetal death, the sluggishness of the uterus is more pronounced, and the retention of the ovum is more prolonged. Under such circumstances, it may be necessary to do an anterior vaginal hysterotomy, introduce a finger into the cavity to loosen the sac, and remove it with the sponge forceps or ovum forceps. Since there is often considerable atony of the uterine muscle with moderately free bleeding, it may become necessary to control this with a pack before closing the hysterotomy incision.

CHAPTER XVII

MOLAR PREGNANCY

IN CERTAIN TYPES of missed abortion, the pathological changes of the ovum are so distinctive as to deserve separate consideration. Since the ovisac in these cases is ordinarily expelled as a fleshy mass, the name of "mole" has been applied to it for many centuries. Dorland defines "mole" as a fleshy mass or tumor formed in the uterus by the degeneration or abortive development of an ovum. In the literature of the seventeenth and eighteenth centuries, as seen in the cut from Lamzweerde's book (Fig. 98), there is much confusion between these molar pregnancies and uterine fibroids, especially the pedunculated submucous type extruding into the vagina. The absence of an embryo in many moles rendered the differentiation doubly difficult. Not until microscopic examinations began to be made routinely was it clear that we were dealing with a product of gestation.

There are three types of molar pregnancy:

- (1) Carneous or Blood Mole
- (2) Hematoma Mole
- (3) Hydatidiform Mole

Carneous or Blood Mole (Fig. 106).—It occasionally happens that even though the entire fetal sac has been detached from its decidual bed, it is not at once expelled from the uterus, but is surrounded by a layer of blood which coagulates, forming a bloody, fibrinous mass. By repeated slight oozing of blood, this mass may increase in size until the coagulated blood is many times larger than the original fetal sac. Since this process takes place only in cases of missed abortion, where the embryo has succumbed in the first few weeks of pregnancy, it is not surprising that as a rule we do not find any embryo within the amniotic cavity, or at the most a vesicular or club-like form. In gross appearance such a blood mole has the isosceles triangular shape of the uterine cavity in which it has been lying for some time before its expulsion. With the exception of a few gray fibrinous striations, the color ordinarily will be a wine red with a tinge of brown in the areas of older bleeding. On cutting open the blood mole, we find in the center a small spherical cavity lined by amnio-chorion and containing a few drops of amniotic fluid (Fig. 107). Chorionic villi are

scanty and barely distinguishable. The clinical history of such a blood mole presents no distinguishing points from that of an ordinary missed abortion, except that it is limited to very early abortions.

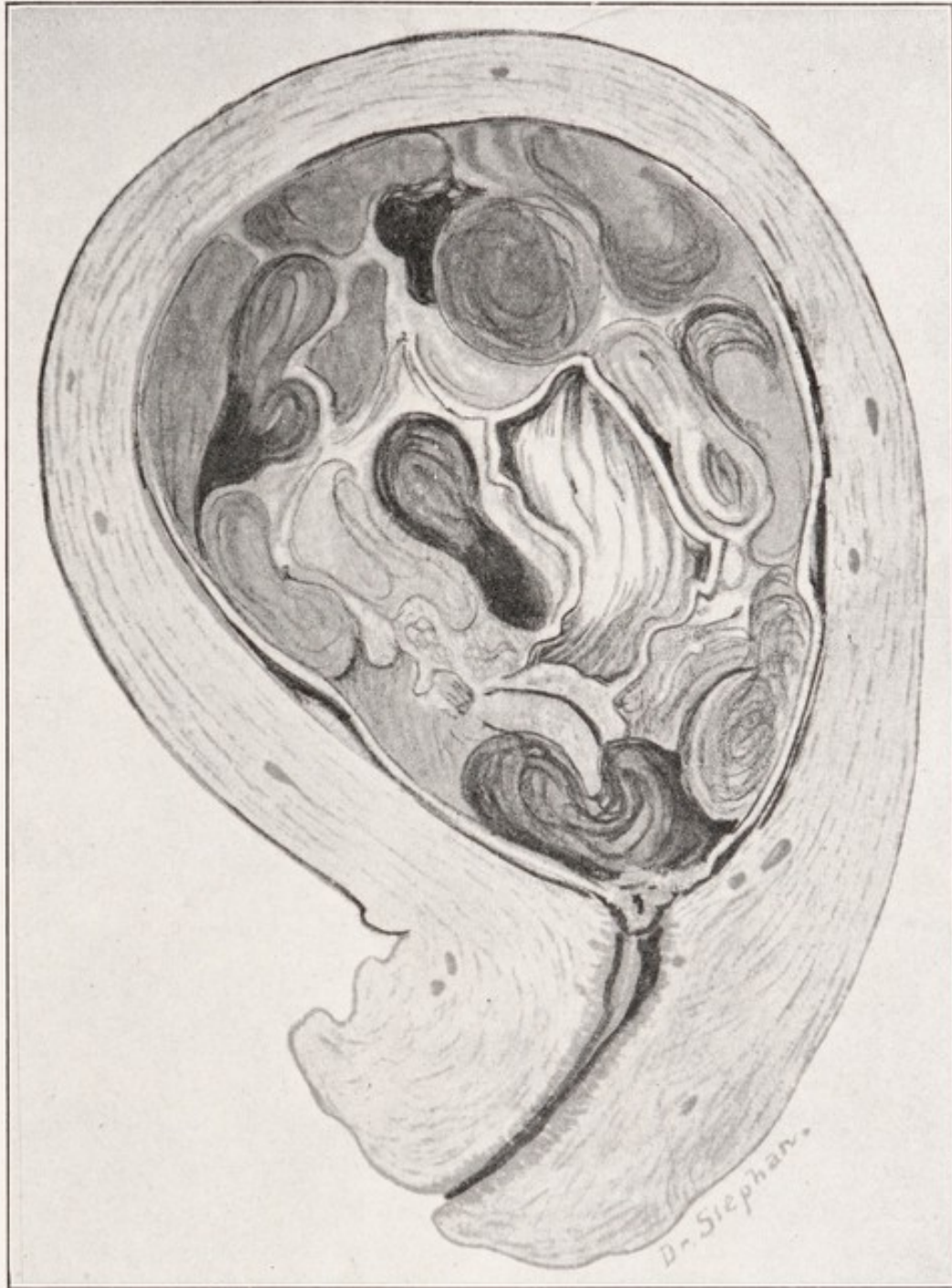


Fig. 106.—Carneous mole in situ in the uterus. (Jaschke-Pankow: *Geburtshilfe*, Springer, Berlin, 1923.)

There is considerable resemblance between these blood moles and the blood clots containing a small amniotic sac frequently encountered in tubal abortions.

Hematoma Mole

One of the most interesting and curious pathological products of abortion is that described in 1892 by Carl Breus as the "tuberous sub-chorial hematoma of the decidua." Although often referred to as Breus moles, we find that Pernice in 1852 already showed excellent illustrations of this condition. The clinical records of the five cases reported by Breus showed that they all gave a history of products of abortion retained for an unusually long period of time, and that



Fig. 107.—Carneous mole showing small empty amniotic cavity and partly fibrinous blood capsule. (Washington University Department of Obstetrics.)

the pregnancy itself had never advanced beyond the seventh week of life, while the ovisac was not expelled until seven to twelve months later.

I had occasion to make a careful study of eight cases of Breus mole in the collection of Professor Wertheim in Vienna in 1902, the findings of which have been for the most part confirmed by subsequent investigators. Depending somewhat upon the localization of the chorionic villi, we find two types of hematoma mole; one, in which the blood sacs assume a polypoid form projecting from all portions of the fetal membranes into the amniotic cavity (Fig. 108); the other, in which the hematomata are broad based, crowded together in one portion of the sac in a hemispherical shape with the remainder of the membranes normal in contour (Fig. 109). Between the hematomata,

folds of chorio-amnion can be seen crowded together by the surrounding sacs. The blood in these sacs has a dark red color, and is for the most part clotted. At their base we find strands of fibrin, grayish brown in color. The decidual covering of the sac has the firm consistency and brownish color seen in all retained abortions.

Although the sac itself is the size of an orange or even larger, the amniotic cavity will be found to be almost entirely obliterated and containing about a half teaspoonful of a fluid having a brownish sediment. This sediment consists of old blood. Most peculiar are the pathological changes in the embryo. The term "cylinder embryo"

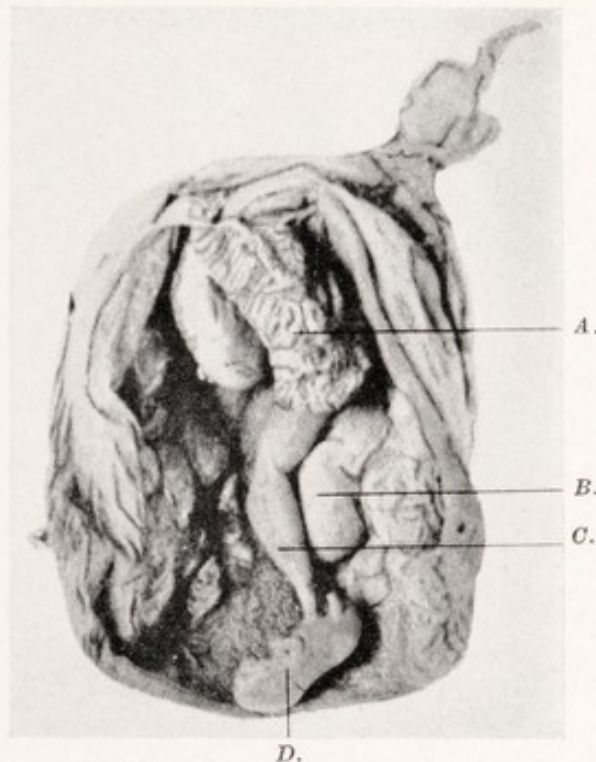


Fig. 108.—Hematoma mole with polypoid hematomata. (H. R. Schmidt in Halban-Seltz Handbuch, Urban and Schwarzenberg, 1927.)

A. Amniotic folds. B. Polypoid hematoma. C. Edematous umbilical cord. D. Embryo.

has been applied to this form, because instead of the normal crescent curve, we find that the head, body and extremities are barely distinguishable in the amorphous cylindrical mass.

The size of these embryos is fairly constant, ranging between 8 and 15 mm. in body length. In a few cases, embryos as long as 20 mm. have been found, but in the larger embryos described by Neumann there is considerable doubt as to the correctness of the diagnosis. This definitely establishes the hematoma mole as a retained abortion dating from between the fourth to the seventh week of gestation. The microscopic findings in these moles show that the fetal membranes

still maintain considerable evidence of vitality. This is particularly true of the syncytium which shows numerous well-staining buds indicative of recent cell division. In the amnion epithelium, we also find the single layer of cells for the most part intact; and in one of the moles I studied, there was an inclusion growth of epithelium around small blood masses lying in the amniotic cavity.

Of considerable importance is the fact that the decidua is for the most part necrotic or in a state of necrobiosis. Its blood vessels are thrombosed, and there is no evidence pointing toward its active participation in the pathologic process. It is for this reason that Breus's



Fig. 109.—Hematoma mole with broad-based hematomata. Specimen from the author's series of cases at Bettina Pavillon (Vienna). (Taussig: *Arch. f. Gynäk.*, 1903.)

original theory and name has been generally abandoned. Whether the fetal circulation has also ceased to function is a matter of dispute. Bill found a lack of blood vessels in the chorionic villi of the case studied by him from Chrobak's clinic. As shown in the illustrations of one of my cases (Fig. 110), such absence of fetal vessels is not necessary for its development. The accumulations of blood are definitely in the intervillous spaces, and the fetal membranes over this area are thinned out and the chorion lacking in villous projections.

The histologic description of pathologic embryos given in the chapter on missed abortion applies equally to those of the hematoma mole.

The head portion shows the most marked degenerative changes. The various organs of the embryo can be recognized with difficulty owing to the cellular changes already described (Fig. 111).

The clinical history of these molar pregnancies is similar to that of other missed abortions except that the tendency to bleeding and



Fig. 110.—Section of chorion from same case (Fig. 109) showing blood in fetal vessels. *Syn* = syncytium; *B* = blood; *G* = blood-vessels; *OB* = oedematous connective tissue.

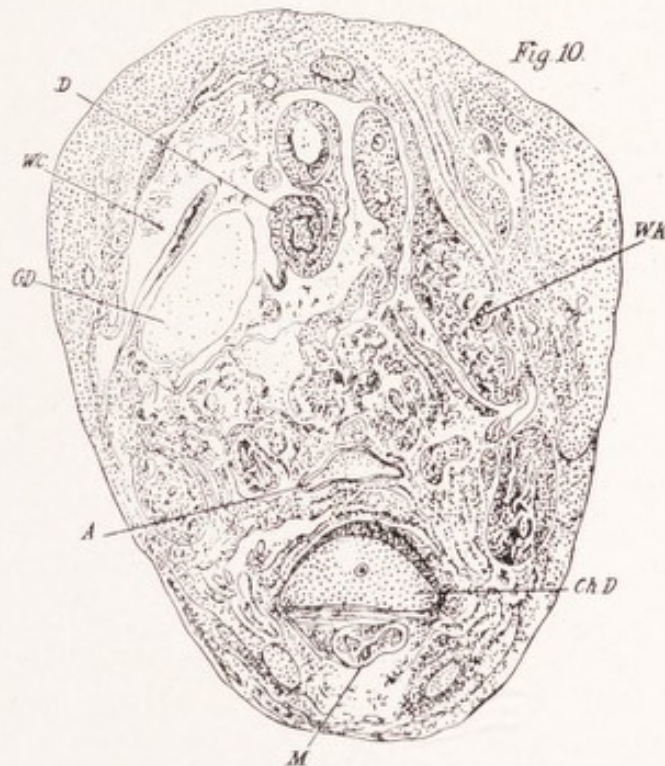


Fig. 111.—Section through cylindrical embryo (Fig. 109), showing partial disintegration. *Ch.D.*, dorsal cord; *A*, aorta; *G.D.*, ovary; *W.C.*, Wolffian duct; *D.*, intestine; *W.K.*, Wolffian body; *M.*, spinal cord.

uterine pains is less pronounced, the interruption of the pregnancy occurs earlier, and the duration of the retention is longer. In several instances, the mole has been retained for eleven to twelve months without any appreciable effect upon the health or well-being of the patient. Practically without exception these pregnancies occurred in

women who had previously borne children or had abortions. The age of the patient usually ranged from twenty-five to thirty years, and in at least one case there was a repetition of the molar pregnancy. In Schweitzer's case, the twenty-six-year-old patient expelled the typical mole 357 days after the last regular menstruation, and 295 days after the last irregular bloody discharge.

The diagnosis of hematoma mole is extremely difficult because of the absence of symptoms, the relatively small size of the uterus, the firmness of consistency of that organ, and the prolonged amenorrhea. If the case has been observed early in pregnancy, and a positive Aschheim-Zondek test changed to negative, as in the case reported by Hammerschlag, we naturally think of missed abortion. Nevertheless in his case previous irregularities and the irregular consistency of the uterus pointed to the presence of a myoma of the uterus; hence a hysterectomy was done, and only upon opening the uterus was it found to contain a typical Breus mole with many polypoid blood sacs. Nürnberger enumerates three characteristics for this mole:

- (1) There are circumscribed, sub-chorial collections of blood, forming knob-like projections into the cavity of the ovisac.

- (2) There is a disproportion between the size of the embryo and the size of the ovisac.

- (3) There is a striking disproportion between the size of the embryo and the duration of the pregnancy.

Concerning the origin of these peculiar mole pregnancies, the discussion waged fiercely for a decade in German literature. As one who took an active part in this forensic struggle, I may be pardoned for restating my own theory at this point. It is as follows (p. 157 of my 1910 monograph on abortion):

"After the death of the fetus in the first or second month of gestation, the fetal membranes and the amniotic fluid increase in volume. Thus there arises a secondary hydramnios-ovum [Fig. 112]. This growth continues up to a certain point. The ovum is retained. The amniotic fluid is then gradually absorbed and the ovum as a whole shrinks somewhat in size. By the negative pressure thus produced, folds, or invaginations, of the membranes arise which become filled with the blood circulating in the intervillous spaces. By continued absorption of the fluid, together with a certain degree of stretching of the membranes by the blood clots, we have the formation of the hematomata. In this process the insertions of the villous stems act as fixed points. If the stems are close together a hemispherical or broad-based hematoma results; if far apart, a tuberosus or polypoid hematoma."

The point of greatest interest at issue is whether the fetal membranes continue to grow after fetal death. This was the assumption of Breus, Gottschalk and others, but has not been confirmed by subsequent studies, and was opposed to my views at that time. Although several critics, and more recently H. R. Schmidt, in the "Halban-Seitz Handbuch" stated that I believed in such a growth of the membranes, the words I actually used were, "increase in volume." I explained this as essentially due to an accumulation of fluid in the amniotic cavity after fetal death, owing to the still vital secreting of the amnion epithelium. This secondary hydramnios following fetal death, corresponds to the accumulation of amniotic fluid commonly found in the last months of pregnancy where a fetal deformity interferes with the swallowing of amniotic fluid. It certainly does not seem far fetched to assume that fetal membranes that show such vitality should for a long time be able to produce additional amniotic fluid, which through

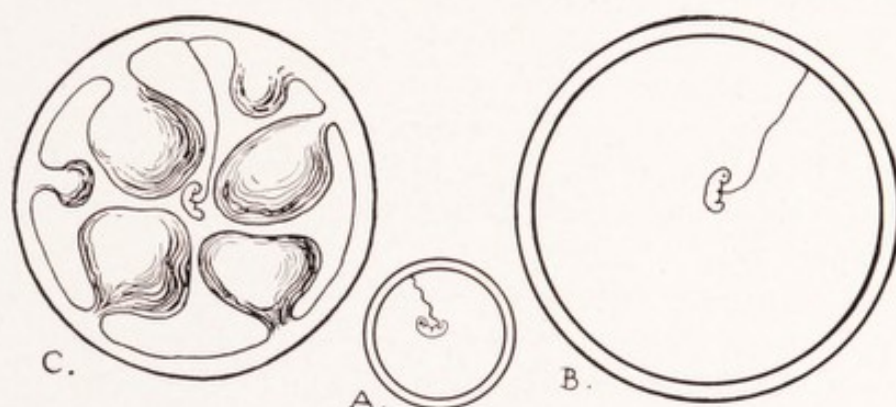


Fig. 112.—Diagrams showing the development of a hematoma mole. A. Normal relation of a four weeks' embryo to its ovisac. B. Relation of such an embryo to its ovisac in early hydramnios. C. Multiple polypoid hematomata, arising in such a hydramnios ovum to form a hematoma mole.

the death of the fetus is no longer needed for fetal metabolism, and hence is not absorbed as is normally the case. In the past thirty years, while numerous cases of early hydramnios ova with pathologic dead embryos have been described, I find no record anywhere of an early hydramnios ovum with *living* or recently dead embryo. For this reason, I cannot accept Davidsohn's theory of a *primary* hydramnios predisposing to the development of these peculiar moles.

The treatment of hematoma mole is essentially that of missed abortion. As a rule there is no necessity for active interference.

Hydatidiform Mole

In hydatidiform mole we pass from the realm of pregnancy and its pathological results into that of neoplasms. To go more deeply into the description, clinical history and pathology of these peculiar

moles, would lead to a discussion of chorio-epithelioma; and this in turn would lead us too far astray for the purposes of our monograph. Since, however, the borderline between physiology and pathology is in this case as in many others so ill-defined, a few comments are in order. It has been repeatedly noted, as illustrated in Fig. 101, that in certain cases of missed abortion we may find small areas of the chorion where the villi have assumed a vesicular form. Such areas are to all purposes miniature reproductions of the picture found in hydatidiform mole. Even more frequently and pronouncedly do we find these peculiar, grape-like changes in cases of hematoma mole. In at least three cases, the first of which was described in my study from Wertheim's clinic, the involvement by the hydatidiform process was as extensive as was the formation of the hematomata.

Microscopically these vesiculated villi as a rule showed but little of the epithelial proliferation commonly associated with hydatidiform mole. Yet we pass from step to step, from the most benign to the most malignant changes in this strange metamorphosis of the fetal membranes. It seems not improbable that when the true theory of the development of these tumors shall have been explained, it will be found to be closely associated with the pathologic processes present in missed abortion.

The frequency of hydatidiform mole is approximately four or five in every thousand pregnancies, according to Onslow Gordon of Bellevue Hospital. It produces uterine bleeding relatively early and therefore the diagnosis is often made of threatened abortion without any suspicion of the peculiar hydatidiform changes. If however there is an enlargement of the uterus out of proportion to the stage of the pregnancy, if the bleeding is profuse and not accompanied by the usual colicky pains, and above all if there is a passage of the characteristic small, grape-like vesicles, the diagnosis of hydatidiform mole can be made with certainty (Fig. 113). In recent years the development of the Aschheim-Zondek test has thrown an interesting light upon the etiology and diagnosis of this condition. This routine pregnancy test is so strongly positive that from quantitative determinations the diagnosis can be made with reasonable certainty. The reasons for this must depend upon the underlying endocrine pathology, and this accounts for the frequent association of the more malignant cases of hydatidiform mole with corpus luteum cysts of the ovary.

In practically all cases of hydatidiform mole, the embryo has died and has either been completely liquified or is vaguely recognizable as a cylinder or nodule, similar to the pathological embryos found in missed abortion. As an exception to the rule, there has been found

in one or two cases a normal, living fetus, but only where the portion of the placenta involved in the hydatidiform change was at a distance from the umbilical insertion.

Of the histologic changes found in hydatidiform mole, we need mention only two:

(1) Marked edema of the chorionic villi with absence of fetal blood vessels.

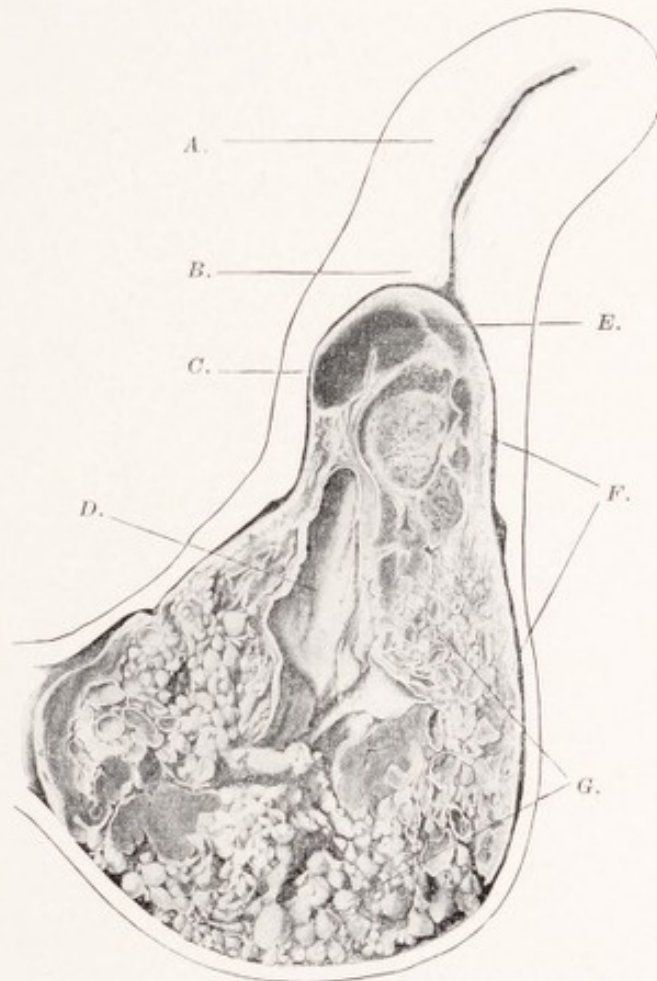


Fig. 113.—Hydatidiform mole in process of expulsion from the uterus. (Bumm.)
A. Uterine body. B. Internal os. C. Cervix. D. Amniotic cavity. E. Blood coagulum. F. Fibrinous capsule. G. Grapelike swollen villi of chorion.

(2) Exuberant proliferation of the syncytium and Langhans cells showing a tendency to invade the maternal tissues and superficial blood vessels (Fig. 114).

The prognosis and treatment of hydatidiform moles vary greatly in the individual case and in the experience of various gynecologists. At one time Schauta recommended that in every case where such a mole had been expelled, we should proceed to remove the uterus as soon as possible in order to prevent the development of that most fatal type of malignancy, chorio-epithelioma. The development of

the pregnancy tests has placed in our hands a yardstick for measuring the malignancy of these cases that is of the greatest value. While we must be guided by our clinical experience, as well as by laboratory tests, we have learned to value the latter very highly in setting the indications for treatment in hydatidiform mole. If the pregnancy test remains positive after the expulsion of the mole for a period of several months, we are justified in the assumption that actively pro-



Fig. 114.—Microscopic section of hydatidiform mole, showing swollen connective tissue of the chorionic villi and marked proliferation of the trophoblast.

liferating fetal epithelium has been retained, and hence that a curettement, or immediate hysterectomy, is justified. By the routine use of this pregnancy test after cases of hydatidiform mole, we can make possible the earlier recognition of chorio-epithelioma. Since some cases of chorio-epithelioma develop after abortion, more particularly after missed abortion, it would seem wise to do an Aschheim-Zondek test after a lapse of one or two months, especially in those cases where there is a slight vesicular change in the membranes.

In the immediate treatment of these cases of hydatidiform mole, a profuse hemorrhage, the absence of cervical dilatation, and the not infrequent invasion of the uterine wall by the mole itself, make its removal a matter of considerable difficulty. This can best be accomplished by operating under local anesthesia with the addition of an intra-uterine hypodermic of infundin to control the bleeding. The uterine cavity can be emptied by the combined use of the finger, the sponge forceps, and the blunt curette. A preliminary blood transfusion will often be advisable.

CHAPTER XVIII

SEQUELAE OF ABORTION

THE IMMEDIATE and serious complications attending spontaneous and induced abortion are discussed in earlier chapters. There are, however, more remote consequences that also have a harmful effect upon the mother's health. As is to be expected, these sequelae are more common after the infected, induced abortion than after spontaneous interruptions that run a normal course.

Ter-Gabrielian made an interesting analysis of 1,120 women in Russia who had had abortions. Of this number, 844 had legalized induced abortions, 197 had illegal abortions, and 79 had spontaneous abortions. Of the total number, 15 per cent were primiparae and 85 per cent multiparae. The primiparae were more frequent in the illegal induced group. The percentages of early and late complications in the three groups were as follows:

COMPLICATIONS	SPONTANEOUS	INDUCED	
		LEGAL	ILLEGAL
None	75	43	45
Immediate	6	18	9
Early	7	11	34
Late	12	28	12

From this, it is evident that late complications occur most frequently in the legally induced group, and early complications in the illegally induced. Furthermore, spontaneous abortions have complications in one-quarter of the cases, as compared with more than half in the induced. Early complications include hemorrhage, anemia and infection. Under late complications we have conditions such as menstrual disturbances, sterility, tendency to repeated abortions, and various neurasthenias.

These harmful effects are not infrequently due to improper treatment by the physician. Under this head must be mentioned, in the first place, too vigorous a curettement. Zomakion discusses 24 cases out of 81 curetted abortions, in which he noted the following sequelae:

- (1) Habitual abortion.
- (2) Irregular menstruation.
- (3) Relative and absolute sterility.
- (4) Oligomenorrhea with marked menstrual molimina.

These complications are due, in part, to the removal of excessive amounts of uterine mucosa including at times bits of muscularis; in part, to injuries of the cervical canal produced by brusque methods of dilatation. Too vigorous curettement is particularly apt to produce bad results in primigravidae.

The most frequent sequelae are those found in the pelvic organs. P. P. Müller cites a case of atresia of the cervix so pronounced as to lead to a hematometra. After dilating the stricture, the blood escaped from the uterine cavity, and the patient was relieved. Serious cauterizing effects upon the uterine wall were noted by Welsch in consequence of the injection of Leunbach's paste to induce abortion. A hysterectomy was done nine weeks after this paste had been injected, and Welsch found at that time extensive necrosis and destruction of the uterine mucosa with some deeper penetration into the muscular coat. The reason for this action is that soap is an important constituent of all such commercial pastes or salves. Within the uterus, soap disintegrates into fatty acids and caustic soda, and the latter produces a deeply cauterizing effect.

Anufrief points out that postoperative supervision should be continued for at least three weeks after abortion. Incomplete regeneration of the endometrium and the presence of necrotic placental material open the road to infection; sterility and chronic pelvic infection frequently result. Hence, a longer stay in the hospital after curettement is desirable.

Salpingitis is a frequent accompaniment of infected abortion. The severe forms of tubal abscess are rare, but the milder lesions associated with adhesions are quite common. In Russia, since the days of legalized abortion, special attention has been paid to cervical infections. Operative intervention has been delayed whenever these were present, because of the frequency with which a tubal or general infection results from such procedures. Gross reports that in 200 infected abortions at Leipzig, 21 per cent were followed by infection of the tubes and ovaries. Only one-third of these infections were due to gonorrhea, the remainder to the ordinary septic organisms.

Mild inflammatory lesions in the tubes do not completely occlude the lumen but, through agglutination of folds, form pockets in which the impregnated ovum may become lodged and so predispose to ectopic pregnancy. We find, therefore, a marked increase in the number of such tubal gestations following induced abortion, which in Russia has caused the Government to increase its efforts to restrict even legalized abortion.

Sterility naturally follows in a large number of cases, due to the pelvic and tubal adhesions of infected abortions. I. C. Rubin, comparing 219 induced abortions with 239 spontaneous ones, found that the former were far more frequently followed by sterility. With the increasing number of abortions, the chances for sterility are also increased. Wojtulewicz found 9 per cent sterility after one abortion, compared with 18 per cent after more than one. A different opinion on this subject is expressed by Vögel, who found that the number of births per years married was the same, whether the women had had children only, or had had both children and abortions. The majority evidence, however, points to increase of sterility, the cause of which may be due to uterine atrophy, cystic ovaries and endocrine disturbances, as well as to a chronic salpingitis, as pointed out by Serdukoff.

Interesting observations have been made in Professor Braude's clinic in Moscow on *cholesterin metabolism* in connection with artificial abortion. Kogan, Lewenson, and Libin made four cholesterin determinations in each of sixty cases of artificial abortion, two before operation, one four days later, and the fourth fourteen days later. The highest cholesterin figures were obtained in the group of primiparae, and in the multiparae with moderate toxemia. In cases of amenorrhea, just as high an amount of cholesterin retention in the blood was noted as in toxic types of pregnancy. These investigators showed a definite relationship between abnormal ovarian function and cholesterin retention in the blood. The sudden drop in cholesterin content on the fourth and fourteenth days after operation points in their opinion to marked disturbance of metabolism following artificial abortion.

Other blood changes have been investigated by Russian observers. Golubein studied the blood in thirty healthy, pregnant women, in whom abortion was induced; specimens being taken before operation, several hours after operation, on the fourth postoperative day, and on the eighth to the twenty-first postoperative day. The hemoglobin was usually unchanged or slightly increased, the number of red cells unchanged, and the white cells temporarily raised to 10,000 in the first few hours. Libin, who collaborated in this work, found that in 77 per cent the precipitation time was *increased* for four days after operation before returning to normal. In 14 per cent, the precipitation time remained short even in the absence of fever, although these cases all showed bloody discharge and painful adnexa. The coagulation time was unaffected by induced abortion.

Abnormal menstrual flow was observed in 28 out of 63 women who had aborted, according to the studies of Nicholson. Two-thirds of

these had a prolonged flow; one-third a shortened flow. Nicholson attributes these changes to alteration of ovarian function by abortion. In a few instances the pathologic changes in the genital tract are not sufficient to prevent conception, but interfere with the proper development of the ovum and so tend to habitual abortion.

Complications in subsequent childbirth are among the most serious after-results of abortion, more particularly infected induced abortion. Lankowitz comparing the labors of 1,722 primiparae without previous abortions with the labors of 661 primiparae who had had one or more artificial abortions, finds that the latter are more prolonged and difficult, with a higher fetal mortality. A similar comparison made by Klein in Germany showed that adherent placenta, delayed expulsion of the placenta, inertia of the uterus, faulty presentation of the child, placenta praevia and postpartum hemorrhage were from two to nine times more frequent in women with previous abortions. Further evidence is presented by Bronnikowa, who compared 717 primiparae without abortion to 653 primiparae with one or more previous abortions, and found that labor was on the average seven hours longer, forceps more frequently applied and adherent placenta a common sequela. Placental abnormalities are particularly to be dreaded. Azleckij found adherent placenta in 6 per cent of 1,337 post-abortion confinements, whereas the average incidence for all 4,278 pregnancies studied was only 2.5 per cent. Out of the total of 110 manual removals of the placenta done in this series, 83 were in the post-abortive group, while in the group that had had no abortions, manual removal was required only 27 times, or less than one per cent. We should mention also the report of Ritala, from Finland, who studied 856 cases, 406 of which had had abortions at one to three months' gestation. A prolongation of labor was noted in those with previous abortions. This occurred primarily in the first stage (20 to 25 hours) and was due, in Ritala's opinion, to rigidity of the cervix produced by post-abortive infection.

One voice alone is raised to contradict these statements. Atzerodt, comparing 3,964 births without previous abortion to 184 births with previous abortion, finds the latter if anything more free from complications. His post-abortive cases are, however, too few to controvert the evidence of other men. Atzerodt believes bad technique is more responsible for such complications than the abortion itself. This opinion is also expressed in Japanese literature by Ogawa, who does not, however, give exact figures as evidence.

That there is a mental as well as a physical strain attendant upon the illegal induction of an abortion is to be expected. The fear of prosecution by the law, the moral conflicts involved, and the anxiety as to the outcome of the operation, all result in a mental strain, which

in a pregnant woman with lowered nervous resistance may end in a true psychosis. Not only is the immediate psychic state to be dreaded, but in the practice of the neurologist and psychiatrist many a mental case, after careful analysis, will be shown to date back to the terrifying experience of an induced abortion. To take a few examples from recent literature, Kankeleit relates the story of a woman who was suddenly seized with vomiting and a choking sensation after seeing her child lying in bed, apparently dead. Hypnotic suggestion gave temporary relief, but cure was effected only after the mother confessed that ever since she had produced an abortion two months previously she had been in constant fear of prosecution and punishment.

An antipathy to her children amounting to a psychosis was the result of an illegal abortion in the patient treated by Timm, and was relieved only by psychoanalysis and psychotherapy. The mother, whose record is given by Flesch, had had three pregnancies in five years. When pregnant the fourth time, she produced an abortion, which was followed by melancholia due to the fear of prosecution.

Edelberg and Galant describe as psychosis after therapeutic abortion several cases of psychogenic-depressive reaction, some of which were followed by a hystero-epilepsy. They raise the question of the value of such a therapeutic abortion done for mental disease. I was forced to a similar conclusion from a recent experience in my own practice: this patient developed a puerperal psychosis after her first pregnancy, which confined her to a sanitarium for seven months. Marital conflicts ensued which delayed her mental recovery. A second pregnancy three years later, whose legitimacy was questionable, brought up new conflicts. Consultation with a neurologist convinced me that a therapeutic abortion might conceivably head off impending psychosis, and that this was further justified by her irresponsibility for maternal duties. This was done without complication, but two months later a maniacal state developed, from which she has not yet fully recovered.

A rare but interesting sequela to illegal abortion, due probably to the unclean instruments occasionally employed, is the development of *pelvic actinomycosis*. Bax cites the case of a chronic pelvic infection following induced abortion, which after a year and a half led to an abscess containing typical ray-fungus nodes. The patient died six months later of pneumonia, and several encapsulated abscesses were found in the abdominal cavity at autopsy, all of which showed actinomycotic kernels. A similar history, with death from actinomycosis ten months after abortion, is recorded by Haselhorst. A posterior perforation of the cervix into the cul-de-sac was apparently the method of implantation of the specific organism in this patient.

CHAPTER XIX

INDICATIONS FOR THERAPEUTIC ABORTION

IN THE CHAPTER on "History of Abortion" attention was called to the practice in ancient times of therapeutic abortion to save the life of the mother, and to the fact that one Greek school of philosophy gave serious consideration to the eugenic indications. In the early Christian era, toward the end of the fourth century, a leading physician, Priscianus, recommended abortion to save the life of the mother. As the influence of the Roman Church became more widespread, physicians were threatened with "eternal punishment" for taking the life of the unborn child and after the tenth century medical treatises contain no mention of this subject, nor was the question reopened for discussion, until the beginning of the eighteenth century, and even then no note was taken of these occasional papers until William Cooper in 1772, speaking of the bad results of Cesarean section in cases of contracted pelvis, stated: "In such cases, where it is certainly known that a mature child cannot possibly be delivered in the ordinary way alive, would it not be consistent with reason and conscience, for the preservation of the mother, as soon as it conveniently can be done, by artificial modus to attempt to produce an abortion?"

American physicians were also liberal in their viewpoint. Dewees in 1843 quotes with approval Alfred Velpeau who had said:

"For my own part, I confess I cannot possibly balance the life of a foetus of three, four, five, or six months, a being which so far scarcely differs from a plant, and is bound by no tie to the external world, against that of an adult woman whom a thousand social ties engage us to save; so that, in a case of extreme contraction, if it were mathematically demonstrated that delivery at full term would be impossible, I would not hesitate to recommend abortion in the first months of gestation." (From "Complete Treatise in Midwifery," Meigs Translation, 1852, p. 530.)

Hodge in his "Principles and Practice of Obstetrics," while decrying criminal abortion (p. 301) as "one of those unnatural and horrible violations of human and divine law which cannot be too severely stigmatized and deserves condign punishment," still advised induction of abortion in cases of contracted pelvis where a viable child cannot be born. The objection raised by Merriman and others that this might

lead to abuse, he says, cannot be entertained, "for such objections apply to all operations in surgery, and we cannot argue against the use of a good agent because it may be abused. Neither should it be regarded as an objection that the accoucheur may be requested to induce abortion in the same woman in several successive pregnancies; for he cannot allow the female to perish under his eye when the means of preserving her life is in his power."

In England and France many obstetricians accepted this suggestion, but in Germany it was not until the beginning of the nineteenth century that Kiwisch, Scanzoni and others came out in favor of therapeutic abortion. During the latter half of the nineteenth century the indications, especially in Germany, were extended to include tuberculosis, heart disease, nephritis and certain forms of psychosis, and in the present century, particularly since the World War, there has been an increasing tendency to extend the indications to eugenic and social-economic factors. The literature in this field is enormous and increasing yearly.

GENERAL INDICATIONS

As to the general principles which should guide us in determining the question of whether or not a woman should be aborted, there is bound to be some difference of opinion among physicians. A discussion of this sort in order to be scientific must be non-sectarian. Every church, whether it be Christian, Jewish, Mohammedan or Buddhist, that tries to regulate human conduct contrary to the laws of health set up by medical science must eventually meet with failure. The recent edict from Rome (Papal Encyclical, 1931) on the subject of abortion limits the freedom of the Catholic practitioner and laity more sharply than ever before. In practice, however, these strict regulations are not always rigidly enforced.

In general one might say that since the World War there have been two movements running counter to each other. On the one hand physicians have declared with increased evidence that certain maternal conditions such as tuberculosis, heart disease, pernicious vomiting, etc., did not require therapeutic abortion as often as reports in previous decades would seem to have indicated. The voice of this conservative group has been worded by Winter as: "Not a single abortion too many and not a single one too few." In other words, unless something were reasonably sure to be gained in the health of the mother, the life of the child was not to be sacrificed.

The other group, represented by such men as Max Hirsch, are trying rather to extend the indications for therapeutic abortion, particu-

larly among the poor and ignorant by whom contraceptive measures are usually inadequately employed. The disastrous social-economic consequences of the War, necessitating the limitation of offspring at all hazards, have led a group of honest and well-meaning physicians to advocate an extension of therapeutic indications to eugenic factors, to general debility, poverty and excessively large families. Some have even gone so far as to advocate the Soviet system of legalized abortion when desired by the mother, as better than the old *laissez faire* policy. The bulk of the profession, however, is at present definitely opposed to any such far-reaching extension of indications, and in Russia, there is an ever increasing effort to reduce the practice, since at best it subjects the woman to some immediate danger and ultimately to the risk of considerable physical deterioration.

In general we may divide the indications for interrupting pregnancy into those applying when the fetus is dead, and those when it is living. In the former group the indication is certain and there can be little argument except as to the best time for interference. Where the fetus is living, we must distinguish between absolute indications, involving an immediate threat to the life of the mother, and relative indications involving serious danger or harm to her health, even though this may not eventuate until some years later.

If therapeutic abortion were limited to those cases where the life of the mother was certainly and immediately imperiled, the number of such abortions would be exceedingly small, and unfortunately they would in many instances be done too late to save her life. It is fortunate therefore that the law in most civilized countries permits therapeutic abortion on the basis not alone of immediate threat to the life, but also of serious danger to the health of the mother. Leading gynecologists, such as Labhardt and Küstner, strongly favor a limitation of indications to medical conditions. In the 1932 edition of their monograph "Künstlicher Abort," Winter and Naujoks emphasize that the final decision on indications must rest with the obstetrician; purely social indications are to be banned, but social factors associated with medical conditions demand careful consideration; ignorance of hereditary factors makes eugenic reasons for abortion only exceptionally permissible. Fairbairn writes cynically of the women in England who favor social indications: "They would die—or would have us believe so—if they produced families half the size of their grandmothers'."

The minor indications for therapeutic abortion give rise to the greatest differences of opinion, according to Whitehouse, who enumerates a wide range of conditions that have been claimed as justifying interruption: (1) very recent pregnancy; (2) general debility

with loss of weight; (3) after suppurative appendicitis that has produced extensive adhesions; (4) after a previous Cesarean operation; (5) to prevent increasing prolapse of the pelvic organs; (6) after plastic repair of the pelvic floor to prevent a recurrence; (7) eugenic reasons such as birth of a defective child or parental feeble-mindedness; (8) suicidal tendencies; (9) economic reasons in women of high fertility; (10) previous postpartum infection; (11) co-existing malignant disease; (12) necessity of travel to remote regions where pregnancy cannot be properly cared for.

In some countries, however, such as *Austria* and *Czechoslovakia*, there is a tendency to permit greater freedom for induction of abortion. In *Czechoslovakia*, according to Von Hentig, the indications include not only: (1) danger to the life or health of the mother; but (2) rape or punishable intercourse with girls under sixteen; (3) danger of serious mental or physical disease in the child; (4) if the mother has already three living children of her own, or has had five deliveries, and if on account of external conditions more children cannot be reared properly.

In *Italy*, under the domination of Mussolini, there has been a strong movement to reduce the number of therapeutic abortions to a minimum. At the Italian Congress on Gynecology and Obstetrics in 1932, Professor Cova discussed the medical indications for the interruption of pregnancy, doubtless influenced by the prevailing Italian point of view. He made sweeping statements to the effect that improvement in medical service has reduced the indications to a minimum: tuberculosis no longer requires interruption of pregnancy. In hyperemesis, goiter and cardiac disease, abortion may be justified, but only rarely. Chronic nephritis constitutes a real danger and is an indication for interference with the pregnancy. In chorea, psychosis, and various nervous diseases, a pregnancy can usually go to term without endangering the patient. In cancer of the uterus, Cova considered radium treatment preferable to hysterectomy, as it permits a continuation of gestation (quite discounting the danger of congenital deformities). In closing he said that, whatever the indications may be, therapeutic abortion always constitutes a failure of medical science. We must do our best, he declares, to see to it that in the future it may be entirely abolished.

Of considerable interest in connection with the general indication for interruption of pregnancy was the questionnaire on therapeutic abortion sent out in 1930, to 1,266 doctors in Hamburg of whom 880 (70 per cent) answered. No signature was required by the physician but usually this was given. Only 66, or 5 per cent, favored removing

altogether the restriction on abortion to medical indications; and while 60 per cent opposed any interrupting for economic or social indications alone, on the other hand 75 per cent favored giving social factors due consideration in weighing the medical indications. The interruption of pregnancy in girls under sixteen years of age was favored by 58 per cent, and 42 per cent were against it; in the presence of four or more children the vote stood 32 favorable, 16 conditional, and 52 opposed. On the question of aborting women who became pregnant after they were 40 years of age, the vote stood 44 per cent favorable, 56 per cent opposed. The conservatism of the German medical profession is sufficiently manifest by this vote.

A similar report on a smaller scale was made in 1930 by J. C. Ayres from a questionnaire sent to 62 obstetricians living in the southern United States. Indications for therapeutic abortion were denied in most instances:

	Yes	No
For social reasons to prevent disgrace.....	10	51
For economic reasons, poverty.....	6	56
For health reasons (life not involved).....	22	37
To save the mother's life.....	61	1
In cases of rape.....	36	20
For dominant hereditary taint in both parents.....	21	34

Frequency.—Statistics, which are available in largest numbers from German sources, indicate a steady growth in the percentage of cases demanding therapeutic abortion. Twenty years ago Fritsch reported only one therapeutic abortion in 10,000 pregnancies, Ahlfeld one in 25,000, and Winkel as low as one in 100,000. But in these same clinics at the present time the ratio of therapeutic abortions to pregnancies is about one in 1,000, and in some clinics even as high as one in 400 pregnancies.

Of the conditions justifying this procedure tuberculosis still remains by far the most frequent cause. Out of 100 therapeutic abortions done by Goldschmidt in Breslau the indication in 81 cases was tuberculosis of the lungs; in 3 cases, laryngeal tuberculosis; in 11 cases, heart disease; and in 3 cases contracted pelvis. Naujoks has tabulated the therapeutic abortions from Königsberg in 1917, Giessen in 1920, Munich in 1925, and Frankfurt in 1925. He found that out of a total of 287 therapeutic abortions, 209 were done for tuberculosis of the lungs, or larynx, 34 for heart disease, 15 for kidney disease, 14 for psychosis, 9 for hyperemesis and 6 for contracted pelvis.

Pawlova cited the indications in 25 cases as tuberculosis 15 times, heart disease 4 times, blindness twice, nephritis once, and miscellaneous 3 times. Superbi reports 15 out of 22 cases of therapeutic abortion done for tuberculosis. In Rome, S. Russo reported the causes of 281

therapeutic abortions in 29,501 pregnancies. The percentage distribution was: for tuberculosis, 38; for nephritis, heart disease and toxemia, each 10; pyelitis, 0.5; and all other indications, about 30. The indications in 162 cases analyzed by Spitzer in Prague were: tuberculosis 87, heart disease 23, psycho-neurologic conditions 13; pregnancy toxemia 10; eye diseases 7; asthma 5; endocrine disorders 9; various other diseases 8.

The improved treatment of hyperemesis has reduced considerably the frequency of interruption for this condition. Out of 69 cases Heynemann was compelled to abort only three. W. J. Dieckmann and R. J. Crossen, Washington University, St. Louis, reported that, whereas from 1917-1921 there were 6 therapeutic abortions in 11 cases of hyperemesis, from 1921-1927, 48 cases of hyperemesis had been treated, with intravenous glucose administration without the necessity of a single abortion. Additional figures on frequency will be found under the head of special indications. In the following summary these reports are listed, showing that tuberculosis was the indication in 54 per cent of the women.

INDICATIONS FOR THERAPEUTIC ABORTION

REPORTED BY	TOTAL	TUBER- CU- LOSIS	HEART	KIDNEY	HYPER- EMESIS	NERVOUS AND MENTAL	CON- TRACTED PELVIS	OTHERS
Goldschmidt	100	84	11				3	2
Naujoks	287	209	34	15	9	14	6	
Pawlova	25	15	4	1		2		3
Superbi	22	15						7
Russo	100	38	10	10				42
Spitzer	162	87	23	10		20		22
	496	268	82	36	9	36	9	76

Group Indications

I have in part followed Winter's analysis of the indications for therapeutic abortion with certain minor changes evident from the following outline. The two main groups are differentiated according to whether the fetus is dead or still living.

A. *Dead fetus.* (mole, missed abortion)

B. *Living fetus*

- (1) Diseases of the ovum
- (2) Pregnancy toxemias
- (3) Complications at labor
- (4) Diseases of the genital tract
- (5) Systemic diseases (tuberculosis, heart disease, kidney, blood, skin, syphilis)
- (6) Endocrine diseases

- (7) Diseases of the nervous system, organic and functional
- (8) Diseases of special organs (eye and ear)
- (9) Other unclassified diseases
- (10) Rape
- (11) Eugenic factors (hereditary disease, insanity, epilepsy)
- (12) Social-economic indications.

A. DEAD FETUS

There is some room for argument as to whether the emptying of the uterus in case of the death of the fetus is properly to be designated by the term of therapeutic abortion. While in the large majority of cases the ovisac will be expelled spontaneously within a few weeks after the death of the fetus, there is nevertheless a notable number in which this does not come to pass unaided. The number of cases of missed abortion is quite considerable, and if greater attention is paid to the history, it will repeatedly be found that the development of the ovum does not correspond to the duration of the pregnancy. In cases of hematoma or Breus mole the ovisac may be retained as long as fourteen months.

The Aschheim-Zondek test is of great help in establishing the diagnosis of fetal death. It has been definitely found that anywhere from seven to ten days after fetal death a test which was previously positive becomes negative, unless the fetal membranes continue to grow because of some pathological condition, such as hydatid mole.

Occasionally there may be irregular uterine bleeding with a few cramplike pains, but without expulsion of the ovisac. In other cases the woman has been told that her child has ceased to develop and is insistent upon the evacuation of the uterus as quickly as possible. The physician while justified in taking measures to bring on an expulsion of the ovum, is not justified in the use of measures likely to prove dangerous to the woman in any degree. It should be remembered in this connection that a uterine muscle, so sluggish as not to expel its contents spontaneously, is apt to require more than the usual amount of medical and mechanical stimulation to react as desired.

B. LIVING FETUS

(1) Diseases of the Ovum

These can be grouped under four heads: Hydatid mole; placental hemorrhage in the first half of pregnancy; hydramnios; and injuries to the fetus from x-ray or radium.

Hydatid mole will in almost all instances be associated with fetal death, but in the presence of a positive Aschheim-Zondek this cannot readily be determined. The diagnosis, resting on bleeding during the first months of pregnancy, associated with rapid growth of the uterus, can be made positively even without the passage of the typical grape-like bodies. In view of the relatively high incidence of chorioepithelioma following this mole, its treatment as a premalignant condition is justified and hence steps should be taken to empty the uterus at the earliest possible moment after the diagnosis has been established. It should, however, be kept in mind that the dangers both of infection and perforation are greater than in the case of an ordinary abortion. There is little difference of opinion as to the indication in such a case.

More dubious are other conditions that produce bleeding during pregnancy, since in many instances its cause is undetermined. In a certain number bleeding will be found to be due to a low position of the placenta (*placenta praevia*), in other instances it is probably traumatic. External causes such as cervical polyp or carcinoma must be excluded, and only when the uterine bleeding has progressed to the degree of producing some anemia are we justified in active interference by abortion. If a negative Aschheim-Zondek points finally to fetal death, a prompt evacuation of the uterus is indicated to check the bleeding. Winter states that if the hemoglobin index has dropped below 50 per cent, interruption of pregnancy is permissible.

Hydramnios will not often be a factor in justifying abortion in the first half of pregnancy. Between the fifth and seventh month, however, the acute form of hydramnios associated almost entirely with multiple pregnancy may give rise to such rapid distention of the abdomen that it would not be safe to permit the pregnancy to continue. Gyulai reports an interesting case of quadruplets of four months' gestation in which there was a sudden increase in the size of the uterus with circulatory upset which did not improve under rest and required therapeutic abortion for its relief. The four fetuses in this case were all in one chorion. More frequently these cases develop after viability of the fetus and therefore need no consideration here.

Injury from Radiation.—As the use of radium and x-ray in large doses for the treatment of cancer and myoma becomes more common, we are faced with a new indication for the interruption of pregnancy. The object here is not so much to help the mother as to prevent the birth of a microcephalic idiot or other monstrosity. The careful analysis of Murphy brings convincing evidence of serious fetal injury following in a large proportion of cases that are subjected to exten-

sive *pelvic* radiation during early pregnancy. Indeed the fact of this injury is taken advantage of in the nonsurgical method of abortion by x-ray in early pregnancy. It is therefore claimed that whenever, by mistake or necessity, a pregnant uterus has been subjected to heavy radiation, it is unwise to permit the child to continue development as it is reasonably certain to turn out to be an idiot or deformed. This is one of the most positive of the eugenic indications and might perhaps be grouped under that head, although it has seemed to me rather a direct injury to the ovum. A few voices have been raised against this viewpoint, as E. Sachs, who believes that the possibility of malformation does not justify abortion after x-ray any more than the possibility of inherited taint in alcoholic parents justifies it. The consensus of opinion, however, is that if a radium treatment of over 1,500 milligram hours, or its equivalent in x-ray, has been applied to the *pelvic organs* within the first five months of gestation, the assumption of serious fetal damage is so great that the pregnancy should be terminated.

(2) Pregnancy Toxemias

Pregnancy toxemias are an important group with varying manifestations that not infrequently require abortion to serve the best interests of the mother. They include hyperemesis, chorea, acute yellow atrophy of the liver, and preeclamptic toxemia. The first three conditions are usually found in the first half of pregnancy when interruption would be of some benefit; but preeclamptic toxemia can ordinarily be treated conservatively, and only in rare instances will an interruption of pregnancy before viability be justified.

Hyperemesis is so important a complication that it deserves special consideration. According to Williams, we must distinguish between a *reflex* or *neurotic* type, and a *toxic* type of hyperemesis. The former is usually mild and can be corrected by various simple measures. Only occasionally in obstinate reflex-neurotic cases do we find that prolonged starvation produces changes in metabolism resulting in a true toxemia. The toxic form, particularly if it has been permitted to gain headway without treatment for some time, presents a very different clinical picture. The loss in weight is rapid as the patient is unable to retain any food by mouth. Repeated enemata of glucose and the intravenous administration of glucose solution in large amounts will as a rule result in gradual improvement of the patient's condition. All such patients should, of course, be hospitalized, if the desired result is to be obtained. The experience of all large clinics has been that, if the case is admitted early and glycogen balance restored

promptly, no serious damage is done, and abortion will not ordinarily be indicated. It is for this reason that we find relatively far fewer cases of hyperemesis requiring abortion in the large maternity institutions than in the average run of private practice. Furthermore, there is no doubt that a considerable number of cases are aborted that would not have required such radical measures, had they been placed in suitable institutions under the latest treatment for this condition.

On the other hand the attempt to be conservative, and to limit therapeutic intervention to the really serious cases, can be carried too far, as is shown in recent reports from many large clinics.

There is considerable variation in the frequency with which this indication has been set. Heynemann in 69 cases of pronounced hyperemesis at Hamburg and Halle was compelled to resort to therapeutic abortion only three times, all patients surviving. Benthin in 68 cases resorted to abortion fifteen times with several deaths; and he also cites a case in which abortion had to be repeated seven times in the same woman for hyperemesis. Davidson at the maternity hospital in Edinburgh between 1923 and 1927 did 18 therapeutic abortions for hyperemesis with 8 deaths.

The difficulty lies in deciding just when the abortion is positively indicated. A delay of one or two days at this point may be very vital to the patient. Naujoks has recently directed attention to the significant clinical and laboratory findings upon which this decision must rest. There is a general agreement that mere loss in weight, even up to twenty or twenty-five pounds, does not justify interference. Nor can the presence of a rapid pulse, a dry tongue and fetid breath be considered as definitely dangerous symptoms. All of these may clear up rapidly in a few days under treatment with sedatives, rest in bed and glucose intravenously.

Winter has stressed the following symptoms: (1) irregular pulse; (2) elevation of temperature to 39° C. (102° F.) or more; (3) albuminuria; (4) cerebral symptoms such as restlessness, mental hebetude, or semi-coma; (5) icterus of light degree; and (6) disturbances of general physical condition, as shown by prostration, fainting, collapse. Benthin emphasizes the cessation of vomiting with rapid pulse and elevated temperature, especially if associated with restlessness, as an ominous sign. Frey considers Winter's indications too wide, and as a result of certain laboratory tests has been able to reduce the number of cases requiring abortion. On the other hand Rupp stresses the fact that in a number of cases proceeding fairly normally, there may be a sudden exacerbation of the vomiting so severe that in spite of immediate abortion the patient cannot be saved. Gauss emphasizes

albuminuria and cylindruria as alarming signs of kidney destruction. In our own recent observations at the Saint Louis Maternity Hospital, neuritis, optic neuritis and psychic disturbances indicating progressive toxemia have been occasionally noted, and these have served as an indication for therapeutic abortion.

Heynemann and Naujoks call attention to the importance of certain laboratory tests, in addition to the general clinical picture, as a basis for arriving at a decision. The presence of large amounts of ketone in the blood demands serious consideration. Less important are the liver function tests which are made complex by pregnancy metabolism. Of considerable value is the bilirubin test. Heynemann finds that increase of bilirubin in the blood up to 2 milligram per cent makes a very serious prognosis for the patient and should justify interference, if corroborated by the clinical picture. Recently Somaghi has simplified the determination of blood diastase as an index of liver damage. It may prove of great value.

To summarize then, therapeutic abortion is indicated in hyperemesis in the presence of temperature elevation, 1+ albumin with casts (if urine has been normal before), an irregular rapid pulse with pronounced prostration, or pronounced toxic symptoms in the nervous system such as optic neuritis, polyneuritis and psychic manifestations. If the patient has been under the recognized treatment for her hyperemesis and such symptoms do not clear up promptly it is better not to delay the interruption of pregnancy. Even so, it should not prove necessary to interfere in over 5 to 8 per cent of the severe cases of hyperemesis, provided the patient can be hospitalized or be under skilled care at home.

Chorea.—Chorea of pregnancy appears in two different forms; one as a recurrence of chorea in childhood, and the other appearing for the first time during pregnancy. The recurrence of a pre-existing chorea is brought about by the increased irritability of the nervous system in the pregnant woman. We usually do not find serious complications in this form, and an interruption of pregnancy is therefore rarely indicated.

The other form is definitely toxic in origin and has a bad prognosis. Pineles found about 17 per cent maternal mortality in these cases. The greatest danger exists from an extension of the twitching to the muscles of the esophagus and the trachea, thereby producing an inspiration pneumonia. Complication with cardiac decompensation and psychosis also gives a bad prognosis. These complications justify interruption of pregnancy as do also those presenting definite indications of toxemia. Winter also advised interruption of pregnancy

where chorea has existed in previous pregnancies and recurs a second time. Even interruption of pregnancy does not give relief in more than a small percentage of cases. According to Pineles there were 27 deaths among 55 women upon whom therapeutic abortion had been done for a severe chorea.

Icterus.—Acute yellow atrophy of the liver according to Levy-Lenz occurs in the first months of pregnancy and presents very serious symptoms. Tenderness over the liver, a reduction in size of this organ, intense icterus, with the onset of mental derangement, justifies immediate intervention. It is better to abort before such serious symptoms have developed. Prolonged icterus in the first half of pregnancy requires careful observation and in case of positive findings of hyperbilirubinemia requires therapeutic abortion to save the life of the mother.

Nephropathy.—Under the head of nephropathy, edema of pregnancy, and eclampsia, are to be grouped cases in which the kidney function is so seriously disturbed that interruption of pregnancy is often indicated. Since, however, the vast majority of these cases do not arise in the first half of pregnancy their consideration under the head of therapeutic abortion can be dismissed with relatively few words. *Edema* in itself does not justify interruption, nor does the presence of albumin and casts. More serious are such complications as premature *detachment* of the *placenta*, and eye symptoms such as *amaurosis*, *retinitis albuminurica* and *ablatio retinae*. If such symptoms present themselves from the fourth to the sixth month of pregnancy as occasionally happens, we are justified in almost every instance in promptly interrupting the gestation, without awaiting viability of the fetus. Where some kidney damage is left over from a preceding pregnancy an earlier interruption in the presence of kidney disease is often indicated. These cases will be given further consideration under the head of chronic nephritis.

(3) Complications of Labor

While the first therapeutic abortions were done for contracted pelvis, and while this indication persisted during the period when Cesarean section had a 20 to 30 per cent mortality, present conditions no longer justify this procedure. Winter puts the situation graphically in the following way: 100 Cesarean sections would have about 2 per cent maternal mortality and 3 to 5 per cent fetal mortality; 100 artificial abortions would have no per cent maternal mortality and 100 per cent fetal mortality. By artificial abortion, therefore, we

would sacrifice the lives of 95 children for the sake of saving 2 mothers. Practically without exception obstetricians would agree that this is not justified.

In place of therapeutic abortion, premature induction of labor has been advised in many cases where the mother's condition would make a laparotomy a more serious procedure. Henkel does not favor entirely discarding contracted pelvis as an indication for therapeutic abortion. He says that an occasional case complicated by unfavorable social conditions (large family, poverty, poor physical condition of mother) would seem to justify interference. In the case of tumors blocking the pelvis surgical intervention at the end of pregnancy is preferable to abortion. In those women in whom extreme narrowing of the vaginal canal or excessive scar tissue make a delivery dangerous, abortion would be contraindicated because of the difficulty of approach from below.

(4) Diseases of the Genital Tract

Malposition.—In certain types of misplacement of the uterus we may have the question of interruption of pregnancy put before us. With but very few exceptions the adherent retroverted uterus will loosen up in pregnancy so that with the assistance of certain vaginal manipulations the fundus can be lifted out of the hollow of the sacrum and the pregnancy permitted to proceed. In rare instances, however, the uterus is so densely adherent as to make this impossible. It is better to loosen such an incarcerated uterus by laparotomy from above than to proceed with the difficult and dangerous job of emptying a three or four months' pregnancy through a cervix whose position at this time would be high above the symphysis.

Somewhat different is the situation in those cases where a pregnancy has taken place, by reopening of tubes after attempted sterilization following an interposition operation. Here the uterus is in extreme ante flexion and the fundus, readily accessible from below, can be evacuated by an anterior hysterotomy. At the same time a high amputation of the uterus can be done from below to insure against further pregnancies.

Complete prolapse with its considerable danger of infection upward from the exposed cervix is an indication demanding serious consideration (Fig. 115). H. Beck favors interruption of pregnancy in many of these cases. Having personally lost a patient through such an infection of a pregnant prolapsed uterus I would be inclined to favor interruption whenever, in spite of prolonged bed rest, there is a recurrence of the prolapse.

Myoma.—The many complications attendant upon myoma of the uterus associated with pregnancy have led most men to proceed with a hysterectomy regardless of the pregnancy, whenever the tumors are large or so situated as to render the further progress of the pregnancy dangerous. Spontaneous abortion occurs in many of these cases, and through the increased tendency to hemorrhage and retained placenta, and the difficulty of access to the uterine cavity, the subsequent treatment is rendered difficult. A sacrifice of the uterus in the interest of the mother would, therefore, be justified in many instances (Fig. 116). At times, particularly if it be the first, and possibly the only, preg-



Fig. 115.—Prolapse of the pregnant uterus following rupture of the vesico-uterine septum. (Redrawn from Henkel: *Zentralbl. f. Gynäk.*, 1929.)

nancy after many years of married life a myomectomy with preservation of the uterus can be done. Therapeutic abortion alone is dangerous in a myomatous uterus and practically never indicated. A similar dictum applies to cases of cancer of the cervix complicated by pregnancy. Here therapeutic abortion would lead to considerable danger of infection of the placental site from the cancerous cervix. We must, therefore, proceed in these cases promptly with the treatment of the cancer by surgery or radium regardless of the existing pregnancy. Only very exceptionally where the cancer is not diagnosed until toward the last month or two of pregnancy, and is at that time too



Fig. 116.—Multiple myomata of the uterus complicated by pregnancy and requiring hysterectomy. (Kelly-Cullen: *Myoma of the Uterus*.)

far advanced for any hope of cure, is it permissible to await the termination of pregnancy by Porro-Cesarean section in the interest of the child.

Diseases of the adnexa are rarely complicated by pregnancy with the exception of ovarian tumors. These cases are usually handled by

surgical removal rather than by emptying the uterus so that they do not demand consideration in this chapter. Small retention cysts developing during pregnancy may be expected to resolve spontaneously. An ovarian dermoid with its danger of infection, a fibroid low in the uterus on the posterior surface, or otherwise threatening impaction or serious interference with labor is reason for interruption. The comparative risks should be stated to the family and the ultimate decision be theirs. A freely mobile ovarian cyst is quite prone to torsion of the pedicle after delivery, and its removal early in pregnancy may be desirable. The moderate-sized fibroids, located high, grow in pregnancy, but unless multiple and thus threatening postpartum hemorrhage, call only for watching.

Winter mentions a few rare cases of endometritis with persistent severe hemorrhage that may necessitate in a few instances emptying of the uterus in order to check the growing anemia. Most of these cases will, of course, abort spontaneously but should this for some reason not occur the emptying of the uterus would seem to be indicated.

(5) Systemic Diseases

Tuberculosis of the Lungs.—The most significant indication for therapeutic abortion in point of frequency, is tuberculosis of the lungs. The common observation that a tubercular process grew markedly worse in the course of a pregnancy and in the periods of the puerperium and lactation, led, at the beginning of this century, to the almost unanimous opinion that patients who showed any evidence of tuberculosis should be advised against pregnancy, and in the event of a gestation should be aborted without fail at the earliest possible moment. In the past three decades, however, more careful observations, and especially the reports from tuberculosis sanatoria, have greatly modified this viewpoint. At present there is general agreement that every case should be most carefully studied from all angles, social as well as medical, and that interference with the pregnancy is only justified in certain well-defined circumstances.

In the first place every patient should be studied closely for a period of three or four weeks. This consists of regular four-hour temperatures, frequent recording of weight, presence of tubercular bacilli in the sputum, general condition, as well as repeated physical examinations of the chest, to determine as accurately as possible whether the process is latent, active or progressive. Such observations are obviously not in the province of the obstetrician. He must call in for advice an internist or the family physician. Owing to the difficulties of accurate diagnosis, it will be better to seek the advice

of the former, wherever possible. Even trained specialists in tuberculosis will not always agree exactly as to the findings, but such occasional differences of opinion do not justify skepticism as to the value of their diagnosis. Obstetricians must rest their decisions largely on the reports rendered by their consulting internists. This does not mean that the obstetrician is to follow blindly their order to abort a patient. As I see it, the duty of the internist is to answer the following questions: (1) Has the patient tuberculosis? (2) Is this tubercular process latent, active or progressive? (3) Has the tubercular process in the course of the three or four weeks of observation and treatment shown a tendency to regress or advance?

With this evidence before him, and with a knowledge of the social circumstances of the particular case (poverty, number of children, possibility of sanatorium treatment), the obstetrician must decide in the light of our present experience whether to proceed with the abortion, to await further developments, or to let the pregnancy proceed to its termination. It is the duty of the obstetrician to know which group of cases should be left alone and which ones should be aborted. Many an internist may correctly diagnose the lesion but not be familiar with the indications for interference. In fact there is general complaint that the internist who does not appreciate the dangers and sequelae of instrumental abortion, is too apt to recommend it when there is no absolute necessity.

The gradual limitation of indications for interference has been partly the result of more accurate methods of diagnosis, partly due to improved methods of treatment, such as absolute rest in sanatorium and the use of artificial pneumothorax, and partly the outcome of a more careful follow-up of cases after abortion and after full-term pregnancy pointing to the questionable value of interference in many cases.

Latent cases of *tuberculosis* are generally regarded as not justifying interruption of pregnancy. While there is no absolute guarantee that a latent case will not from time to time flare up in a more active form, this will happen but rarely when the patient has been kept under close observation, and prophylactic rest and prompt treatment instituted on the first evidence of suspicious symptoms. Moreover, the abortion will in itself at times have an unfavorable influence on a latent tuberculous lesion.

The *apical* form is generally conceded to be more benign and hence amenable to treatment, so that in such lesions, according to Klemperer, Doederlein and others, abortion should not be performed.

In active manifest tuberculosis interruption is recommended by Winter, since six out of seven cases grow worse during pregnancy. Winter would advise abortion in every case of persistent fever definitely due to the tuberculosis, and in every woman whose sputum shows tubercle bacilli, but not in cases of weight loss or hemoptysis. Klemperer considers the early exudative type of tuberculosis and the presence of a cavity as suitable for therapeutic abortion. On the other hand, we have the extremely conservative view of Mayer and Menge who believe that no benefit is derived from abortion even in these cases, and that it should, therefore, only rarely be done. I doubt whether such an extreme position is justified, even though Schultze-Rhonhof from Menge's clinic, found that out of 44 cases of clinically manifest tuberculosis in which pregnancy was allowed to go to termination, subsequent observations over a period of five years showed 21 improved, 10 unchanged, 6 worse and 7 dead. Scherer also found that cases often did better when abortion was refused for some reason, than those cases upon whom it was done.

The bulk of evidence, however, points to a definite value of therapeutic abortion in active or progressive cases of tuberculosis. Thus Winter reports 167 therapeutic abortions before the sixteenth week with 145 favorable results (87 per cent). Kehrer saw improvement in 80 to 90 per cent. Cambiaso in Genoa found that while out of 105 tuberculous patients in which pregnancy was allowed to go to term 9 per cent were alive after 10 years, out of 85 cases in whom abortion was done 33 per cent were living. Norris and Murphy found 65 to 70 per cent improvement as a result of abortion.

In a study of the obstetric histories of 484 patients treated at the Trudeau Sanatorium, Matthews and Bryant (1931) found that of all women who became pregnant before "cure," 44 per cent noted that their lung condition was adversely affected by the pregnancy. In the 80 artificial abortions reported by these patients, no bad after-effects were noted. They conclude:

"(1) Pregnancy has a definitely deleterious effect on tuberculous women.

"(2) The more advanced the tuberculosis, the more deleterious the effect of pregnancy.

"(3) The women who took sufficient time before getting pregnant after being 'cured' (three years or more), and who obeyed all rules and regulations after leaving Trudeau, fared better than those who did not.

"(4) Out of the 579 children born, 556 are alive, and 501 are healthy and well. Fifty-five are below par, and only 9 of these have had tuberculosis in any form, or have been suspected.

"(5) Education of the patient in the care of herself as regards tuberculosis as well as pregnancy is of the utmost importance.

"(6) Finally, the whole subject is a difficult one; experiences differ, there are many opinions. To pursue the right one, doing justice to the mother, to the child, and to the other members of the family, demands most careful thought, the exercise of the keenest judgment. Sanatoriums, clinics, floating hospitals and rest homes have been provided for all ages and conditions of patients except pregnant women. Intelligent guidance through pregnancy, scientific supervision of the labor and puerperium, with proper care of the child and sanatorium treatment for the mother, should be the management of all such cases."

In a study made by Jennings, Mariette and Litzenberg of 27 tubercular women six months postpartum, it was noted that while one died and three became worse, the vast majority were not unfavorably affected. Those with minor lesions in the lungs were unharmed by pregnancy or labor. Hence, while advising against a pregnancy in tubercular women, the authors believe that when conception has occurred, such women can with due care and under favorable conditions be safely carried through their pregnancy.

In a recent discussion on the indications for therapeutic abortion in tuberculosis, Pottenger emphasized a study of factors such as cholesterol, calcium deficiency and absence of allergy reaction that might indicate decreased resistance to the disease. If the tuberculosis is active, and is discovered previous to the third month, and if the patient is unable to be kept under observation, he advises abortion.

Evidence is undisputed that if abortion is done early, it is less dangerous and the final result is more favorable than if done late. Thus Winter found that, while 87 per cent of 167 cases aborted between the second and fourth months showed improvement, only 51 per cent of 99 abortions between the fifth and seventh month and only 25 per cent of 36 inductions of labor from the eighth to tenth month showed favorable reaction. On the other hand, this should not be interpreted as demanding immediate intervention, for experience has shown that a study of several weeks with suitable treatment may lead to the conclusion that abortion is not required. Furthermore, evidence from other sources does not confirm the harmful effect of the last months of pregnancy on the tuberculosis; rather does it seem that the fixation of the diaphragm at such times may have a favorable effect similar to that of an artificial pneumothorax.

Especially does the consistent and prolonged treatment of these women in sanatoria, or, even better, under treatment in a special division of a maternity hospital, lead to strikingly favorable results. The experience of the past ten years according to Bauer has conclusively proved the value of such treatment in arresting the disease in active lesions complicated by pregnancy. Treatment at home is rarely satisfactory. In fact such patients must get absolute bed rest for long periods of time throughout the pregnancy. In addition to this, the more extended use of artificial pneumothorax in suitable cases has greatly diminished the number of cases requiring interference.

Such prolonged sanatorium treatment is, however, not always feasible. On the one hand, as Scherer points out, it may lead to family disloyalty; on the other hand, it may for social or economic reasons be impossible. In fact the question of therapeutic abortion in tuberculosis of the lungs is intimately bound up with the social-economic status of the patient. In a poorly nourished woman with a large family, we must regard the saving of fetal life with less concern than in the woman who can and will carry out sanatorium treatment for the required period of time during and after her pregnancy, and for whom the saving of the child is a matter of great concern. In such women with but one or no children we may, even in active cases, refrain from intervention, while in those whose external conditions make the pregnancy and the subsequent care of the child a serious burden, we would incline more readily, even in latent cases, to an interruption. Unfortunately this ideal sanatorium treatment of the tuberculous pregnant woman is for economic reasons available for but a relatively small number of persons, so that we must resort to therapeutic abortion in the majority of cases that are not definitely quiescent.

Laryngeal tuberculosis as a complication of pregnancy demands special consideration because of the common experience that it becomes more active at such time and leads to a fatal termination. Of 231 cases collected from the literature by Lobenstine, 200 died during pregnancy, in labor, or soon after, a mortality of 86 per cent. Norris has found it usually associated with active lung tuberculosis and seriously complicated by pregnancy. There is a general consensus of opinion that abortion is indicated in laryngeal tuberculosis, even though the final outcome is fatal in a considerable percentage of cases. If between 85 and 90 per cent of these women die when pregnancy is allowed to continue to term, abortion may be said to have a favorable effect, if it reduces the mortality to 54 per cent, as indicated by Winter's statistics.

We find Menge and Mayer taking a skeptical view of the value of therapeutic abortion in these cases. The swing away from abortion in laryngeal tuberculosis in recent years is most strongly presented by the careful report of Karl Fink (1931). Doubtless better methods of diagnosis and treatment have had their bearing on therapeutic indications. Fink's collection of 131 cases showed 33 per cent in which the tubercular lesion was relatively benign and in which abortion in his opinion was not justified. On the other hand, the far advanced cases could no longer be benefited by any such measures. This leaves a greatly reduced number of instances in which he felt that such measures were of benefit. The marked improvement in the treatment of laryngeal tuberculosis with tracheotomy, the Finsen light and sanatorium care has caused a drop in the death rate from 90 to 50 per cent. Fink differentiates between the circumscribed and the diffuse ulcerative lesions. The former can under proper treatment be healed or kept within bounds in spite of the pregnancy. The latter will often require a termination of the gestation. Such therapeutic interference should if possible be done in the early months of gestation, since it is of practically no value if performed after the sixth month.

To summarize, then, it would seem reasonably certain that:

- (1) Pregnancy has an unfavorable effect on tuberculosis.
- (2) Latent tuberculosis does not justify interruption.
- (3) Active or progressive tuberculosis is an indication for interference.
- (4) Therapeutic abortion, in two-thirds or more of these cases, will diminish the harmful effects of the pregnancy on the tubercular process.

Diseases of the Heart.—Recently a tendency toward greater conservation has also been manifested with regard to the indications for therapeutic abortion in women with heart disease. Yet we find that many internists are unwilling to accept the additional risks entailed by a waiting policy. The difficulties of predicting whether the heart muscle will be able to withstand the added strain of pregnancy, labor and the postpartum changes are very great. It would seem, therefore, that here, too, as in the case of tuberculosis, we must give serious consideration to the social factors, the number of children, etc., in our decision whether the added child is worth the added risk to the mother's life.

In heart disease we are faced with a threefold danger: (1) the strain upon the circulatory system by the pregnancy itself; (2) the effect of the labor with its unavoidable physical exertion; (3) the sudden change in intra-abdominal pressure immediately following de-

livery with its increased risk of embolism and sudden heart failure. Even where the first of these conditions is causing no visible disturbance, we cannot be certain of the effect of the other two.

Nevertheless it must be stated that the majority of cardiac cases will not require interruption of pregnancy, provided the family circumstances are such that the required rest and convalescence after delivery are feasible, and the care of a child or an additional child will not be likely to overburden a defective heart. *Aortic lesions* and *mitral insufficiency* will, with careful supervision to avoid undue exertion, necessitate no interference. *Mitral stenosis* on the other hand gives a more serious prognosis. Here we must differentiate between the mild cases that give but slight, if any, signs of *cardiac decompensation*, and the severer ones with definite early impairment of the myocardium. Most internists (according to Levy-Lenz, fifteen out of twenty-five) are agreed that all such severe cases of mitral stenosis should be aborted as early in pregnancy as possible. According to Traugott and Kautsky, seven out of eight cases of mitral stenosis become decompensated in pregnancy with a mortality of 28 per cent. This is particularly true of women over thirty-five years of age who have had several children in close succession. Failure of cardiac compensation that does not promptly yield to digitalis justifies interruption; the more so, because, as Da Maggio points out, the *dyspnea*, *edema* and *albuminuria*, attended as they are by accumulation of CO_2 in the blood, cause fetal death in a large number of cases. In cases of marked decompensation, however, it is better to delay the therapeutic intervention until the patient's condition has been somewhat improved by treatment. According to Dame Annie Louise McIlroy, the abortion itself may occasionally have an unfavorable effect upon the heart condition.

In **myocarditis**, according to Levy-Lenz, the indication for early therapeutic abortion is always present. Only when the condition is not recognized until after the fifth month is a waiting policy justified. The prognosis even with abortion is unfavorable. Interference is also advised in cases of recurrent *endocarditis* after *angina* or *polyarthritis*, merely waiting for a favorable moment after the acute symptoms have subsided.

Kypho-scoliosis complicated by pregnancy is apt to cause such abnormal conditions of intra-abdominal and intra-thoracic pressure that the heart is seriously affected. Fortunately a large percentage of these women miscarry but among those that go to term the incidence of sudden death following delivery is very great. For this reason Levy-Lenz advises therapeutic abortion in these women on the first appearance of cardiac disturbance.

Paroxysmal tachycardia will ordinarily respond to strophanthin and even though the pulse may be extremely rapid and the feeling of distress and palpitation pronounced, the danger is not great and no interference with the pregnancy is justified. Von Orłowski lists among the indications for therapeutic abortion the pressure of a large *aortic aneurysm*, and also cases of advanced *arteriosclerosis*.

Winter claims that we cannot recognize as a prophylactic indication for abortion, a history in a previous pregnancy of signs of cardiac decompensation. In estimating the severity of the decompensation, he says, less stress is to be placed upon such symptoms as *dyspnea* and *palpitation* than upon the objective signs of *edema*, *cyanosis* and *lowered urinary output*.

Among American cardiologists the majority would seem to favor a more conservative attitude in the interruption of pregnancy for cardiac disease. Daly and Strouse make the just criticism that we have heretofore tended to look upon these cases as pregnancies complicated by heart disease rather than patients with cardiac lesions who have become pregnant. In other words, the heart condition is the primary condition and demands first consideration. These writers report the end-results in the treatment of 352 pregnant women with organic heart disease, only five of whom required interruption of pregnancy. In nine patients in whom decompensation developed, it was found possible to correct this and carry the pregnancy to term. Ninety-six per cent recovered completely. Kellogg, Mackenzie and Smith also report favorable results from treatment so that therapeutic abortion rarely proved necessary. Campbell on the other hand believes that pregnancy considerably increases cardiac damage and definitely shortens the length of life. Both he and White believe that every pregnant woman suffering from *mitral stenosis*, *fibrillation*, or *chronic myocarditis* should undergo therapeutic abortion and sterilization. In cases of marked decompensation, however, time should be allowed for partial recovery before proceeding with any operative measures to interrupt the pregnancy.

As a result of comparing the life expectancy in cases of rheumatic heart disease occurring in men, in nulliparous women, and in parous women, Gilchrist and Murray-Lyon conclude that repeated childbearing (averaging over four children) accelerated the deaths of women with such heart disease. Their analysis of 109 fatal cases indicated that by escaping the burdens of a large family women could guard themselves against the risk of congestive heart failure until the age of about 38 years, but usually died of embolus in the course of the following twelve years. One, or at the most two, children can be carried

to term without serious damage to the mother, but beyond this number the risk of death is greatly increased.

Stander's study of 81 patients treated at the Woman's Clinic of New York Hospital in 1932 showed that in every patient with a definite history of decompensation, radical treatment should be promptly employed. This consists of interruption of pregnancy with sterilization.

The careful observations of Pardee upon the influence of pregnancy on heart disease have helped our understanding of the subject. Since we are less concerned with the location of the pathologic process than with the strength and function of the heart muscle, Pardee has suggested certain tests of exercise to determine how much damage has been done to the heart muscle. He divides his patients into four classes:

Class I. Those who are able to perform ordinary and usual physical activity without unusual fatigue, palpitation or dyspnea.

Class II A. Those who are able to perform the usual normal physical activity but who have discomfort in so doing. Such a person would have noticed an increase in shortness of breath after climbing stairs or after walking against a wind or upgrade, or after such exertions as house cleaning or lifting heavy articles. These patients would be said by some to be "fairly well compensated."

Class II B. Those who are unable to perform the more difficult features of ordinary physical activity without stopping on account of fatigue, shortness of breath, or palpitation. Such activities would be climbing two flights of stairs or walking at an ordinary rate for a half mile. These patients might be called "somewhat decompensated."

Class III. Those who are unable to perform the simplest physical activity without fatigue or shortness of breath or palpitation. Such a patient would be unable to walk 200 or 300 feet or to climb one flight of stairs without resting, and would be unable to do any housework. These might be said to be "much decompensated" or "definitely decompensated."

In drawing conclusions from these tests Pardee takes into consideration the general physical condition of the patient since some women are under normal conditions more easily fatigued than others. This is different from the shortness of breath experienced by the cardiac case. Out of 112 cases in his original study at the New York Lying-In Hospital, Pardee included two with congenital heart disease, 29 with mitral insufficiency, 64 with mitral stenosis and 11 with aortic insufficiency. In addition to these, six patients entered the hospital

with symptoms of serious heart decompensation (*Class III*), five of whom had a mitral stenosis and one an aortic insufficiency. Three out of these six markedly decompensated cases died in spite of treatment. Of the remainder, 75 cases were grouped as *Class I*, 20 as *Class II A*, and 11 as *Class II B*. In the last named group there was also one death. In general, Pardee believes that cases belonging to *Class I* and *Class II A* may continue through pregnancy if kept under treatment. In those belonging to *Class II B* and *Class III* the question of a therapeutic abortion demands consideration and unless there is definite improvement under rest and treatment the pregnancy should be terminated as soon as the patient's condition permits. Those who have shown evidence of dangerous decompensation in previous pregnancies should be aborted at the first indication of heart failure.

In discussing Pardee's recent paper on this subject presented at the Cleveland session of the A. M. A. (1934), Hamilton takes exception to the accuracy of the exercise test. He found it necessary to recommend interruption of pregnancy in 54 out of 553 pregnant women with cardiac disease at the Boston Lying-In Hospital. Forty-five of these women had heart decompensation and nine had auricular fibrillation or other conditions necessitating abortion. The majority of these women should have been warned against pregnancy. Unfortunately many cardiologists fail to appreciate the inherent practical difficulties attendant upon carrying out the very strict regimen necessary to keep such women from over-taxing their hearts. Too often the doctor leaves orders and does not properly check up to see whether they can be carried out. It is better to abort such women than risk the chance of subsequent serious decompensation.

As to the time when such interruption should take place, there is no question as to the advantage of early interference, preferably before the sixteenth week. After that time the procedure itself becomes more severe, according to Dame Mellroy, and the possibility of saving the life of the child must be weighed in the balance. The delay of several weeks called for to make the exact diagnosis and fine-drawn considerations recommended by some authors may remove the pregnancy from that stage (before the second omitted period) where interruption is simplest and safest, into the third or fourth month, where dangers of hemorrhage and infection are greatly increased. Moreover we have in cardiac decompensation a condition that may arise suddenly and require immediate intervention if the mother's life is to be saved. Questions of anesthesia and the best methods of intervention in this later period will be discussed in the subsequent chapter on Treatment.

Diseases of the Kidney.—Some kidney lesions have already been discussed under the head of Toxemias. There still remain for consideration the following:

- (1) Acute nephritis
- (2) Chronic nephritis
- (3) Pyelitis
- (4) Tuberculosis of the kidney
- (5) Pregnancy after nephrectomy

An acute nephritis following some infectious process during pregnancy may produce hematuria and occasionally progress to a stage of chronic nephritis, but does not, in the opinion of many obstetricians, justify interruption of pregnancy since it will ordinarily subside under proper treatment and with due care should not recur.

Strauss differentiates between those cases in which the kidney disease arises during the pregnancy and those in which it preceded the gestation. In the former group early albuminuria requires no interruption and only if *eclampsia* or pre-eclamptic symptoms develop early is interruption to be considered. In the latter group which include *chronic parenchymatous nephritis*, abortion is usually indicated owing to the threat of retinal hemorrhage and cardiac complications. Herrick believes that when evidence of kidney disease arises early in the pregnancy, the patient should be promptly aborted. In primary nephritis with prolonged albuminuria, anemia and edema, the absence of hypertension does not indicate that a therapeutic abortion can be avoided. As an indication of renal sufficiency Mussey says that a patient should have the ability to concentrate urine to 1,025 and dilute to 1,003 specific gravity.

Far more serious are the cases of *chronic nephritis*. If there is a *hydrothorax* and *hydropericardium*, especially if there is nitrogen retention in the blood and beginning *anuria*, Winter says we should not hesitate to end the pregnancy. He gives this as one of five indications, the remaining four being: (1) Threatened or existing *uremia*, (2) heart *decompensation* resulting from the kidney lesion, (3) early appearance and progression of *albuminuric retinitis*, (4) *amaurosis* and *ablatio retinae*.

The symptoms of impending uremia to be watched for are persistent vomiting, severe headaches and increasing torpidity. The eye complications demand special consideration since we are here concerned not merely with possible danger to the life of the mother but also with the conservation of her vision. Some ophthalmologists advise interruption of pregnancy in all cases of *retinitis albuminurica*, but Fink reports nine cases in which pregnancy went to term without

permanent impairment of vision. Winter found it necessary to interrupt pregnancy only 6 times in 50 cases of chronic nephritis. In spite of the fact that in many of these women there is permanent damage to the kidney, he does not believe that in a subsequent pregnancy we are justified in doing an abortion for prophylactic reasons.

How far such conservative measures are to be followed will again depend in some measure on the number of children and the social economic conditions present. Sachs, cited by Winter, reports that out of 48 pregnant women with chronic nephritis, only 21 gave birth to a living child. When we consider this fetal mortality of 56 per cent, together with a risk of premature detachment of the placenta estimated by Winter at 12 per cent and the definite increased damage of such a kidney in pregnancy, I believe prophylactic abortion should be done more frequently.

The ultra-conservative attitude held by the European gynecologists regarding abortion for chronic nephritis is not shared by Cary, Watson, Stander and other Americans. If the woman is very anxious to have the child and all risks are carefully explained, it is possible, as in two recent cases in my own practice, to carry her through the pregnancy safely. Such risks are, however, not justified in the vast majority of cases. *Hypertension* is a danger sign that should usually make abortion advisable. A woman whose kidney has been damaged by chronic nephritis should not be compelled to go through her pregnancy, unless she, knowing the chances, chooses to have her child.

According to B. P. Watson the high prenatal mortality in chronic nephritis and chronic hypertension justifies more frequent interruption of pregnancy. In a series of 322 cases of nephritic toxemia of all degrees of severity the prematurity rate was 25 per cent, rising to 37 per cent in the severe cases. The total fetal mortality of the entire series was 34 per cent, but where the toxemia was pronounced it was 69 per cent. "We, therefore, consider," he writes, "a pronounced hypertension with or without albuminuria an indication for the induction of abortion." Stander is equally positive in his recommendation for termination of pregnancy in cases of chronic nephritis with the prevention of any further pregnancy by contraception or sterilization.

Pyelitis of pregnancy is very common and will, of course, ordinarily yield to simple medication, rest and diet. In some instances ureteral catheterization and irrigation will prove necessary, at times even prolonged drainage of the kidney pelvis for a week or two by means of catheters. When in spite of these measures the high fever persists and there is *hematuria* and rapid loss of strength, we must assume an

involvement of the kidney substance with *nephrosis* or *perinephritic abscess*. In such cases interruption of pregnancy is indicated. If we wait too long the condition may progress to a general septicemia. This is fortunately a rare complication; Winter interrupted only once in 117 cases of pyelitis. Lützenkirchen advises against delay if the pyelitis has progressed to a *pyelo-nephritis*. The life of the child is only rarely spared in these severe cases; hence there is less objection to interruption, especially as it is far safer than operations on the kidney during pregnancy.

Since abortion often sets in spontaneously in the more severe forms of pyelitis and pyelo-nephritis, Goedecke does not find many cases that require therapeutic abortion. The majority of patients will get well with local measures and medicine but where serious damage to the kidney or septicemia is threatened, an interruption of the pregnancy should not be delayed, even if at a later date one kidney may require removal.

Medical treatment and ureteral pelvic irrigations have greatly reduced the number of cases requiring abortion in the opinion of Mikulicz-Radecki. If, however, the kidney parenchyma is involved, the outcome may be fatal unless pregnancy is interrupted. The indications for therapeutic abortion are: (1) severe cases of *pyelo-nephritis*, especially if double-sided; (2) *toxic pyelitis* where pregnancy toxemia is an important additional factor. He inclines toward more frequent interruptions, since the child is lost in one-third of the cases anyway, and there is considerable danger of permanent damage to the mother's kidneys. In agreement with these views, Benthin advises prompt interference since he lost two cases from excessive conservatism.

Tuberculosis of the kidney, if one-sided, primarily demands nephrectomy. Therapeutic abortion is at times advisable in addition thereto. If the tuberculosis is in both kidneys, we should interrupt at the earliest possible moment, since a delay to the later months will make any treatment utterly valueless. Even so, the benefit will, of course, be only temporary.

A previous *nephrectomy* may put the remaining kidney to some added strain if pregnancy supervenes. This will rarely lead to conditions serious enough to require intervention. Certainly, in itself, it rarely necessitates a therapeutic abortion, if the remaining kidney is healthy.

Diseases of the Liver.—Acute *yellow atrophy* of the liver occurs in about 30 per cent of the cases in association with a pregnancy. While *icterus* has already been considered under the head of Toxemias, it

should be borne in mind that every case occurring during pregnancy demands careful consideration. If the icterus cannot be explained on the basis of a cholecystitis, a calculus or intestinal disturbance, we must, particularly in the early months, suspect a possible acute yellow atrophy. The presence of a rapid pulse, fever, cerebral symptoms, and hemorrhages in the skin and mucous membranes are diagnostic of this condition, but at this stage the therapeutic abortion rarely saves the patient's life. If done at the first signs of beginning toxemia some help may be gained, but the diagnosis may prove faulty and the procedure therefore unjustified. Lützenkirchen also stresses the severe toxic icterus appearing in the latter half of pregnancy, which demands a termination of the pregnancy if other causes for the icterus can be excluded.

Diseases of the Blood.—The physiological changes that occur in the blood during pregnancy are relatively slight and of no serious significance. We find a slight increase of leucocytes, a thinning of the blood, lowered color index and increase of fat content. Three conditions occur that may at times bring up the question of interruption of the pregnancy:

- (1) Pernicious Anemia
- (2) Hemolysis of pregnancy
- (3) Leukemia

Pernicious anemia may either precede the pregnancy and become worse during the gestation, or it may arise during pregnancy. If the patient is seen for the first time when she is pregnant, it may be impossible to decide which form we are dealing with. The anemia that develops as a result of the toxemia of pregnancy is the more serious, and will in many instances justify interruption even though this procedure may be of only temporary benefit. Frequent pregnancies in close succession predispose to its development. The most vigorous treatment with arsenic, blood transfusions and liver extract should be at once undertaken, and if prompt benefit does not result, interruption is generally advised. This will be more readily done if the pregnancy is not yet far advanced. In the middle months the decision may be difficult. Since the pernicious anemia is apt to become more pronounced in the second half of pregnancy, it is wiser in doubtful cases not to delay therapeutic intervention. Seitz stresses the presence of megalocytes in the blood as an indication for interrupting pregnancy. The recent development of treatment with liver extract will doubtless materially reduce the number of cases of pernicious anemia requiring abortion. Favorable results from liver treatment in

pregnancy have been noted by Schilling and others. In the extensive review of Sachs, out of 22 women who survived the pregnancy by interruption, 13 died subsequently.

Pregnancy hemolysis must be looked upon primarily as a manifestation of toxemia. It may be hastened at times through giving such drugs as quinine or veronal. There is both hemoglobinemia and hemoglobinuria. Indications for interruption have as yet not been decided on, in view of the rarity of these cases.

Leukemia also is rarely associated with pregnancy. In fact no case of *chronic lymphatic leukemia* in pregnant women is recorded, since such women are invariably sterile. In the *myelogenous* type of the disease, however, and in acute forms, it is occasionally found. Naujoks records but 30 cases altogether in literature. Kosmak's two cases ended fatally, one at three months' gestation before abortion could be done. Two cases I observed in the service of the Washington University Department of Obstetrics are especially illuminating. The first was one of acute leukemia that ran a rapid course terminating in spontaneous expulsion of a six months' macerated fetus, with the death of the mother eleven days later. Several transfusions were of no avail in this patient. This typifies the usual course of the disease. Even relatively early abortion will be of little help in acute leukemia but the majority of obstetricians feel it is indicated in these cases.

The other case observed in our service for a long period was one of chronic myelogenous leukemia, diagnosed and vigorously treated with x-ray before the pregnancy ensued. Great care had been taken to protect the ovaries from radiation and this accounts for the fact that a pregnancy was possible and that when it proceeded to termination a healthy child was born. This child is now over two years of age and shows every evidence of being entirely normal. In this patient the unusually large liver and spleen, reaching down to the navel, were no serious complication to the development of the pregnancy, and labor set in practically at term. The mother died of her leukemia about nine months after the birth of her child. Whether such conservation is always justified is open to question. In Levy-Lenz's book interruption is advised, whereas Winter does not favor it. Naujoks believes that in the interest of the mother more active measures for interrupting pregnancy are justified. In our own case the amenorrhea was interpreted as due to the previous x-ray treatment and the case was not referred to the obstetrician until pregnancy had advanced

to the fifth month. With a relatively favorable blood picture at this time it was decided to let the pregnancy proceed.

Twenty-six cases from literature in which leukemia was the indication for interrupting pregnancy are analyzed by Hofstein. Ten of these were acute and sixteen were chronic leukemias. In one patient with chronic myeloid leukemia there was a rapid increase of leucocytes at the onset of pregnancy and after artificial abortion at the second month there was marked improvement. In acute leukemia there is so little prospect of gain by the abortion that it hardly ever is justified.

Skin Diseases and Syphilis.—Skin lesions resulting from the toxins of pregnancy may take the form of a pruritus, herpes, erythema, urticaria or impetigo. While these conditions produce pronounced discomfort to the patient, they do not indicate an interruption except in the severe form of an *impetigo herpetiformis*. In such an impetigo there are large pustules over the entire body associated with fever. Hebra saw five cases, four of which ended fatally. The disease is more common in the second half of pregnancy and the interruption of pregnancy is not of great value in lessening the mortality. The majority, however, favor adopting such measures early in the disease. Buschke and Curth advise abortion in severe cases of herpes gestationis. In *pemphigus*, however, it is justified in their opinion only when the patient is definitely growing worse.

Syphilis as an indication for therapeutic abortion has been advised by a few persons in those cases that resist treatment. This has not, however, been generally accepted. Sprecher believes that modern methods of treating syphilis make this indication unnecessary. On the other hand Buschke and Gumpert analyze the serious effect of syphilis upon the offspring and the difficulty of carrying out any effective treatment. They stress the high incidence of imbecility (13-25 per cent) among children with congenital lues. They, therefore, believe that, if a proper course of intensive treatment is impossible, in cases of familial syphilis of the nervous system, a therapeutic abortion should be given serious consideration.

(6) Endocrine Disturbances

The pronounced changes occurring in the endocrine system as a result of pregnancy are best evidenced by the tremendous outpouring of pituitary secretions demonstrated in the Aschheim-Zondek test. It is not surprising, therefore, that during pregnancy the glands of in-

ternal secretion may undergo serious alterations and result in pathological conditions imperiling the life of the mother. The more important of these diseases of metabolism and the endocrine organs are:

- (1) Diabetes
- (2) Osteomalacia
- (3) Tetany
- (4) Hyperthyroidism and hypothyroidism
- (5) Addison's disease

Diabetes in relation to pregnancy has been greatly influenced by the discovery of insulin. Before the days of insulin, diabetic women were almost invariably sterile as a result of general debility, atrophy of the ovaries and alteration of sexual desire. After the employment of insulin, women with diabetes who have been sterile will readily conceive. Thus in one way the problem has become more important than heretofore. Furthermore the results of treatment with diet and insulin have been so brilliant, even in cases of diabetic coma, that we no longer need to condemn such women to a childless marriage. Our advice will, of course, be largely governed by the severity of the case and its response to treatment, since there is no question that the mother's diabetes is as a rule unfavorably influenced by the pregnancy and in addition thereto we must face a greatly increased fetal mortality with a not inconsiderable risk of deformities.

Occasionally the diabetes makes its first appearance during the pregnancy and in these cases, as Naujoks points out, the prognosis is usually very good. An increased risk of spontaneous abortion is also present in these diabetic women. Umber and Rosenberg, who believe that it is possible with proper treatment to allow every diabetic to undertake a pregnancy without serious risk to her life, nevertheless qualify this by demanding an abortion: (1) if we are dealing with a severe diabetes associated with pronounced acidosis; (2) if the pregnancy is definitely leading to a lowered tolerance and increased consumption of insulin; (3) if external conditions prevent a consistent complete treatment with diet and insulin throughout the pregnancy.

Peckham followed the course of seventeen pregnancies in twelve diabetic women. He concludes that the disease may become exaggerated in the first two-thirds of pregnancy but improves in the last three months. Under careful supervision the average diabetic woman should be able to go through a pregnancy with reasonable safety.

Lützenkirchen stresses as an indication for abortion a severe *acidosis* in association with *ketonuria*, that resists diet and insulin. She also considers *hyperemesis* and toxic kidney complications as symp-

toms of danger. Cases in which the diabetes is more pronounced at the menstrual period are more likely to require intervention in pregnancy. Naujoks as a result of an inquiry among internists concludes that therapeutic abortion is indicated only after failure to correct the diabetes by insulin treatment regardless of its apparent severity, and in those cases where there has been an exacerbation of the diabetes in pregnancy and it is impossible for external reasons (social conditions, distance, etc.) to carry out consistent treatment. Ehrenfest believes that with insulin the dangers for mother and child are eliminated. The late Nellis Foster, however, considered that diabetes should be considered a eugenic indication for abortion, since the child was likely to be congenitally diabetic.

Osteomalacia due to hypofunction of the ovaries is an increasingly rare disease. It is controllable by internal medication with phosphorus and calcium or in more severe cases by removal of the ovaries. The disease often begins during pregnancy and as a rule develops more rapidly as a result of gestation. The outcome is fatal if not treated, but treatment by ovariectomy, which can be performed during pregnancy without risk of abortion, is successful in 87 per cent of the cases according to Winter. Only in younger individuals who resist treatment with medication can abortion be advised in order to avoid the necessity of sterilization at this age. Such an indication will only rarely arise. Since living conditions and diet play such an important part in the cure of this malady, abortion may be preferable in young primiparae to give them time to eradicate the disease without operation and permit in later years the normal birth of such children as are desired.

Tetany may prove fatal to the expectant mother through muscular cramps involving the larynx and pharynx. It results from damage by the toxins of pregnancy on the parathyroids. There is normally an increased nervous irritability during pregnancy, so that milder manifestations, so-called subtetanic symptoms, are not rare (according to Seitz, 10 per cent). True tetany is rare but may be very severe and whenever the muscles of respiration are involved, demands therapeutic abortion. The results of such treatment are usually very satisfactory. In Levy-Lenz's monograph, the dangers of a previous thyroidectomy, or depleting chronic infections when associated with tetany, are stressed and abortion is advised under such conditions. Where tetany has occurred in a previous pregnancy, abortion should be induced at the first appearance of symptoms pointing to a recurrence of the disease. Tetany occurring during pregnancy has a mortality

of 7 per cent according to Seitz, who reported 83 cases. Where pregnancy is interrupted in the later months results are less favorable than if done early.

Thyroid disturbances of a milder type are quite common in pregnancy. There may be either an increased or a lowered activity of this gland. An increase in size of the thyroid is quite commonly observed in pregnancy but is of no significance except where there are definite symptoms of toxicity pointing to Graves' disease. Rübsamen, Beck and Gross saw only 13 cases out of 700 enlarged thyroids in pregnancy in which the size of the tumor caused embarrassing pressure symptoms. Strumectomy will give such patients complete relief and does not ordinarily interrupt the pregnancy. They reported 6 per cent of spontaneous abortions.

Graves' disease when complicated by a pregnancy may lead to the development of a thyroid heart, and it is such cardiac conditions that necessitate oftentimes more radical measures than rest and Lugol's solution. If the tachycardia is attended by symptoms of heart decompensation we must choose between partial strumectomy or interruption of the pregnancy to prevent more serious damage. The decision between these two is often difficult, but strumectomy is usually preferable, unless the patient's condition militates against operative measures, or unless there is pronounced hyperemesis, chronic nephritis or cardiac decompensation. Except in the presence of enlargement of the thymus gland, therapeutic abortion will usually give prompt relief in these cases.

Winter reports 11 successful cases in 15 abortions. Occasionally the failure to get a satisfactory result with surgical resection of the thyroid will necessitate a later interruption of the pregnancy. It is for this reason that Lützenkirchen feels that in doubtful cases it is safer to interrupt the pregnancy at once.

Daly and Strouse state that abortion is rarely indicated for *hyperthyroidism*, since it may diminish the thyroid toxicity but will rarely produce a true remission. In contradistinction to this viewpoint is the experience of Seitz, who found that 60 per cent of 112 treated cases of toxic thyroid required abortion. On the whole, however, opinion favors the active treatment of the thyroid disease rather than any interruption of pregnancy.

Addison's disease is usually due to tuberculosis of the adrenals. It is rendered worse by pregnancy. Frequently there is associated with it a tuberculosis of other organs. Too few cases have been observed to justify a positive opinion but *a priori* it would seem that a therapeutic abortion is advisable to check the spread of the disease.

(7) Diseases of the Nervous System

Diseases of the nervous system as they are influenced by the pregnant state may at times give rise to the necessity of a therapeutic abortion. So difficult, however, is it to judge wisely as to the indications, that in every instance a psychiatrist or neurologist should be asked in consultation and sufficient time given to arrive at a satisfactory diagnosis and prognosis.

Cerebral neuroses include neurasthenia, hysteria and epilepsy. The first two of these conditions should never justify abortion, but *epilepsy* will at times become so pronounced, leading to the condition known as "status epilepticus," that the pregnancy must be interrupted to save the life of the mother. Haupt calls attention to the fact that over one-half of 19 cases of "status epilepticus" with pregnancy ended fatally. In one case the patient's condition was so serious that no operative measures could be employed. A lumbar puncture, removing 40 c.c. of liquor and injecting 20 c.c. of air, caused cessation of attacks. Later an abortion and sterilization was done. Hofmann advises that in every case of epilepsy the conditions and number of attacks be closely watched so that the interruption of pregnancy is not unduly delayed when conditions are rapidly growing worse. About 40 to 50 per cent of epilepsies are unfavorably affected by pregnancy. Occasionally, however, there is a definite improvement at such periods.

Of the *organic* diseases *brain tumor* may on rare occasions present a problem. Believing that they show no increase in size in pregnancy, Winter does not agree with Plaszek that pregnancy should be interrupted in these cases. *Acute encephalitis* may arise upon a toxic basis and for that reason a therapeutic abortion is indicated. Bland and Goldstein call attention to the frequency with which such an acute encephalitis is followed by paralysis agitans. If the encephalitis occurs during pregnancy, this complication occurs three times as often as in the non-pregnant woman. *Encephalitis lethargica* is so little influenced by the pregnant state, that there is rarely an indication for interrupting the gestation.

Spinal diseases complicated by pregnancy are: (1) tabes dorsalis; (2) multiple sclerosis; (3) myelitis.

Tabes is not unfavorably influenced by gestation, except in a few asthenic individuals. Winter interrupted the pregnancy in two young women with hereditary tabes dorsalis in whom marked improvement had occurred in the interval between the pregnancies. For *eugenic* reasons, however, abortion must be advised in most cases of tabes or other forms of cerebro-spinal syphilis.

Multiple sclerosis is very definitely influenced by pregnancy, and occasionally begins at this time. Symptoms are exacerbated with the pregnancy and become more pronounced with each child. Marked improvement is noted after the conclusion of the pregnancy. It, therefore, is a definite indication for therapeutic abortion whenever there is an exacerbation in the pregnancy and, according to Orzechowski, whenever in preceding pregnancies there has been an increase in symptoms.

Myelitis is in the opinion of most neurologists a toxic effect of the pregnancy. It usually arises during pregnancy, becomes worse during that period and may recur in later pregnancies. Hence therapeutic abortion is indicated, even though in some cases there is no improvement following this procedure.

Of the peripheral nerve lesions influenced by pregnancy we must mention *localized neuritis* and *polyneuritis*. Localized neuritis is of little moment unless such nerves are affected as the vagus, or in the case of optic neuritis leading to loss of vision.

Polyneuritis is a form of pregnancy toxemia resulting as a rule from prolonged or severe hyperemesis. From studies made thus far, it seems probable that the nerve lesions are due to absence of vitamins, especially vitamin B. This condition of avitamosis produces *Korsakow's syndrome* (hyperemesis, polyneuritis, psychosis). In the experience of O. Schwarz at the St. Louis Maternity Hospital this is an indication for prompt emptying of the uterus. If done in time the abortion will stop the progress of the polyneuritis and tend to a gradual recovery of function. With this complication mortality is high, according to Hoesslin who reports one-fifth of 46 cases dead. Cases of rapidly ascending *Landry's paralysis* present a somewhat similar picture and according to Winter's advice should be aborted.

According to Büchler it is beyond dispute that spinal and cerebral tumors, syringomyelia, progressive spinal muscular atrophies, hereditary chorea, lateral sclerosis, and severe forms of epidemic encephalitis form absolute indications for abortion. In doubtful cases Büchler holds that social and eugenic considerations may be allowed to influence the decision.

Psychosis.—It is not surprising that a pregnancy that is for some reason undesired and seriously complicates the life, the occupation or social standing of the individual, will result in a pronounced psychic upset, especially in individuals whose mental balance has previously been below par. Figures are lacking as to the frequency of suicides resulting from such states of mental depression, but it is certainly an important factor in suicides among women. Hence the physician

must face the difficult decision of therapeutic abortion in these cases. On the one hand, the woman may threaten suicide for the purpose of obtaining her end, an abortion; and on the other, we may have a true psychosis in which the woman is no longer responsible for her actions. Interning such a patient in a sanatorium may at times clear up the diagnosis and result in definite improvement. Singer also stresses as a psychic factor in these women the fear of the sufferings and dangers of labor. Where a state of nervous exhaustion results from these continued worries, an abortion may in rare instances be justified. Mingazzini is somewhat lax in his indications for abortion. He believes that in multiparae with pronounced nervous symptoms such as pressure on top of the head, eye symptoms, weariness, sleeplessness and irritability, interruption of pregnancy for the sake of the mother is justified. In every such case the previous history and the family inheritance of the individual must be given special consideration. Fraenkel calls attention to the fact that the abortion itself may result in new psychoses, and that therefore we are jumping from the frying pan into the fire by interrupting the pregnancy.

H. W. Maier calls attention to the fact that in the past fifteen years in Zurich there has been a marked increase in the number of psychiatric patients referred for therapeutic abortion. In the years from 1929 to 1931 alone in the city of Zurich with a population of 400,000 inhabitants, there were 718 therapeutic abortions for psychiatric reasons, in 481 of which this procedure was combined with sterilization. In 529 other patients interruption of pregnancy was considered but refused because of insufficient indications. The indications were, on the one hand, cases of involuntary pregnancy due to rape, idiocy or under-age (less than 15 years); and on the other hand, medical conditions affecting the somatic and psychic constitution of the individual.

Many writers, including Büchler and Cheney, believe that there is no individual disorder that is in itself an absolute indication for abortion, but rather that each case must be judged for itself. Eugenic factors, Maier says, are not decisive but must be given due weight. Where the psychic factors are apt to recur in succeeding pregnancies, sterilization should always accompany the abortion.

The two psychoses that need consideration in this chapter on therapeutic abortion are *dementia praecox* and *manic depressive insanity*. In *dementia praecox* we have frequently a tendency to increasing imbecility during pregnancy. A single period of exacerbation of symptoms does not justify interruption but if we have a history of such an exacerbation occurring in previous gestations, then we are justified at the first indication of the advance of the disease in interrupting a new pregnancy.

Strohmeyer states that dementia praecox has a specially bad prognosis if the onset is during pregnancy, or if there has been an exacerbation of symptoms at this time. In 92 out of 107 cases of dementia praecox Herzer found that the disease began during pregnancy, puerperium or lactation. Lienau and Saenger found that therapeutic abortion and sterilization had a definitely favorable effect on the psychosis. Most psychiatrists would deny any such improvement as a result of abortion but would concur in the idea that for eugenic and social reasons patients with this disease should be aborted and sterilized.

In *manic depressive* states, while the pregnancy has no direct harmful effect upon the psychosis and while the child may be perfectly normal, practical considerations will usually make an interruption advisable. The inability of the woman to care for her child, not to mention complications in labor and occasional attempts at suicide, make it preferable to induce an abortion rather than to permit the birth of a child under such distressing circumstances. Sterilization should, of course, accompany such a therapeutic intervention.

(8) Diseases of Special Organs (Eye and Ear)

Eye Diseases.—Some of the eye conditions requiring therapeutic abortion have already been mentioned, under Kidney Diseases. Certain toxemias produce their most serious lesions in the eye. We may have retinitis, optic neuritis, separation of the retina and less often such milder conditions as keratoconus. Functional disturbances in the form of hemianopsia and narrowing of the visual field may at times arise during pregnancy. Winter stresses the fact that all these eye conditions do not endanger the mother's life, nor are they often double-sided. Even when only one eye has been seriously affected, there is a considerable risk of lesions of a similar nature appearing in the other eye sooner or later. Winter, therefore, advises that where the vision of one eye is seriously threatened by a condition resulting from the pregnancy, we should proceed with therapeutic abortion. The occurrence of hemorrhagic retinitis in pernicious vomiting of pregnancy is in Stander's opinion an indication for therapeutic abortion. The character of changes noted in two such cases makes it probable that the eye lesion is caused by a change in the permeability of the capillary walls. Routine repeated examination of the eyegrounds should be made in all cases of hyperemesis.

According to Szwarc, we can distinguish two groups: diseases starting in pregnancy and those aggravated by pregnancy. Most important in the first group is the *retinitis albuminuria* appearing as an indication of pregnancy toxemia, pictured in Fig. 117. Winter, Szwarc, Krieger and others recommend immediate evacuation of the uterus when this condition appears.

Whenever eye changes indicate a moderately advanced stage of pregnancy toxemia, a careful study of the eyegrounds may, according to Wagener, be of great prognostic importance. Retinal hemorrhage and optic neuritis indicate severe toxemia and require prompt abortion, both because of the renal condition and the danger of blindness. Bedell in discussing Wagener's recent contribution to this subject emphasizes the early recognition of hard and rigid arterioles by the ophthalmoscope so that by early abortion more serious damage may



Fig. 117.—Albuminuric retinitis as an index of severe toxemia in nephritis. Note the speckled appearance of the retinal membrane and the rigid arterioles. The blood vessel changes are noted relatively early in the toxemia and almost always demand prompt therapeutic abortion. (Clarke: *Fundus of the Human Eye*.)

be prevented. Menge, who is ultra-conservative as to therapeutic abortion, would limit interference until after the period of viability and then induce labor.

Concerning separation of the retina (*ablatio retinae*) there is general agreement that immediate therapeutic abortion is indicated in practically every case. It is usually the sequel to a toxic retinitis of

pregnancy but may at times appear in otherwise healthy pregnant women. The only chance to avoid blindness is the interruption of the pregnancy. In a considerable number of cases when this was done within two weeks of the time of the retinal separation, the retinal membrane returned again to its former position without material damage to vision. Cases are recorded by Delpozso, Soli and Vorderame in which in two successive pregnancies, vision was lost in one eye where no interruption was done and saved in the other eye following therapeutic abortion. In *keratoconus*, abortion is advised by Szwarc only if the second pregnancy definitely causes the condition to grow worse.

In the group of pre-existing disease, Szwarc includes as justifying abortion *tubercular optic atrophy*, *tuberculosis of the ciliary body*, *optic neuritis* on a *diabetic* basis, and *retinitis*. Winter calls attention to the varying intensity of the optic neuritis. While usually one-sided, the disease may spread rapidly during pregnancy. In view of the relief given by the termination of the pregnancy, abortion at an early stage is indicated in every case of even moderate severity. Cases are recorded of what Krieger terms "*pernicious myopia*" in which during each pregnancy the vision becomes markedly poorer. This, together with the danger of retinal loosening in such cases, justifies ending the gestation. Bathe speaks of the danger of retinal bleeding in these cases of myopia.

Ear Diseases.—The risk of loss of hearing is not as great as that of blindness. Yet there is one condition, generally becoming worse in pregnancy, that requires consideration. *Otosclerosis* is in 88 per cent of cases double-sided, a chronic inflammatory process, leading to deafness. While no one denies that the disease will progressively grow worse, many otologists recommend interruption of pregnancy to delay the advance of the disease.

(9) Other Unclassified Diseases

A few other unclassified conditions have from time to time been brought forward as an indication for therapeutic abortion. In *caries* of the *bone*, according to Fekete, the difficulties of calcium metabolism during pregnancy have raised the question as to interference. Our information as to the harmful effects of pregnancy in these cases is too meagre, I think, to justify intervention. A case of severe *fracture* of the *vertebral column* in a three months' pregnant woman requiring the prolonged use of rigid and constricting apparatus was recently observed by Ehrenfest and myself and the patient allowed to go to term without any serious complication and with perfect union of the vertebra. *Varicose veins* may at times completely incapacitate the pregnant mother, but the fact that absolute rest in bed gives relief in

most cases makes abortion rarely justified. An associated *phlebitis* will, however, at times necessitate therapeutic interruption. *Hernias* may become more pronounced during pregnancy but the treatment must consist in replacement or herniotomy, and not in uterine evacuation. The same criticism applies to appendicitis and cholecystitis.

In a patient having *Pott's disease* Tassovatz found that the old vertebral lesions were softened with the onset of pregnancy and hence proceeded with a therapeutic abortion to prevent lighting up new tubercular deposits. *Vertebral deformity* in which pregnancy would cause increased pressure on the spinal cord and serious disability was the indication that prompted Eisenreich to proceed with abortion in two of his cases. Other rare indications for interruption reported by him included two cases of *breast cancer*, operated upon a year and a half before the onset of the gestation, in which he feared a greater tendency to recurrence if the pregnancy were to continue.

(10) Rape

The indication for therapeutic abortion in cases of rape will, of course, depend to a considerable degree upon the evidence produced by the woman that such an assault has actually been committed. That the physician is not always in a position to gather and weigh such evidence is manifest; hence he will do better to be guided in doubtful cases by the decisions of the court. If rape has been committed, there is general agreement that an emptying of the uterus is justified, if pregnancy arises as a result thereof. In the cases of girls pregnant under sixteen years of age the laws of Czechoslovakia permit abortion since they are considered to be irresponsible before this age. While our own laws and those of other countries do not as a rule recognize rape or extreme youth as indications for abortion, we as physicians, knowing the harmful mental or physical effects produced by a pregnancy in such cases, should seek to justify an abortion for medical reasons. If the abortion is done openly, there is little doubt that the courts would uphold such a decision.

(11) Eugenic Indications

On the borderline between medical science and sociology lies the field of eugenics, concerning which much has been written and yet so relatively little is known. Each decade has, however, added material and bit by bit we can begin to distinguish between those conditions that are definitely heritable, those that play a certain part in hereditary stigma, and finally those that have been overestimated in the past

and are really of little consequence. Let us suggest a spirit of sane skepticism in arriving at our decision. In many individuals, we might urgently advise against a pregnancy, or even under certain circumstances be willing to proceed with a sterilizing operation. Yet, if faced with a pregnancy actually established, we should be compelled to balance carefully the certainty or weighty likelihood that the disease or condition would be inherited. No doubt too many idiots and imbeciles are being born in the world but the differentiation as to likelihood of inheritance of such a taint must be given due consideration.

Only two general diseases of consequence can be directly transmitted from mother to child: tuberculosis, very rarely, and to a limited degree, syphilis. Both conditions can be usually controlled by proper treatment and therefore do not present a eugenic indication.

It is primarily with those conditions affecting the germ-plasma in which a taint or abnormality is definitely transmitted from generation to generation, that we are concerned. Max Hirsch, who has made prolonged studies of these problems, believes that we should extend our indications, including not merely danger to the mother but also danger to the child and the coming generations. He agrees with Nietzsche, who was more concerned with the "Kinderland" than with the "Vaterland." Unfortunately the marriage rate and birth-rate among the feeble-minded is alarmingly high. Rentoul in 1901 in England found 18,900 married out of 60,721 feeble-minded women; and 46,800 married among 117,274 insane women. The fertility of such women is illustrated by the reports from Rostock, giving 1,490 children in 234 mothers (6.4 children per mother).

Naturally no one would recommend therapeutic abortion for such minor deformities, even though definitely inherited, as polydactylism, clubfoot, tibial defect or color blindness. On the other hand if the inherited taint interferes with mental development (idiocy, imbecility, feeble-mindedness) or if it leads to congenital blindness (amaurosis, microphthalmus, aniridia) we must give the matter very serious consideration. Such cases will, of course, be quite rare and it is well, wherever possible, to consult with some specialist in genetics before reaching conclusions. Hirsch would recommend abortion in cases of *retinitis pigmentosa*, *amaurotic idiocy*, *dementia praecox*, *manic-depressive insanity*, Huntington's *chorea* and genuine *epilepsy*. Hirsch would rather abort than sterilize such women. Vonnegut, I think rightly, insists upon sterilization with abortion; for if it is serious enough to justify the latter, the former is also indicated. Hirsch would have the laws widened in scope to include eugenic abortion by the word-

ing: "The interruption of pregnancy is legal, provided it is done by a physician and justified by the observations of science."

Vonnegut, however, maintains that this is unnecessary and might lead to abuses. He contends that in the rare instances where such abortion is advisable, medical ethics would justify the procedure regardless of the absence of any legal right, just as for years therapeutic abortion for medical diseases was done without legal justification. This position is illogical. If it is morally and scientifically right to abort, it should be made legally right also.

Winter mentions the following conditions which show a definite hereditary tendency: (1) Psychoses such as *dementia praecox*, *idiocy*, and severe fatal *epilepsy*. (2) Results of *alcoholism*: for instance, *idiocy*, *psychoses*, *epilepsy*. (3) Nervous diseases such as *hereditary ataxia*, *spastic spinal paralysis*, *Huntington's chorea*, *myotonia congenita*. (4) Eye diseases such as *retinitis pigmentosa*, *optic neuritis*, *glioma* leading to blindness.

An interesting discussion of the eugenic indications for therapeutic abortion and sterilization recently took place in German medical circles. Reading between the lines the influence of Nazi doctrine was manifest. The sterilization of the unfit was generally accepted, although one Catholic physician, Niedermeyer, argued that sterilization was ethically just as wrong as interrupting pregnancy. Seitz and Naujoks favored interruption of pregnancy for eugenic reasons as well as sterilization and would combine the two procedures. Eugenic control in psychiatric patients should in the opinion of Bumke never justify birth control measures, since the normal would make use of such devices as well as the abnormal, thus increasing the danger of the "birth strike" which threatens the extermination of the Teuton Aryan race. Rüdin feels that sterilization of the unfit is better than inducing abortion but favors eugenic indications in cases of pregnancy for the betterment of the race.

If it could be proved that such diseases were *always* and positively inherited, there could be little argument against therapeutic abortion to prevent the birth of such unfortunates. Much study is however still required before we can positively take such a stand. We should be more inclined to interference on subsequent pregnancies if one or more children had already been born with such an inherited taint. Hessberg mentions such a case. The parents were both blind early in life with *microphthalmus* and *amaurosis*. Two children had been born blind with almost total *aniridia* and *nystagmus* and the mother was again four-and-a-half months pregnant. In spite of the fact that therapeutic abortion was advised, the father refused and the third

child was later born with the same eye defect, totally blind. On the other hand Fleischmann discusses the case of a woman with congenital cataract of both eyes, who was already in the fifth month of her pregnancy. Although fifteen out of thirty-four members of this family had either cataract or amblyopia, pregnancy was not interrupted because of the risk of interference at this late stage. As chance would have it, a healthy girl was born at term. The mother, however, consented to sterilization five months later.

The Eugenics Society last year produced a volume "The Chances of Morbid Inheritance," in the form of a symposium by specialists, designed to give physicians a basis for judgment in these matters. Genetic Principles, Nervous Disorders, Epilepsy, Mental Disorders, Diseases of the Eye and Ear, Allergic Diseases, Cretinism, Diabetes, Tuberculosis, Analysis of Pedigree, etc., are all discussed. Before determining the question of a therapeutic abortion for eugenic reasons, it would be well to consult the evidence presented by these writers.

Granting fully the difficulties of proof in these cases of inherited disease, I would incline to favor an extension of the indications for therapeutic interruption but would insist upon simultaneous sterilization of such a tainted individual, if after consultation such an abortion seemed necessary.

(12) Social-Economic Indications

The moment we proceed to a consideration of therapeutic abortion for social or economic reasons, we tread upon dangerous ground, for we are getting away from the purely medical aspects of the case and our information comes from sources the reliability of which may be open to question. The spread of social service in association with hospitals and dispensaries throughout the country has, however, materially improved the accuracy of information obtained regarding the living conditions of our patients. This has led us all to appreciate the bearing of these factors upon the physical well being of the entire family. To proceed with a therapeutic abortion merely because there is already a large family of children may be permissible in Russia, but is not as yet accepted as a wise course by the rest of the world. We should not, however, close our eyes to the direct effect of such a burden of children upon an already impoverished and underfed family. It is foolish to measure every thing by one standard. Burdens that are safely carried by one woman may readily undermine the health of another.

If prevention of disease is wiser than its cure, then we cannot entirely set aside a consideration of such social-economic indications. It has already been stressed that in many cases of tuberculosis and heart disease a report on the social conditions present materially influences our decision whether or not to interrupt. I am inclined to believe that abortion may also be justified in patients showing asthenia, loss of weight, and physical depletion, especially if there are several children, and the mother has heavy household duties, and lacks resources properly to care for those children already born.

Some conservatives such as Winter, believe that therapeutic abortion for social-economic reasons would let down the bars to all manner of abuse. I cannot agree with this. We should not hesitate to proceed with measures, simply because an unscrupulous person may take advantage of them for his own gain. Even now, as we all know, medical indications are often loosely established and abortion done merely for the convenience of the patient and the financial gain of the physician. Would it not be better if the indications were extended to include these depleted pluriparous women, particularly if we insist that such an abortion could only be done in a registered hospital after a careful survey of the facts and after consultation by two or more physicians? For the present we must reluctantly agree that physicians are not permitted to perform an abortion until the health of the mother has already been impaired. As physicians, we are, however, justified and obligated in trying to persuade our fellow-citizens to consider this problem from the broader aspects of preventive medicine, and ask them to take such steps, legal and otherwise, as will make it possible for the conscientious physician to do an abortion under such circumstances to preserve the health of the mother and the integrity and well being of the family.

CHAPTER XX

METHODS AND TECHNIQUE OF THERAPEUTIC ABORTION

HAVING DETERMINED in accordance with the principles of the preceding chapter the necessity of interruption, we are faced with the decision, by no means simple, of the best method of emptying the uterus in the particular case. There is no one method that is superior to the others, rather must we study the various factors in each case and select the one that is most suitable for that particular condition. This will depend upon the underlying disease that calls for the abortion, the stage of the pregnancy, previous parity, necessity of simultaneous sterilization operation, surroundings under which the abortion is to be done, and skill and experience of the accoucheur. Before proceeding to a discussion of the selection of the preferable method, let us analyze the various methods available. These may broadly be divided into the non-surgical and the surgical methods.

Non-Surgical Methods

Drugs.—Of the drugs that stimulate uterine contractions few are sufficiently powerful to induce emptying of the uterus, unless through fetal death, or other factors, the uterus has been rendered more sensitive to their effect. *Quinine* and *pituitary extract* have thus been occasionally employed with success in pregnancies between the fourth and sixth month. Schimmel claims that in pregnancies later than the second month *ergot* if given in large quantities will occasionally bring on expulsion of the ovisac. He gives a potent preparation of ergot, gynergen, 2 c.c. hypodermically three times a day for three days, a total of 18 c.c. This amount would seem to be not devoid of danger of ergot necrosis and hence cannot be recommended. Turolt reports complete failure in inducing abortion with gynergen. Winter suggests the use of ergot in combination with mechanical stimulation (massage or heat), but acknowledges that it is rarely successful.

Hormones.—Interesting and suggestive is the recent experimental work of Margaret Smith at Johns Hopkins. She found in working with rats that abortion could be produced with injections of large amounts of *follicular extract* obtained by the Allen-Doisy method,

given in the first five days of pregnancy. Larger amounts were required for each day that the gestation had advanced; three units sufficed for the first day but by the third or fourth day twenty units were necessary to produce the result. L. Levin, P. A. Katzman and Doisy found that in the last half of pregnancy neither theelin nor theelol had any effect in producing abortion in the albino rat even where given in very large dosage.

Edgar Allen, in a personal communication, stated that it has been fairly well demonstrated that it takes excessive doses of folliculin to produce abortion in laboratory animals. In testing for passage of folliculin through the placenta, he submitted pregnant rats to fairly high doses without terminating the pregnancy. Courrier and Kehl, using rabbits, found that by injecting 20-40 R. U. of folliculin the greatest resistance to abortion was in the early days of gestation. After the twelfth day less folliculin was required to produce abortion. They believe this is due to the antagonistic effect of corpus luteum in rabbits to the action of folliculin in the early stage of pregnancy. How far these experiments may be applied to the woman remains to be seen. It seems possible that where conception occurs shortly before the menstrual period and the indications for abortion are fundamentally present, injections of theelin or similar preparations in large amounts within a few days after the period has been passed may at times give the desired result. Future experience will determine whether this method has any therapeutic value. According to Hofmeister the experimental use of fresh testicular substance and proprietary testicular extracts showed no definite effect in producing abortion.

Pastes and Solutions.—The injection of *pastes* and solutions into the uterine cavity by means of a syringe has long been used for purposes of abortion, but such methods cannot ordinarily be said to do more than start contractions. The successful use in thousands of cases of a special paste by the German druggist, Heiser, a professional abortionist, led the Russian Commission to give it a trial. Genss told me in 1930 that it had been used 55 times in Russian clinics but without decisive results. Recently as distinguished an obstetrician as Sellheim said that he was testing its efficacy. It is claimed that the uterus is evacuated spontaneously 24 hours after the injection.

Recent literature especially in Germany has been full of reports concerning the dangers of using pastes to induce abortion. The very simplicity of the procedure has added to these risks, since many physicians, without obstetrical experience, have been tempted to use it in private practice without proper technique or asepsis. Contrary

to Leunbach's experience who found it necessary to curette only 12 patients out of 150 in whom he used his "Provokol" paste, we have the report of Otto, who found that in only 8 out of 24 cases was the evacuation complete. There was pronounced hemorrhage in 6 cases. A further danger lies in the fact that the paste is introduced into the uterine cavity forcibly by means of a pressure syringe. Engelmann cites 5 deaths from air-embolism and 12 deaths from fat embolism after the use of pastes. Autopsies done on two patients dying from embolism after the injection of pastes showed, according to Brack, infiltration of salve throughout the soft uterine wall, and lung emboli. The cauterizing effect of these pastes has been repeatedly noted both on the cervix, and in the uterine mucosa where they interfere with normal involution. Schach in Prague cites a death from fat embolism and records 25 similar fatalities in literature. According to Müller-Hess and Hallermann deaths after the use of pastes are not due to air-embolism attendant on faulty technique, but to fat embolism of the salve itself. Fingerland believes the paste is forced into the dilated veins through the contractions of the uterus. Where soap solutions are used, Haselhorst and Schaltenbrand believe that death is not due to air-embolism but to the entrance of soap solution into the circulation, producing clot formations with great rapidity. Apparently abortion results from loosening the decidua from its attachment to the uterine wall (Fig. 118).

A few writers such as H. Wolf, Sachs and E. Will report favorable results with the use of pastes, but they are far out-balanced by those opposed. So strong has this feeling become in Germany that the Federal Minister of the Interior has prohibited the use of such pastes as Heiser's, Interruptin, Antigravid, Provokol, Aretus and a vast array of similar preparations, except by a physician's prescription and upon the physician's responsibility as to the outcome. If further disastrous results are reported from their use, it seems probable that their sale and manufacture will be absolutely prohibited.

De Tarnowsky in this country has reported three cases of tubercular women in whom he used *intrauterine injection* of 3.75 c.c. of *ether* to induce abortion. In each case the ovisac was expelled within 20 hours.

A simple measure, but of questionable efficacy, is the use of glycerine vaginal tampons, suggested by Wittenberg. He found that they produced cervical dilatation sufficient to start an abortion in 58 out of 60 cases. We agree that it is safer than the use of pastes, but doubt whether others will get equally satisfactory results.

It would seem that such methods are either dangerous or unreliable. Certainly they will require further trial before they can be given serious consideration.

Irradiation.—Of unquestioned value, where operative methods are contraindicated and a period of temporary sterility is desired, is the use of *radiation* to produce fetal death in utero and thus lead to spontaneous expulsion of the ovisac. A number of important papers have appeared on this subject. Ganzoni and Widmer, who have used it extensively, stress as special advantages of this procedure that it does not require narcosis, eliminates danger of infection and can be done in bedridden patients. It was first employed by Krause, Schmidt

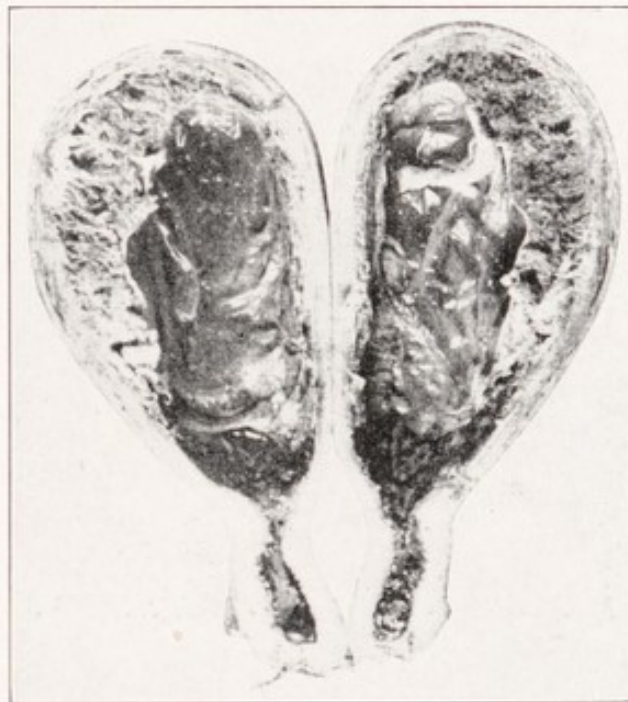


Fig. 118.—Uterus removed after injection of paste used for abortion. The paste deposited in the lower uterine segment lifts the decidua from its point of attachment. (E. Sachs: Zentralbl. f. Gynäk., 1932.)

and Försterling in 1914, but the results were disappointing owing to insufficient dosage. The method as described by Stern and used at Mt. Sinai Hospital in New York consists of a 50 to 60 per cent skin unit dose with high voltage machine. The number of fields is determined by the number of portals of entry necessary to administer the required depth dose. The voltage is 200 kilovolts, the milliamperage is 4, the distance usually 40-50 cm., and the filter always 0.5 mm. copper plus 1 mm. aluminum. No dermatitis was noted. Similar results could doubtless be obtained by the use of large radium packs (3 grams or more) in a manner similar to deep x-ray therapy, though I am not aware that they have been so employed in any radium clinics.

Experience has shown that this method is reasonably certain in its results, but that, as Archangelsky points out, it is more suitable for the first seven weeks of pregnancy. Stern would limit it to the first fourteen weeks, since the percentage of failures is greatly increased after the third month. Ganzoni and Widmer in 1925 reported 34 cases with 4 failures. Whenever unsuccessful, a curettage should be done since the ovum is almost certain to show serious developmental defects. In one case where permission to empty the uterus was refused, a microcephalic idiot was born. Out of 31 cases of therapeutic abortion induced by x-ray reported by Stern, spontaneous expulsion of the ovisac was noted 26 times (21 intact, 5 times fetus and placenta separately). Of the remaining 5 patients 2 were curetted; one had a hysterotomy although the fetus showed evidence of death and might later have been expelled; one showed placental changes that would eventually have caused death; and one case was definitely underdosed in treatment. The usual interval between treatment and expulsion was 14 to 42 days. There was usually very little pain or bleeding at expulsion. The castration symptoms were usually milder than after x-ray treatment of fibroids. Stern stresses the fact that one woman, who refused x-ray treatment for abortion in place of operative measures, died as a result of the latter. Wintz found that a considerable interval of time, up to 128 days, often elapsed between irradiation and expulsion of the ovum owing to the tendency in these cases to a missed abortion.

There would seem therefore to be a fairly definite, though rather limited, field for employing this method of abortion. It is where the abortion is to be done in the early months for a condition in which operative measures are if possible to be avoided, and in which haste is not a material consideration. Dangers of permanent sterility are very remote and damage to any fetus that may be born in subsequent pregnancies is most unlikely. No such late injurious effects have as yet been noted.

Pathological examination of the expelled products usually show a flattened, shrunken, slightly macerated fetus, a turbid amniotic fluid and a slightly flaccid sac. The appearance is that of a missed abortion. Microscopic examination so far has failed to reveal any characteristic changes.

It may here be noted that though the ovaries are included in the irradiated field in most of the cases, it is possible to obtain the same result while partially shielding the ovaries. Harris now has a series

of cases in which the ovaries have been excluded and in which the amenorrhea has been of very short duration.

The method has been used extensively on the service of Robert T. Frank, in very ill patients suffering from severe Graves' disease, cardiovascular disease, renal disease, Parkinson's syndrome, epilepsy, active pulmonary tuberculosis and several other conditions. In view of the absence of mortality and morbidity and in view of the favorable effect of the amenorrhea, we feel that the method has some advantages over surgical intervention. The length of time of amenorrhea will depend, of course, upon the age of the patient. Roughly, under 25 years of age, with the ovaries included in the field, the amenorrhea should last from one to two years. At the age of 35 or over amenorrhea is likely to be permanent.

It is important to recognize that in addition to the physical examination a careful psychological inventory should be made to determine on the one hand the attitude of the woman to amenorrhea and possible sterilization, and on the other to prepare her for such an eventuality by the reassurance that it will not produce ageing or lessen sex desire. One cannot emphasize too strongly the necessity of careful selection of cases, the strict following of indications, and the most scrupulous attention to details of technique in the employment of this method. These are necessary to secure one hundred per cent efficiency. It should go without saying that a careful check-up of the apparatus by an expert physicist at periodic intervals is absolutely essential.

To summarize, we record the method as an extremely valuable addition to our gynecological armamentarium, if it is restricted to cases in which all indications have been met, where the necessary accurately tested apparatus is available and in which interruption by surgical means appears extra-hazardous.

Surgical Procedures for Therapeutic Abortion

The simplest form of surgical procedure recommended for induction of abortion is the aseptic puncture of the ovisac to let out the amniotic fluid. This method is more suited to the later than to the early months. It merely sets to work the mechanism by which uterine contractions are produced, resulting in the gradual dilatation of the cervix and expulsion of the uterine contents. Lovrich reported 120 cases with no death where the ovisac was thus punctured to induce abortion. Mayer also prefers it, wherever possible, in the fourth to the sixth month of gestation. For most cases it will prove an uncertain method.

Stages of Therapeutic Abortion

The usual technique of therapeutic abortion may be subdivided into three stages: (1) methods of dilating the cervix; (2) methods of emptying the uterus; (3) methods of evacuation through a uterine incision.

Methods of Dilating Cervix.—Three measures are employed for dilatation in the early months of pregnancy: (1) metal dilators, (2) laminaria tents; (3) gauze packs. In the recent special inquiry on methods of inducing abortion, collected from 21 leading clinics in Germany and Austria, it is apparent that dilatation with graduated metal dilators is not as popular as the use of laminaria tents. Hoehne, Stickel, Halban, Doederlein, Franz, Eymer, Peters and Novak favor metal dilators, while Pankow, Füth, Fraenkel, Peham, Frey, Mayer, Weidel, Zangemeister and many others favor laminaria tents. Opitz, Henkel and Adler advocate gauze packs to promote cervical dilatation. Some Germans and the majority of American obstetricians hesitate to use laminaria tents because of the difficulty of complete sterilization. Another disadvantage is the uncertainty of so applying them that the entire cervical canal is dilated. Whitridge Williams favored the use of metal dilators in most cases. In primiparae, or in patients that require wider dilatation owing to the size of the ovisac, he preferred to accomplish this either with a cervico-vaginal gauze pack or a vaginal hysterotomy. DeLee considers laminaria tents dangerous. Vaux, in the latest edition of Edgar's *Obstetrics*, recommends either metal dilators or a gauze pack applied to the lower uterine segment as shown in Fig. 119. In England we find, however, that Munro Kerr advises laminaria tents where slow dilatation is indicated.

Few Americans will agree with Levy-Lenz that therapeutic abortion is a procedure that can be left in the hands of the general practitioner to perform in his office or at the home of the patient. With proper limitation, according to indications already set forth, their number or urgency is not so great but that all such patients can, and should, be hospitalized so that the procedure may be done with the least risk of complications.

In Russia experience has shown that under hospital conditions metal dilatation can be done with uniform safety in the first three months of gestation, certainly in all multiparae. The essential thing, of course, is that the operative field be prepared and kept sterile as for a surgical operation. If this is done, the slower methods of dilatation will not have to be employed in the earlier months. Levy-Lenz advises dilatation up to 12 mm. for 1 month gestation, 15 mm. for 2 months gestation and 22 mm. for 3 months gestation. In the choice of in-

struments I prefer Hanks' dilators to the ordinary Hegar type (Fig. 120), because the former have a greater forward curve, corresponding to the normal anteverted position of the pregnant uterus; and because the depth of introduction is gauged by a ridge on the dilator, so that they do not slip in too far, and injure the posterior uterine wall. In every instance, of course, the cervix must first be caught with a tenaculum forceps and drawn down into the vaginal canal, so that the angle between the cervix and vagina is straightened, and the cervical canal held rigid for the dilatation.

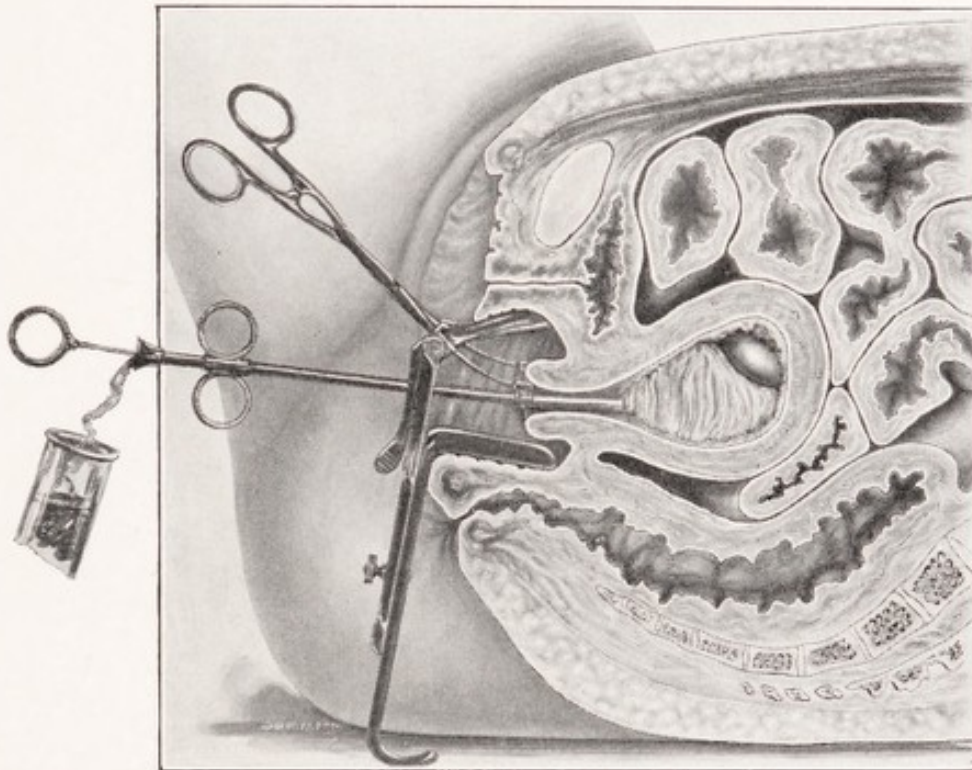
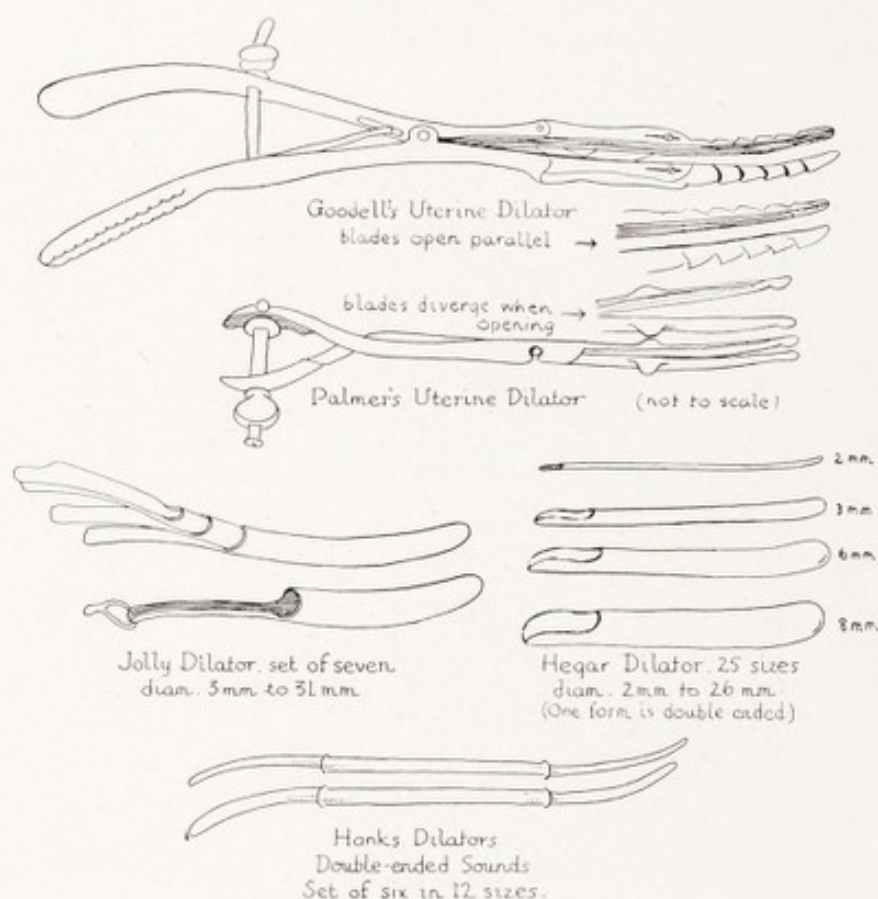


Fig. 119.—Use of uterine pack to stimulate contractions and bring about dilatation of the cervix. The small tube packer through which the gauze is introduced is about 1 cm. in diameter and can readily be inserted after stretching of the canal with metal dilators.

The technique of dilatation from the twelfth to the twenty-eighth weeks of gestation is very different from that employed earlier. Here we have a choice between gauze packs into the lower uterine segment and cervix, the use of the bag, the metal metranoikter, and incision operations. The necessity at this stage of development for a larger opening through which the ovum can be expelled or extracted, is apparent. Hence the use of instrumental dilatation in these cases will hardly meet requirements. Most American obstetricians employ a firm gauze pack in the lower uterine segment to stimulate contractions and if these do not result in opening up the canal, a small rubber bag of the Voorhees type is introduced and, occasionally with the assistance

of traction on the bag, the canal is dilated to a diameter of 3 to 5 cm. In Germany we find obstetricians such as Opitz, Halban, Novak, Peters, Franz, Pankow, F  th, Fraenkel, Doederlein, Adler, Peham, and Zangemeister all advising the use of the bag for dilatation (Fig. 121). A few, such as Henkel, Schroeder, Weibel and Frey prefer to obtain access to the uterine cavity through vaginal or abdominal incision.



Metal Uterine Dilators.

Fig. 120.—Metal dilators used in induction of abortion. Round graduated dilators are less likely to produce tears than are the two-pronged instruments. The blunt, only slightly curved dilators, designed by Jolly and Hegar, are more likely to perforate the cervix than are the more pointed, more curved, Hanks type, that in addition have a mark to indicate the depth of introduction. Particularly in the nulliparous cervix with antelexion should this type of dilator be preferred.

Emptying the Uterus.—The best method of emptying the uterus after the cervix has been dilated has been, and still is, the subject of heated controversy. Levy-Lenz insists that the average practitioner must be trained to rely more on instruments than on his finger for evacuating the uterus. The curette and ovum forceps should suffice in a pregnancy up to the twelfth week, but after that period has been passed, the guidance of the finger is essential to prevent excessive hemorrhage or perforation. Perforation is indeed the complication

most dreaded when instruments are used. In all instances a thorough dilatation should precede their use, so that they can slip into the uterine cavity without resistance. When a semi-sharp curette with a large loop ($1\frac{1}{2}$ cm. wide and 3 cm. long) is employed, the risk of perforation in skilled hands is small, provided the pregnancy has not advanced beyond eight to ten weeks (Fig. 122). While it may not be possible to remove every portion of the ovum by this means, the remaining particles of decidua are usually expelled without difficulty in the next day or two.

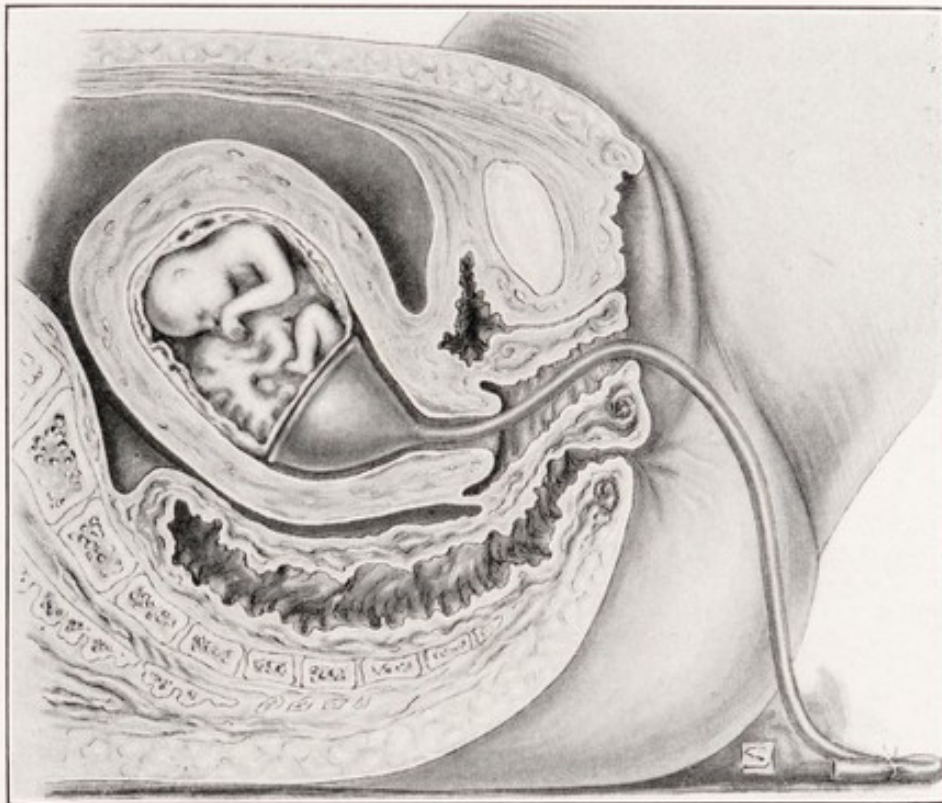


Fig. 121.—Voorhees bag used for dilating the cervix in pregnancies of four to six months' development.

The bleeding is rarely excessive in such early pregnancies. In the third and fourth months, however, it is wiser to combine the ovum forceps with the curette to remove the uterine contents. Details as to the technique of such an evacuation can be found in Chapter XIII. Here we need only to emphasize that the ovum forceps is not to be employed to pull the ovisac from its attachment to the uterine wall, but merely to remove large masses that have previously been loosened and that are lying free in the uterine cavity.

If the cervix has been dilated to 2.5 cm. in diameter, a finger can be introduced to determine whether there are still remaining portions of the ovisac attached to the uterine wall. With a little practice the

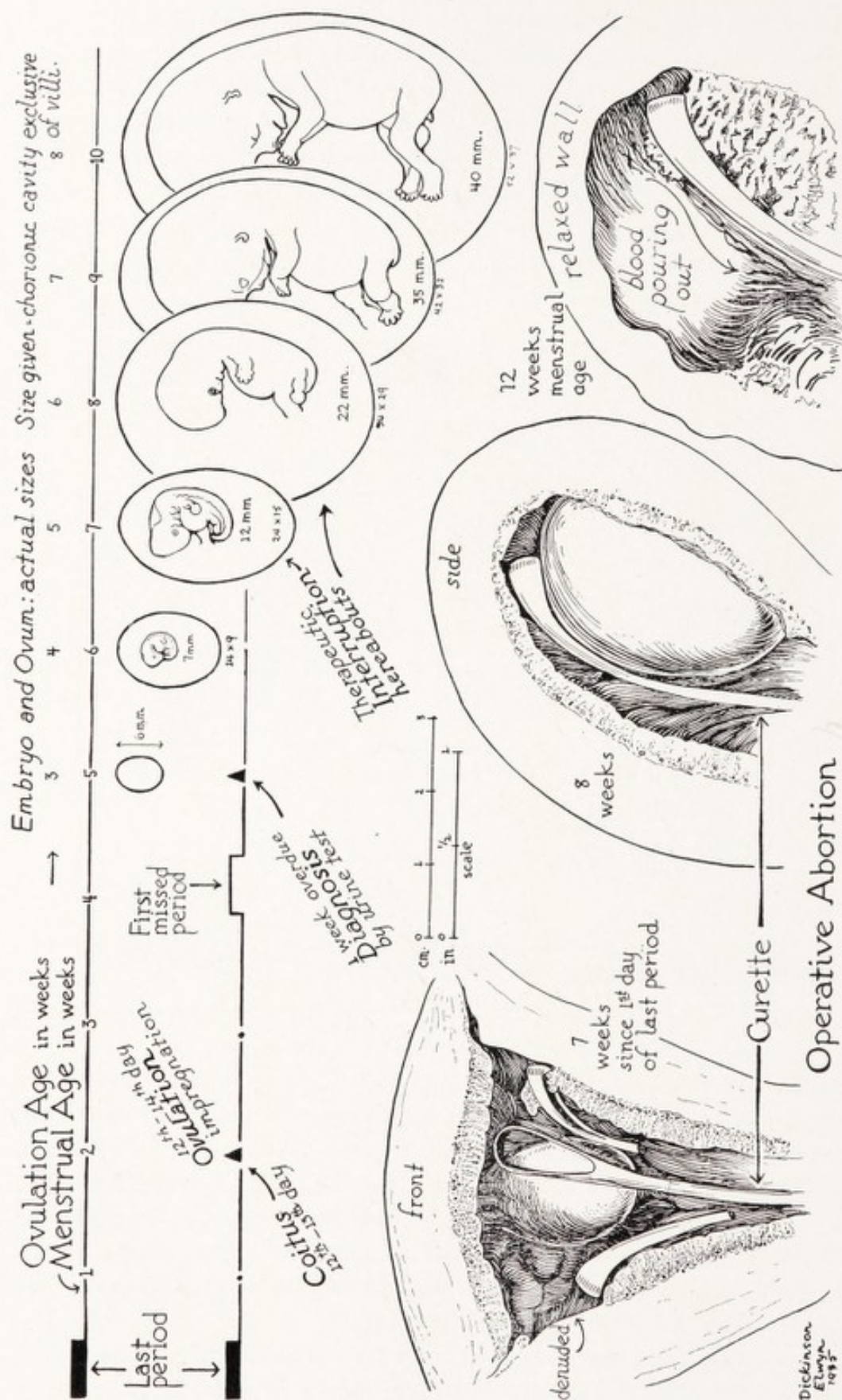


Fig. 122.—Operative abortion by means of the semi-sharp curette in the first 12 weeks of pregnancy. Above is indicated the size of the ovum and embryo in relation to the date of impregnation and last menstruation. Below is shown what the curette finds in the uterus at the fifth week, the eighth week, and the twelfth week after menstruation. (Dickinson.)

finger can be trained to loosen such portions, so that they can subsequently be grasped by the ovum forceps and extracted. In many cases after the finger has thus been employed to loosen the placental attachment, the pieces of ovisac can be expressed from the uterus without the use of any instrument. In such cases the simple sponge holder with its oval open ends, is a convenient instrument for the removal of smaller pieces. The use of local anesthesia (0.5 per cent novocain solution with the addition of 3 drops of adrenalin to the ounce) into the base of the broad ligament at either side of the cervix, together with the injection of 0.5 c.c. of infundin into the uterine muscle, will reduce the hemorrhage of such an evacuation to a minimum. Both DeLee in America and Munro Kerr in England are convinced of the greater safety of the finger over the curette. Physicians can be trained to use their fingers for palpation and loosening of the placenta in a relatively short time.

The dangers of therapeutic abortion according to Levy-Lenz, are divided between the risk of infection and perforation.

Risk of infection can be reduced to a minimum by the exclusion of all cases of cervical infection, especially gonorrheal, until preliminary treatment has cleared them up. Then, of course, we must employ the strictest precautions as to asepsis and antisepsis, with shaving of the vulva. The use of such antiseptics as acriflavine, mercurochrome, or pieric acid in the vagina and cervical canal will also decrease infection risks. Equally important is the removal of the entire ovisac, so that there is no opportunity for bacterial multiplication in the retained necrotic placental tissue.

Perforations will rarely occur when the cervix has been thoroughly opened, especially if, before operation, a bimanual examination be made to determine the size and position of the uterus, and instruments are used gently in the manner already described.

One-Stage or Two.—There is considerable argument as to the relative advantages of the one-stage and the two-stage method of evacuating the uterus. S. Topuse prefers to empty at one sitting, even though there is greater risk of cervical tears, because of the lowered chance of infection. After the third month of gestation, he removes the ovum by vaginal hysterotomy. This was done in 145 cases without fatality.

In discussing the technique of therapeutic abortion employed with 162 patients, Spitzer found that in the 78 cases where the uterus was emptied at one time from below, there was the lowest percentage of infection, 5 per cent. In 31 cases abortion was done in two stages. Finally there was a series of 51 cases of vaginal hysterotomy, one

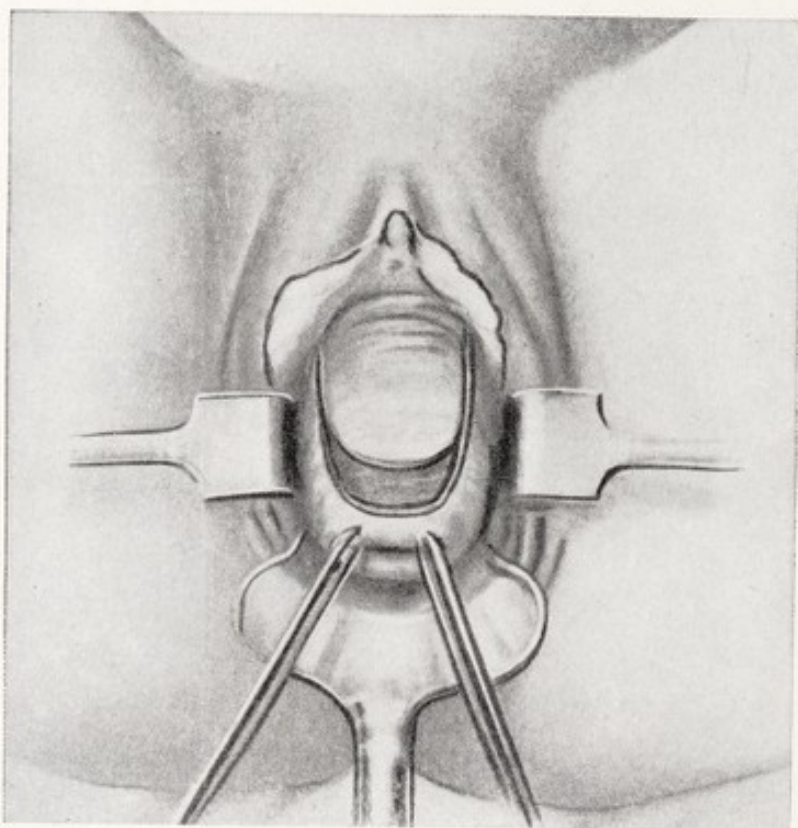


Fig. 123.—Vaginal hysterotomy for therapeutic abortion. (1) Semilunar vaginal incision to loosen vaginal flap over bladder and cervix. (Nelson's *Looseleaf Surgery*, 1932.)

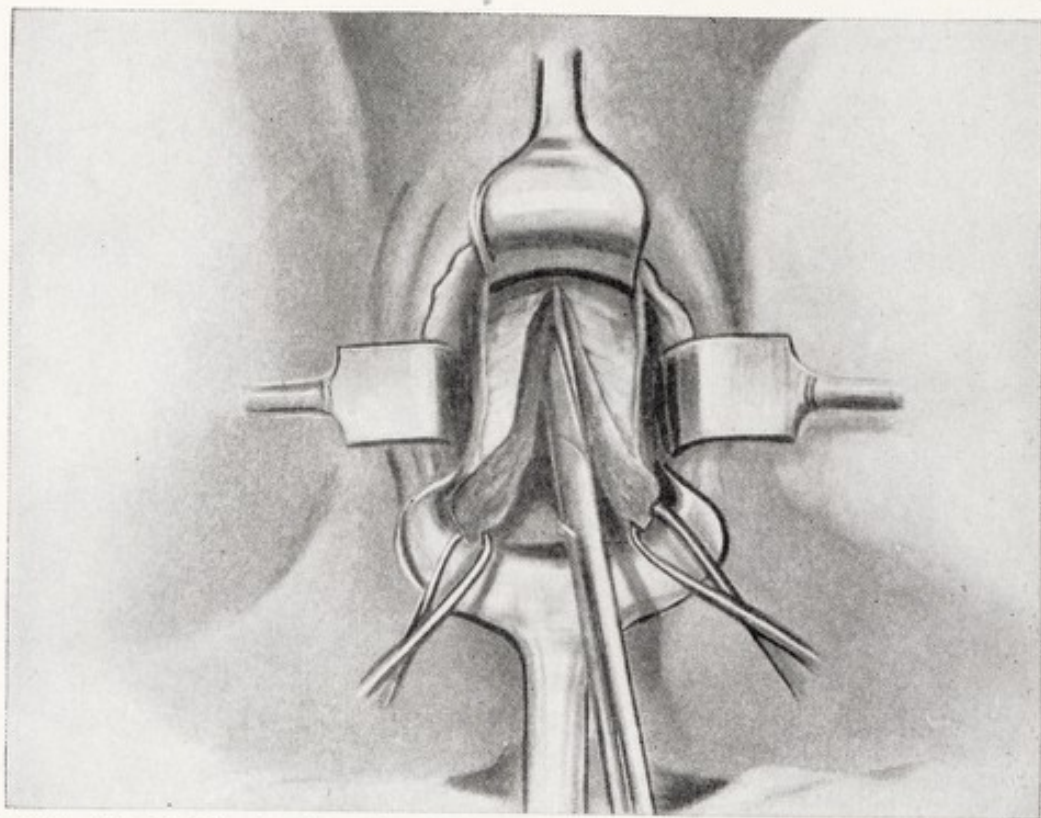


Fig. 124.—Vaginal hysterotomy for therapeutic abortion. (2) Sagittal incision through the cervix. (Nelson's *Looseleaf Surgery*, 1932.)

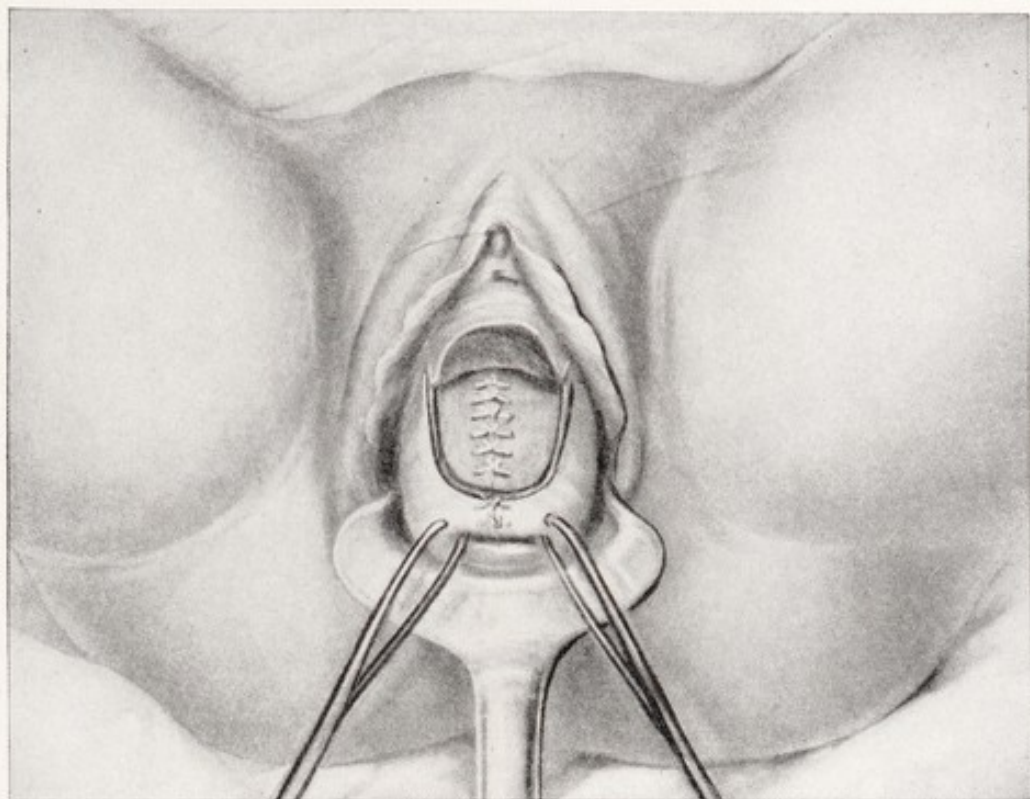


Fig. 125.—Vaginal hysterotomy for therapeutic abortion. (3) Suture of the incision through the cervix after evacuating the uterine cavity. (Nelson's *Looseleaf Surgery*, 1932.)

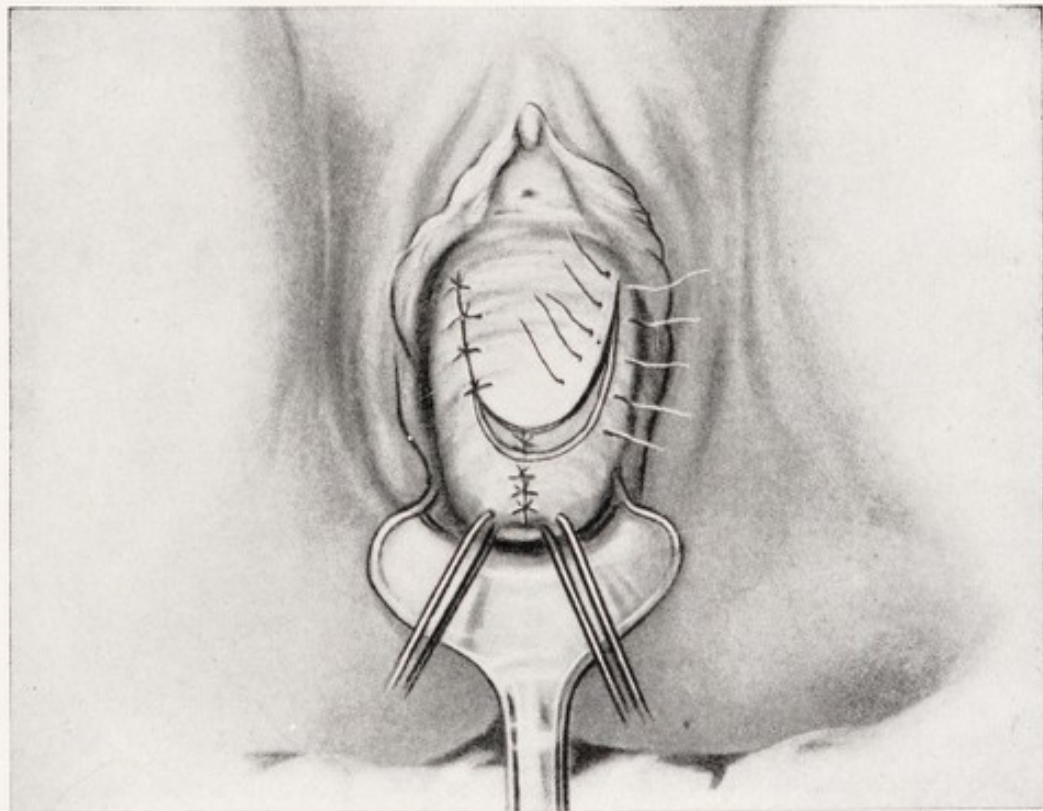


Fig. 126.—Vaginal hysterotomy for therapeutic abortion. (4) After removal of the ovisac, the cervical canal is closed with interrupted catgut sutures, and the vaginal flap fastened back at its original point. (Nelson's *Looseleaf Surgery*, 1932.)

combined with sterilization and two cases of abdominal hysterotomy done in more advanced pregnancies. All three of the deaths in this series of 162 cases were due to the maternal disease and not to the abortion. Spitzer quotes the following mortality statistics for therapeutic abortion: Benthin, 244 cases with one per cent deaths; Fuchs, 223 cases with 0.4 per cent deaths; von Franque, 129 cases with 2 per cent deaths.

Evacuation Through Uterine Incision.—Evacuation by uterine incision may be either a vaginal or abdominal procedure. The vaginal operation may consist either of an anterior sagittal incision through the cervix (Figs. 123-126) and lower uterine segment, or, having opened the peritoneum by an anterior vaginal celiotomy, the uterus may be incised above the cervix and the ovisac pulled out through this opening. Whenever the operation is thus done vaginally, it should be restricted to the multiparous woman with somewhat lax floor, in whom the pregnancy has not advanced beyond the third month. If done under these conditions, the operation is relatively simple for one trained in vaginal work; and it can be combined with a tubal sterilization procedure, if this is indicated in the particular case. Bengolea has done such a *vaginal celiotomy* successfully with incision of the uterus nine times; and Irving reports satisfactory results in five patients where such technique was employed. Irving used sacral anesthesia in his cases. Winter prefers incision of the cervix as in cases of vaginal Cesarean section, pushing the bladder back, to gain a higher approach into the uterine cavity. Occasionally in pregnancy up to the fifth or sixth month a posterior cervical incision will also be required. No attempt at sterilization is made in this operation.

A more radical vaginal procedure than any heretofore described is the *vaginal hysterectomy*, recommended by Hornung, in cases where a cessation of menstruation is also desired, as in certain cases of tuberculosis in multiparous women. Hornung did 43 such operations in Kiel from 1922-1928 without a fatality. The procedure was done under twilight-local anesthesia.

The *abdominal operation* for therapeutic abortion has been recommended by Newell and Frommer in this country and by Perez, Gall, Pawlova and Goldschmidt abroad. This procedure is particularly suitable in primiparae with a pregnancy advanced between the thirteenth to twenty-eighth week, where sterilization is to be done simultaneously (Figs. 127-129). Pawlova and Gall prefer the transverse Pfannenstiel incision through the abdominal skin and fascia.

Pawlova had one death from heart disease out of 25 cases. Perez had one septic death in 42 operations, half of which were done for social-economic indications. Frommer did 14 operations, 6 under local and 8 under spinal anesthesia. He claims that emptying the uterus by abdominal section is less of a physical strain than the ordinary vaginal therapeutic abortion. Improvements in operative technique and an-

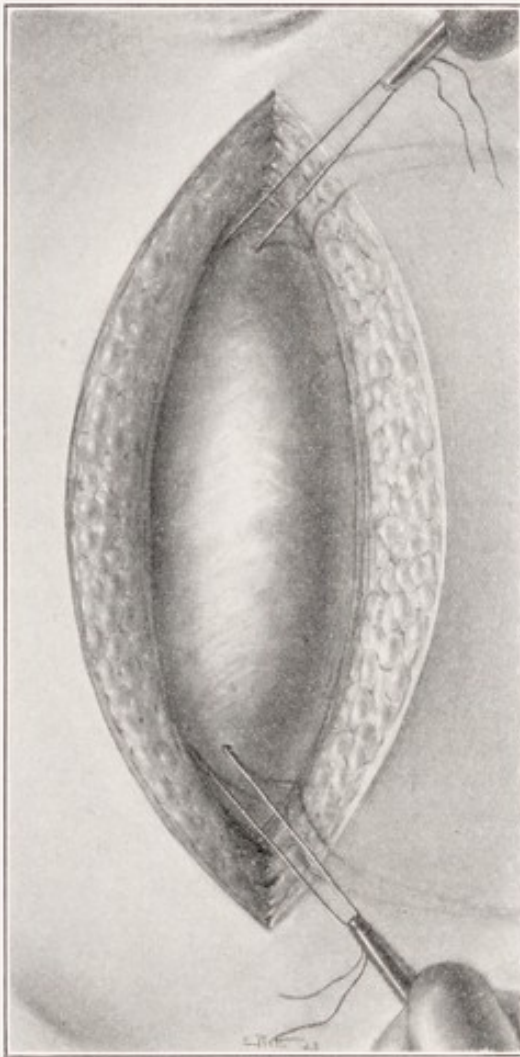


Fig. 127.

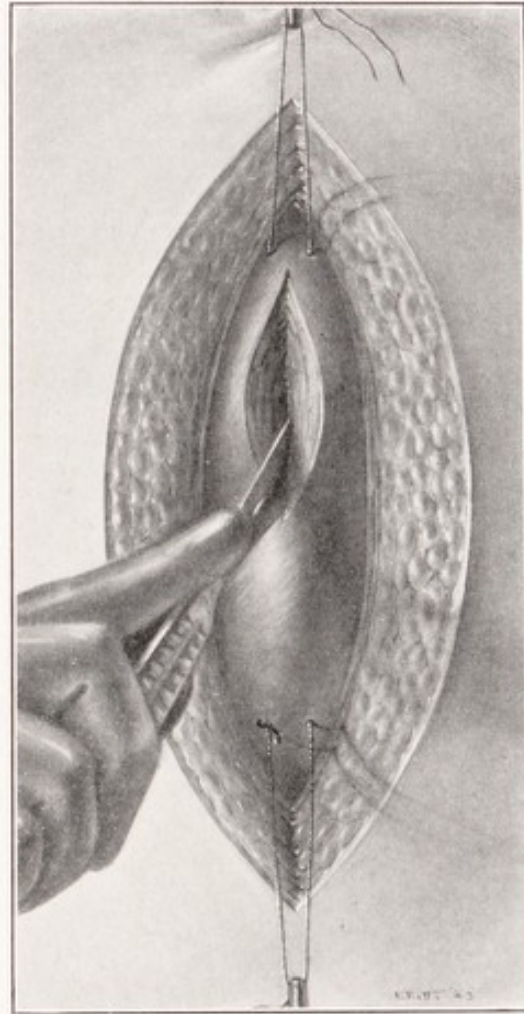


Fig. 128.

Fig. 127.—Abdominal hysterotomy for abortion in the middle trimester of pregnancy. (1) After median incision, two stay sutures are placed through the uterine wall to the right of the mid-line. (Irving: *Am. J. Obst. and Gynec.*, 1923).

Fig. 128.—Abdominal hysterotomy. (2) Sagittal incision of the uterus between the two stay sutures. (Irving: *Am. J. Obst. and Gynec.*, 1923.)

esthesia, together with the frequent desirability of associating the abortion with sterilization has led to more frequent adoption of such incision procedures.

Selection of the Method of Induction.—Since the foregoing pages may have left some confusion as to the best method of emptying the

uterus, I shall now try to set down briefly certain generally accepted dicta about the factors influencing selection, which include:

- (1) the indication for abortion;
- (2) the parity of the patient;
- (3) the stage of the pregnancy; and
- (4) the skill and experience of the physician.

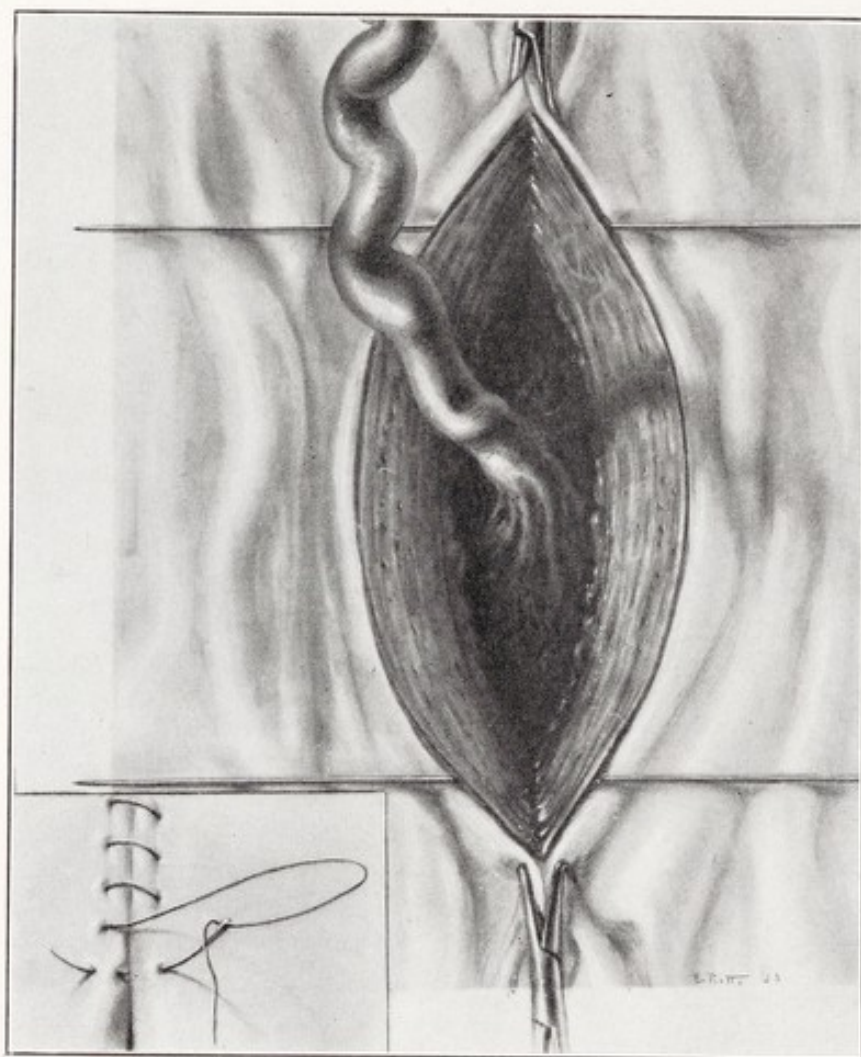


Fig. 129.—Abdominal hysterotomy. (3) The uterus is emptied of its contents and after transfixing the uterine wall by means of two sharp knitting needles to keep it approximated to the abdominal incision, the uterine cut is closed in layers with special attention to the overlapping serosal stitch as shown in the lower, left-hand corner. (Irving: Am. J. Obst. and Gynec., 1923.)

(1) In cases where *rapid* emptying of the uterus is demanded, as in beginning toxemia accompanying hyperemesis, impending diabetic coma, uremia, eclampsia, serious heart decompensation, we must employ metal dilatation and curettage, or one of the operations involving incision into the uterus, with immediate evacuation. If, however,

there is no need for such haste, we can employ either gauze pack or laminaria tents in earlier pregnancies, and the bag or bougie in more advanced ones.

(2) The *parity* of the patient materially influences the dilatation of the cervix. Metal dilatation is usually recommended in the multiparous individuals, while gauze packs or laminaria tents are employed in the longer and more rigid cervix of the woman who is pregnant for the first time.

(3) The *stage* of the pregnancy, as already indicated, is of great importance in the choice of methods. In the first eight weeks of gestation, opening the cervix with metal dilators and emptying the uterus with a curette will be generally accepted as the best method.

OUTLINE C. METHODS FOR THERAPEUTIC ABORTION

	FIRST TO EIGHTH WEEK	NINTH TO SIXTEENTH WEEK	SEVENTEENTH TO TWENTY-EIGHTH WEEK
RAPID METHOD	Metal dilatation of cervix. Curettag of uterine cavity.	Metal dilatation of cervix. Emptying uterus with finger, sponge forceps, and curette.	Vaginal hysterotomy or abdominal hyster- otomy, with instru- mental evacuation un- der control of finger.
SLOW METHOD	Same as above.	Utero-cervical gauze pack. If not expelled spon- taneously, remove with sponge forceps and curette under guidance of finger.	Rubber bag dilatation of cervix; followed by spontaneous evac- uation, assisted by digital removal of placenta when neces- sary.

In the following eight weeks (9-16th week) the preferable method will be metal dilatation to 25 mm. or the utero-cervical gauze pack preliminary to an evacuation with the finger, sponge forceps or ovum forceps, and curette. From the seventeenth to the twenty-eight week we would suggest bag dilatation of the cervix, followed by spontaneous evacuation of the ovisac, when haste is not required and vaginal or abdominal hysterectomy where rapid emptying of the uterus is indicated.

(4) The *skill* and *experience* of the physician will limit the extent of operative procedures. Only trained obstetricians should attempt any of the incision procedures, since the danger of hemorrhage, or injury to surrounding organs would be too great in unskilled hands. Levy-Lenz claims that, for the average practitioner, the curette is safer than the finger in emptying the uterus but this is not generally ac-

cepted as true. I should personally feel that any physician, who takes the responsibility of a case of abortion, should train himself in the technique of digital palpation of the uterine cavity.

In *Outline C*. I have tried to present in a graphic way the choice of methods for the varying conditions that are found. Naturally for the sake of clarity this selection is somewhat arbitrary and based on American experience. For this reason the use of laminaria tents has not been included.

CHAPTER XXI

PREVENTIVE MEASURES—STERILIZATION

Preventive Measures

IN THE PRECEDING chapters the disastrous, oftentimes fatal, complications attending induced abortion have been described. Certain measures are of course available for mitigating their severity but fundamentally it must be self-evident that the best way to prevent these complications is to prevent the occurrence of the undesired pregnancy. Spontaneous abortion is a relatively minor accident. It is induced abortion, both therapeutic and illegal, that presents the grave dangers. If in these cases the pregnancy had been prevented, the desire or need for interrupting it would not have arisen.

Conception can be prevented in various ways.

The simplest of these is sexual abstinence; but, in married life, this is, to say the least, impractical.

Another plan is restriction of sexual relations to the so-called "safe period," recommended by certain Catholic agencies. While some reduction in the total number of children can reasonably be expected by this procedure, it is too unreliable to be given serious consideration as the sole method of restricting conception.

A third group of measures for avoiding pregnancy are the chemical and mechanical measures employed in association with marital relations. It is beyond the scope of this book to discuss these methods in detail. Considerable progress has been made in recent years by scientific research upon this subject, and at the meeting of the American Medical Association held in 1935 it was finally decided to have the Board of Trustees appoint a special committee to study the entire problem. Since we are still far from having discovered the ideal method for avoiding pregnancy that is suitable for the poor and ignorant, who need it most, it is to be hoped that the research of the next few years will find for us a safer and more practical procedure. Measures employed at present give from 60 to 95 per cent safety depending on the intelligence and persistent care used by the married couple.

Physicians can find a full discussion of these methods in the following publications:

Eric C. Matsner: "The Technique of Contraception," Pamphlet, 38 pp., Williams and Wilkins Co.

R. L. Dickinson and L. S. Bryant: "The Control of Conception," 290 pp., Williams and Wilkins Co., 1931.

Finally, there is a group of so-called "sterilization" measures which act either upon the sex glands or the sex ducts to make conception impossible for longer or shorter periods of time. These measures have the advantage that they are more or less permanent and have no influence on marital relations.

STERILIZATION

When the prevention of conception is desired either permanently or for long periods of time, and when for special reasons greater certainty of success is demanded, we must resort to sterilization either temporary or complete. This does not imply that the sex glands must be removed. These sterilizing procedures in no way interfere with sex functions. In fact such sterilization operations have been found rather to increase than to diminish the completeness of sexual life, since the inhibitions associated with the fear of an undesired pregnancy that often attend normal intercourse, however safeguarded, are no longer present.

Non-Surgical Procedures

Hormonal Treatment.—The desire to accomplish this result without the necessity of surgical intervention has led many to attempt the use of endocrine products that will either interfere with ovulation or will inhibit or destroy the motility of sperm cells that gain entrance into the female genital tract. Most of the work that has been done thus far is based on animal experimentation. Haberlandt was successful in producing temporary sterility by injections of female sex hormone. Kowacs has attempted testicular transplantation. Zondek has used anterior pituitary extract. In Russia some of these measures have been used in human beings with fairly satisfactory results. Much additional investigation must, however, be done before we can give this method serious consideration. I concur in Reis' criticism that the prolonged use of extracts that tend to disturb the normal balance of the endocrine secretions cannot be regarded lightly. The chances for the discovery of a method that would be both certain and harmless is not great.

Radiation.—Mention was made in Chapter XX of the use of the x-ray in the non-surgical induction of abortion. An amplification of this radiation to produce temporary amenorrhea with resulting sterility has been recommended. In those cases where even a slight surgical

procedure would carry with it the risk of increased mortality, as with heart disease or diabetes, we must give this method of sterilization serious consideration. Experience has shown that in women over forty years of age such sterilization with radiation is more apt to be permanent than in younger individuals. Where the individual to be sterilized is of this age and the disturbances of a premature menopause are no contraindication, we should give preference to this simple procedure. Fear of a deformity in the child, should a pregnancy take place in succeeding years, is not justified by clinical experience. The great objection to its more widespread use is the uncertainty of radiation results in any particular case. There are individuals whose ovaries show marked resistance to radiation even in large doses. At the first re-appearance of a menstrual-like flow, the treatment must be repeated, or surgical measures employed.

Surgical Sterilization

While we shall discuss here only those operations that are done on the woman, it is well to bear in mind, in considering the problem of any given couple, that the simplest procedure is that of vasectomy on the husband. The fact that it does not require hospitalization, is perfectly harmless, and does not in any way inhibit the sexual function of the male should make it the preferable procedure in a large group of cases. Practically, however, it is as yet difficult to persuade many men to undergo this slight sacrifice for the sake of their wives. There are also conditions in which later marriage of the man is a possibility to be weighed.

The vast array of operations that have been devised for sterilization in women make it difficult to discuss this subject with any degree of completeness. The construction of a double vagina recommended by Zomakion and Haendly, one narrow passage ventrally connected with the cervix for the menstrual flow and one dorsal canal for coitus, is mentioned only to be discarded for evident technical difficulties. Pocketing the ovaries beneath the peritoneum of the cul-de-sac is shown to lead to serious disturbances of function and is an extensive operative procedure. The remaining procedures all deal with some method of blocking the passage of sperm and ovum through the Fallopian tubes. The operations suggested consist of ligation of the tube, partial or complete excision, extra-peritonealization of the fimbriated end, intra-uterine cauterization of the isthmie portion, or a combination of these methods.

Tubal ligation, first employed by Blondel in 1823, and more frequently employed by Dührssen and Kehrler toward the end of the last

century, was found to be very unreliable. Continuity was not infrequently re-established, even where the tube was cut between the ligatures. The healthy tube of fertile women is in this respect very different from the diseased tubes of those less fertile individuals upon whom even a successful salpingostomy with patency is not followed by a pregnancy. It was necessary therefore to resort to more radical procedures. Complete double salpingectomy has been done in many cases but because of its danger of interference with ovarian circulation is not recommended. It is an unnecessarily extensive procedure and depends for success upon the careful excision and closure of the uterine end.

Of the various operations that deserve careful consideration we can distinguish two groups:

- (1) Those intended for permanent sterilization.
- (2) Those designed to make possible a re-establishment of the patency of the tubes if a pregnancy is later desired.

Permanent Sterilization

Operations for *permanent* sterilization may be divided into four groups:

- (1) Crushing of a loop of the tubes followed by ligation.
- (2) Excision of the isthmie portion of the tubes with peritonealization of both ends.
- (3) Severing the tube about one inch from the uterus and transplanting the uterine end beneath the peritoneum or within a uterine incision.
- (4) Excision of the entire cornual portion of the tube with careful closure of the uterine wound.

(1) **Crushing Loop Operation.**—The advantages of this method suggested by Madlener and modified by Walthard (Fig. 130) lies in its simplicity and in the fact that it has been successful in the very large series in which it has been employed. In several cases where the tubes were later removed in connection with other operations and studied microscopically, the satisfactory results could be explained by the complete destruction of the tubal mucosa in the crushed area. Saenger found that adding his own 620 cases to Madlener's 166 cases and Gianella's 604 cases from Walthard's clinic, there was but one failure in 1,390 operations; certainly to be designated as a satisfactory result. Saenger stresses the importance of using an 8 mm. wide enterotribe without corrugations to crush the tubes and picking up a large loop of the tubes as advised by Walthard. Other operators have,

however, not been so successful, so that Fraenkel, collecting 5 failures from various reports, terms it an insecure procedure.

(2) **Resection of Tubes with Peritonealization.**—Some operators prefer to ligate the tube near the uterus, and after incising the peritoneum over the tube, resect about 3-4 cm. of it. A very careful suturing of the peritoneum over the two ligated ends effectively covers them and prevents the passage of sperm or ovum from one portion of the tube to the other (Fig. 131). Satisfactory results have been obtained with this technique in several thousand cases in institutions for the insane and feeble-minded in this country.

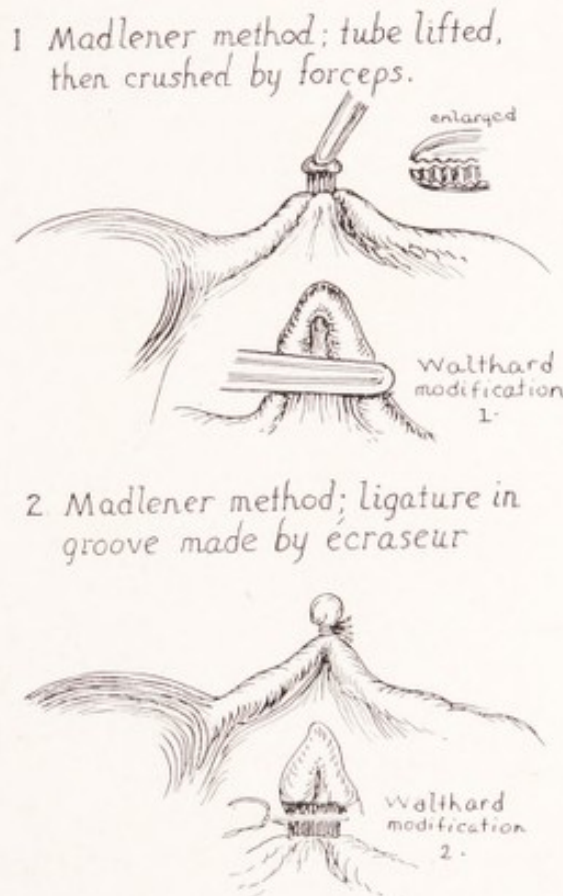


Fig. 130.—Madlener operation for tubal sterilization with the addition of Walthard's modification, according to which a larger loop of the tube is crushed and then ligated.

(3) **Burying the Severed Uterine End of the Tube in the Uterine Wall.**—Irving plunges an artery forceps beneath the peritoneum and outer uterine wall at the cornual angle to make a canal into which is drawn the ligated uterine end of the tube. In this way about 2 cm. of the tube are buried deeply in the anterior uterine wall and fastened there by several sutures. The distal end of the severed tube is covered by the peritoneum of the broad ligament. When this type of operation is combined with a therapeutic abortion, H. Fuchs prefers to im-

plant the severed end of the tube directly into the fundal incision through which the ovum has been evacuated. It is claimed for this operation that utero-abdominal fistulae are less likely to occur and that few sutures are required. The method has not as yet been used long enough to determine results, but is worthy of further trial.

(4) **Excision of the Uterine Cornua.**—It is logical to assume that closure of the tube can most readily be accomplished at its narrowest portion. Among gynecologists a widely adopted technique of tubal sterilization is therefore based on the excision of the uterine cornua containing the interstitial portion of the tube. A disadvantage of this

1. Incision through peritoneum.

3. Suturing incision.



2. Tube lifted for exsection.

4. Incision closed; tube ends buried

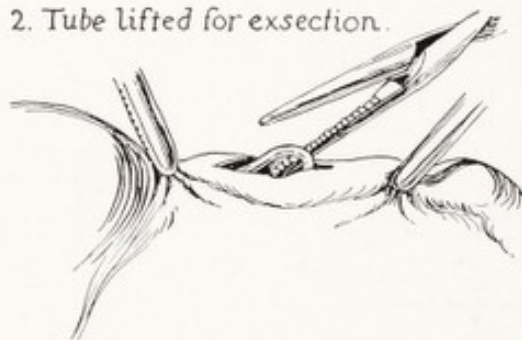


Fig. 131.—Resection of a segment of the tube near the uterus with peritonealization of the two ends for purposes of sterilization.

method lies in the increased bleeding and longer time required in its performance. The occasional failures reported by this method can probably be ascribed to faulty technique. Particularly are mistakes and hemorrhages likely to occur where the sterilization is done vaginally with undue haste and improper exposure. The excision of the uterine cornua should include not merely a small wedge but the greater part of the interstitial portion of the tube and the wound should be closed in layers with separate peritoneal sutures as recently described by P. Thiessen (Fig. 132). My own modification of this technique, as shown in Fig. 133, consists of further fortifying the seal-

ing of the uterine wound by catching the round ligament with its peritoneal fold and suturing over this wound. Since many of these cases are multiparae, the folding over of the round ligament has the added advantage of elevating and holding forward the sagging uterus.

Fraenkel after reviewing all methods of sterilization concludes that excision of the tubal cornua has given the most satisfactory results. Reis compares results obtained by cornual excision with those following the Walthard-Madlener type of operation at the Michael Reese

1. Exsection of wedge at cornu.



2. Cross section; diagram of closure of cornu.



scale 0 1 2 in.

Fig. 132.—Cornual excision of the interstitial portion of the tube with suture of the uterine wound in layers.

Hospital (1925-1931). He found that with the same operators there were 91 cornual operations without a failure and 49 Madlener operations with two known subsequent pregnancies.

Reversible Operations for Temporary Sterilization

Between the two extremes of simple contraceptive measures on the one hand and permanent sterilization on the other, we find a small but definite group of patients in whom it is desirable to obtain the certainty of operative sterilization for a period of time without making it impossible for them ever again to have children. In certain cases of tuberculosis and other systemic diseases, the physical condi-

tion of the patient may after a time show such marked improvement as to make pregnancy no longer contra-indicated. It also happens occasionally that the death of children early in life makes the mother willing to take renewed risks for the sake of not being left childless. Finally we have a group of persons who should be sterilized but are unwilling to agree to such measures if they are denied the possibility of changing their minds at some later time. For such individuals surgical measures have been suggested that effectively block the tubal passages without destroying their continuity and so enable the surgeon at a later time to re-establish patency by a second operation.

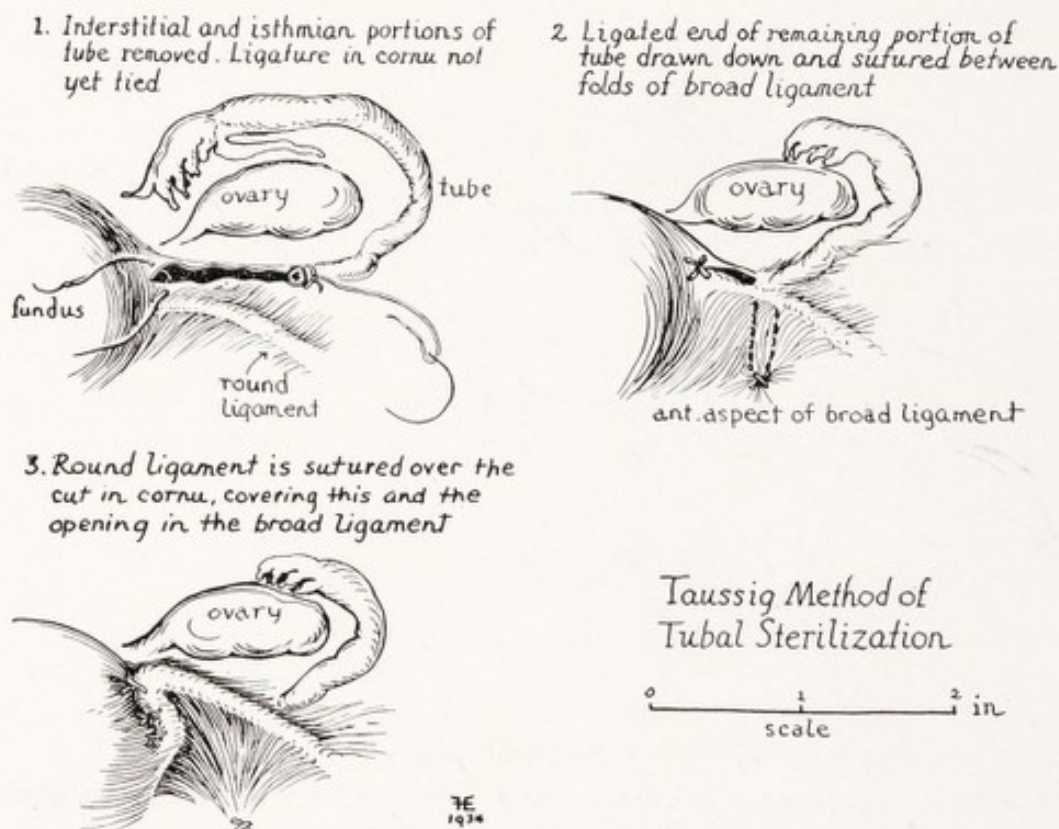


Fig. 133.—Cornual excision method of Taussig. The essential features of this operation are: the complete excision of interstitial and isthmic portions of the tube, the repair of the uterine wound in layers, the reduplication of the round ligament with its peritoneum over the uterine wound, and the burying of the distal ligated end of the tube between the folds of the broad ligament.

The chief of these so-called “reversible” operations for temporary sterilization may be grouped under two heads:

- (1) those in which the ampulla of the tube is buried beneath the pelvic peritoneum
- (2) those in which the ampulla of the tube is drawn into the inguinal canal and anchored there extraperitoneally.

In the first of these operations a peritoneal pocket in which the end of the tube is lodged is constructed usually between the bladder and

the uterus. In Littauer's operation the tubes are drawn forward beneath a puncture wound under the round ligament and sutured together in front of the uterus; then they are covered by the vesical peritoneum. In a recent cervical Cesarean section where temporary sterilization was indicated I found no difficulty in attaching the ampulla of the tubes over the lower uterine segment and covering them by a fold of the bladder peritoneum. This technique corresponds to the operation of Alfieri which Francesco has used in 30 cases without a failure.

In the inguinal operation of Menge and Stoeckel a short incision is made over the inguinal canal as in the Alexander operation for retroverted uterus. The peritoneum is then opened at the internal ring to pick up the end of the Fallopian tube and draw it out of the abdomen. The small opening in the peritoneum is then closed tightly around the tube. Since there is some pull upon the tubes, these should be firmly anchored to the fascia of the inguinal canal. The procedure is repeated on the opposite side through a separate incision. This operation has the advantage that the peritoneal cavity is invaded only momentarily and the operative risk is thereby reduced.

Tubal Coagulation

Dickinson and others have advocated a method of intra-uterine electro-coagulation of the tubal cornua with production of a stricture that seals the entrance of the tubes into the uterus. Sterilization by this method has the advantage that it can be done in the office or clinic dispensary without an anesthetic. As failures are reported in about 10 per cent in over a hundred cases, further tests must be made before it can be accepted as a secure method of sealing the tubes. The treatment is given soon after a menstrual period, and both sides may be done at one sitting (Fig. 134). A description of the technique is given in Dickinson and Bryant's "Control of Conception," page 134. With training in the use of the hysteroscope, it may become possible to visualize the opening of the tubes and make for greater accuracy of cauterization and even for a re-opening of the strictured tubes if pregnancy should later be desired.

Causes of Failure

With the use of almost any of these newer methods of tubal occlusion, the number of unsuccessful cases is extremely small. While the older methods of ligation and section had from 5 to 10 per cent of failures, the newer sterilization technique has only a fraction of one per cent of failures. Even this is too high, however, when we consider

the importance of absolute prohibition of pregnancy in many of these cases. Analysis of the failures is therefore of some value. In the Madlener operation the obliterated ends of the tubes are closely approximated and if the obliteration is incomplete, the lumen may be re-established. In the cornual operation the occasional development

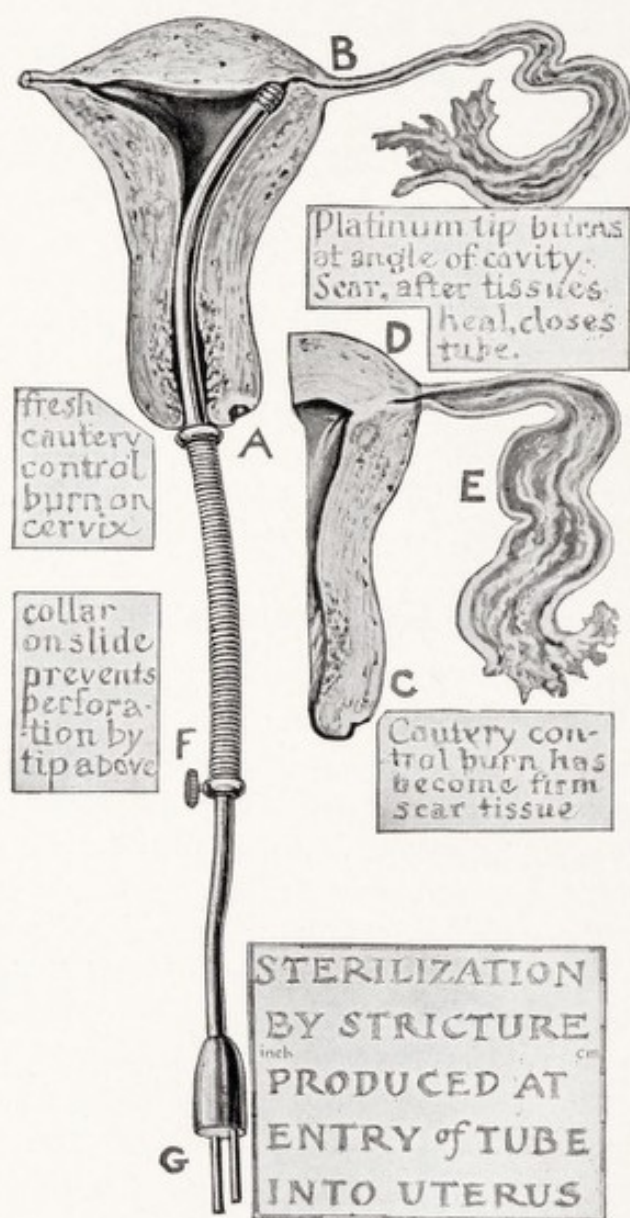


Fig. 134.—Dickinson's method of electro-coagulation of the tubal cornua. Sterilization can thereby be accomplished without resort to hospitalization or operation. (Dickinson and Bryant.)

of a utero-abdominal fistula is due to superficial excision and inaccurate closure of the uterine wound. When the technique of Thiessen with the addition of my plication of the round ligament is employed, it seems a physical impossibility for any fistula to develop. Many of the failures are associated with the vaginal operations for steriliza-

tion. Unless the pelvic floor is relaxed and the uterus can be drawn down into the vagina so as to allow for good exposure of the uterine portion of the tube, accurate closure is difficult and therefore insecure. In most cases it is better to make a small abdominal incision and see clearly the structures that are to be resected and sutured.

Choice of Method

When the physical condition of the patient makes it desirable to do the shortest, simplest operation possible, the Madlener operation is to be preferred. In all other cases cornual excision with careful closure in layers is the safer and hence better procedure. Where sterilization is to be done at the time of a therapeutic abortion it is better to do both uterine evacuation and tubal closure through an abdominal incision. Only in very obese patients or in the presence of marked pelvic relaxation is the vaginal route to be preferred. If permanent sterilization is to be done with a therapeutic abortion, the fundal incision with excision of the interstitial part of the tubes gives the best results. If temporary sterilization is desired, a sagittal cut is made in the anterior wall to evacuate the uterus followed by the Littauer or Alfieri operation. For temporary sterilization alone without abortion, the Menge operation has the advantage of being practically an extraperitoneal procedure.

CHAPTER XXII

METHODS AND ACCIDENTS OF ILLEGAL ABORTION

IN THE EFFORT to rid themselves of undesired pregnancies, women have in the past employed almost every known poison and every conceivable type of instrument. Merely to list, without comment, the various measures that have been utilized would take many pages of this monograph. In his book "Die Fruchtabtreibung durch Gifte und andere Mittel," Prof. L. Lewin has recorded a vast literature and any one who wishes more detailed information on this phase of the abortion problem would do well to consult his volume of 523 pages. I shall mention only a few of the more common drugs and methods employed, since the vast majority of these have no specific abortifacient properties and belong more properly in a volume on toxicology. In fact, a considerable portion of our knowledge of poisonous drugs is derived from the human experiments made upon themselves by women desirous of an abortion. It is an evidence of the desperate state of mind of these women that they so willingly face self-destruction in their efforts to terminate a pregnancy. Success awaits them in but a small portion of cases. Yet, decade after decade, they continue to try anything that has been recommended. Of late, however, particularly in the larger towns and cities, instrumental interference by a trained abortionist has largely replaced the haphazard use of drugs and homemade appliances.

Abortifacients

The measures employed to bring about an illegal abortion may be considered under three heads:

- (1) Drugs,
- (2) Physical agents,
- (3) Genital instrumentation.

Drugs.—Greater accessibility of *vegetable drugs* in a pure form has led to their wide employment in preference to either animal or mineral preparations. In former generations when the vast majority of people lived in the country, it was a simple matter for the women to go out into the woods and fields and pick the berries, leaves or roots of such plants as, according to old wives' tales, would "bring them around" if they were pregnant. The brews and concoctions suggested for this

purpose were innumerable, but here and there chance came upon some drugs that seemed more frequently to bring about the desired result.

Of these *ergot of rye* was one of the most popular, and its definite action in stimulating uterine contractions has made it the recognized agent for controlling postpartum bleeding. All clinical experience has shown definitely that its effect is reliable only if the pregnancy is at or near term, and the uterus already in a condition to respond to irritation by contraction for other reasons. In the early months when the interruption is most often desired, it is successful only in less robust women with a tendency to spontaneous abortion. It is one of the less dangerous ecbole drugs.

The efficacy of *quinine* in strengthening contractions that have already begun is undeniable, especially in the latter half of a pregnancy, but according to Haberda, only exceptionally will a woman be found so sensitive to it as to abort without some other contributing cause. Large quantities up to 70 or 80 grains have been taken at times as an abortifacient without result.

More poisonous in their effect are such drugs as *oil of savin* (*Juniper sabina*). This popular agent for abortion has been used since ancient times. Lewin in reviewing the literature records 21 cases in which abortion was produced by means of this drug, but was followed in nine instances by the death of the patient. In eleven additional cases the drug failed to interrupt the pregnancy, but killed four of the women who took it. The pronounced purgative effect of *aloes* has led to its use in abortion, although with but scanty success, and in some cases serious illness and even death have resulted. Other herbs that have been recommended for this purpose are saffron, thyme, cloves, hellebore, sassafras, rue and hydrastis.

Tobacco, as mentioned in the chapter on Etiology, has apparently some increased tendency to produce abortion when it is absorbed over a long period of time by workers in tobacco factories, but has no immediate effect as an abortifacient drug.

In rural America *tansy* tea is the favorite remedy. It is relatively harmless, with only an occasional death reported, but it is also almost invariably useless unless other measures are also employed or the patient is unusually predisposed to abortion.

From recent literature it would seem that *apiol* (parsley) is now the popular drug. Joachimoglu believes that its abortifacient action is sufficiently definite to make it advisable to prohibit the sale of this drug without a physician's prescription. Its effect is that of the drastic purges. Guttman warns against the popular use of *apiol*, since it contains a poison that in large doses produces nerve paralysis.

He cites two cases, one with atrophic paralysis of the extremities and one with polyneuritis, both conditions having an unfavorable prognosis.

Many *inorganic drugs* also have been employed illegally for interrupting pregnancy. *Metals*, such as lead, mercury, copper, arsenic and phosphorus, produce their effect indirectly by toxic action upon the kidneys and intestines.

Lead is the most important of this group since it unquestionably has a specific deleterious effect upon the chorionic epithelium (Fig. 135). This leads to fetal death and abortion in a high percentage of workers in the lead industry. The harmful effects of lead can be seen even in those children who have been carried to term. Lewin gives



Fig. 135.—Destructive effect of lead on the fetal epithelium of animals. (Blair-Bell, London Lancet, 1924.)

as illustration the results of 123 pregnancies among lead workers, 64 of which ended in abortion, 9 in dead premature births, 35 children dying within the first three years, and only 15 surviving. An English report states that 239 mothers who, before being employed in the lead industry, had had 487 pregnancies with 34 abortions, were found after being so employed, to have 566 pregnancies with 67 abortions. There was therefore an increase from 7 to 12 per cent in abortions as a result of their new occupation.

The knowledge of this abortifacient action of lead has conduced to its widespread use by midwives and druggists as an agent to interrupt pregnancy. In the form of *diachylon* pills containing mainly

oleate of lead, it has been widely used in England, and according to Parry, efforts are being made to control their sale since cases of lead poisoning confined chiefly to women of the childbearing period in the neighborhood of Nottingham led to an investigation that showed diachylon was the main ingredient in "*Mrs. Seagraves' Pills*," a popular abortifacient. Mrs. Seagraves, alias Wardell, was subsequently convicted of producing abortions by this means. The terrible consequences of taking diachylon pills are illustrated by Parry in the history of an unmarried girl aged twenty-two, who took them for delayed menstruation. She was attacked with symptoms of lead encephalopathy, from which she eventually recovered, but remained completely blind as a result of optic atrophy. The *Pharmaceutical Journal* for August, 1934, contains an account of the current legislation on this subject in Great Britain.

In Sweden, where *phosphorus* has been largely used in the manufacture of matches, we find many cases in which match heads were eaten to bring on abortion. While pregnancy was often terminated by this means, it almost always led to jaundice and severe toxic symptoms, with occasional fatal outcome.

Of *animal poisons* commonly used for abortion, mention should be made of *cantharides* (Spanish Fly) and *snake venom*. They usually fail to interrupt the pregnancy, but are highly toxic. More effective are the *pituitary extracts*, although these are difficult for the laity to obtain in sufficient quantity to bring about an abortion.

Physical Agencies.—Less popular with the laity are various forms of *external mechanical or thermic trauma* to bring on uterine contractions. A hot foot bath or hot sitz-bath is occasionally used in combination with other measures, but rarely produces results. Excessive exercises, jumping, gymnastics, carrying heavy objects, rough automobile rides, etc., are resorted to. More effective is direct trauma to the abdomen, such as jumping or pounding upon it, as employed by savage races, but such injuries are usually ineffective except in more advanced pregnancy and may lead to a premature separation of the placenta, with serious consequences. Electric shocks by means of a static machine may, in women whose uterus is easily aroused to contraction, terminate in miscarriage. On the other hand, as noted before, we have innumerable examples of women who have endured the most severe physical and nervous shocks without any effect upon their pregnancy.

Genital Instrumentation.—Vaginal applications, suppositories and douches are but little more effective than the external measures already mentioned. If, however, the instrument or medicine is brought

within the uterine cavity, it is apt to bring about the abortion. Among the poorer classes who cannot afford to go to an abortionist, various devices have been utilized to gain this object. Many women who wish to have no more children train themselves to feel for the location of the cervical orifice, and without any effort toward sterilization, slip instruments within the cervical canal and successfully terminate their pregnancy. A whole galaxy of instruments have been used for this purpose (Fig. 136), from goose feathers, crochet needles and pen-holders to hatpins and catheters.

In America *slippery elm tents* are used, with or without the assistance of a midwife. In Roumania, *malven roots* with a string attached are commonly applied to the cervix. These agents, like laminaria, swell up with moisture and dilate the cervical canal, thus bringing on an abortion. In Hungary, pine needles, and in Slovakia thorns are a favorite means of rupturing the membranes and producing abortion.

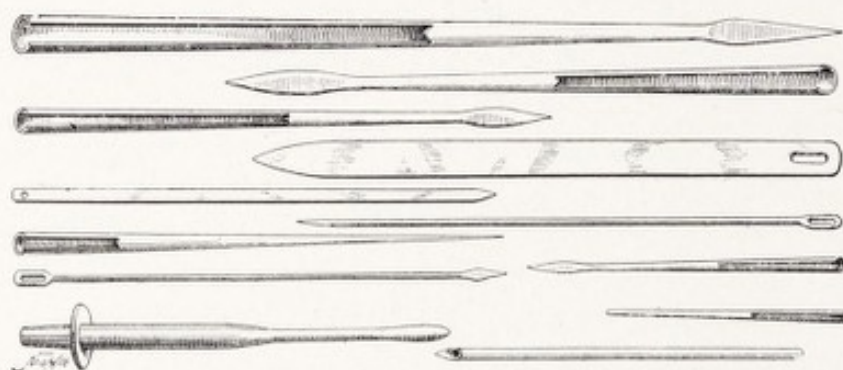


Fig. 136.—Collection of instruments for illegal abortion sold in Paris.

In recent years the long stem, or spring type of intrauterine *pesary* has often been introduced by the abortionist to bring on abortions. Its use as an agent to prevent conception makes it readily available for this other purpose, when desired.

The professional unskilled abortionist, whether midwife or charlatan, depends largely upon the intrauterine syringe for success in his or her maneuvers. Soap solutions or glycerine are injected as a rule, and only rarely is the measure taken of the amount of the injected fluid. To the danger of infection by unsterile instruments and the local cauterizing effect of the injected fluid, we have the added risk of forcing some of the fluid through the tubes into the abdominal cavity. If the second party to the abortion is more timid, he or she may prefer merely to introduce a soft catheter into the uterus. This should suffice to start the abortion, but occasionally it produces no effect; many cases are on record where the catheter has been delivered

at term with the baby, or if a uterine perforation has been made, has been found years later in the abdominal cavity.

Abortion Attempts in the Absence of Uterine Pregnancy.—A very considerable number of cases are described in which either the pregnancy is in the tube instead of the uterus, or the patient is not even pregnant, but merely amenorrhoeic. The attempt to bring on an abortion under these conditions is likely to lead to serious accidents. The abortionist meeting with failure at the first attempt is inclined to repeat the procedures, each time with greater violence and greater risk of perforation and infection.

Magid and Pantschenko have recently summarized some of the literature on induced abortion in *tubal pregnancy*. They cite 81 such cases reported by Zeitlin and refer to the article by Gruzdev, who from personal experience found that intrauterine attempts at abortion had been made in 15 out of 180 cases of ectopic pregnancy. In their own series of observations Magid and Pantschenko found that in the course of nine years 51 cases of attempted abortion had occurred in 726 tubal pregnancies. Infections are less commonly noted in reports from Russian sources, since there the attempted abortion is done in a hospital by a physician. In other countries where such technique is not routinely employed, serious and often fatal complications ensue. No accurate tabulation of these infected ectopic deaths exists, but their number must be considerable.

Many cases are also on record in which instrumentation for purposes of abortion was done in women who were not pregnant. Liebeck, in 1913, gave a list of 49 such cases, 18 of which ended fatally. Many cases have since been reported, but the vast majority never get beyond the knowledge of the midwife who has made the mistake. In cross-questioning patients concerning previous abortions it is quite common to get a history that clearly points to temporary hypofunction of the ovary, simulating pregnancy. The patient desiring an abortion under these circumstances goes to a midwife, who by her manipulations produces a slight flow of blood and tells the patient everything has come away. Professional abortionists take advantage of the fears of these women by telling them they are pregnant, when they are reasonably certain that this is not the case, in order to get an extra fee for a curettement. When the patient herself employs instruments in the absence of pregnancy, serious accidents are apt to occur. The absence of softening leads to the employment of more force. In Zikmund's case the bougie broke off leaving the stump in the uterus. This stump subsequently worked its way through the uterus and was recovered by operation in the epigastric region.

Accidents of Illegal Abortion

Perforation of the uterus, the most frequent type of injury resulting from illegal abortion, has already been considered in a previous chapter. Neighboring organs are, however, also traumatized occasionally by the inept manipulations of the patient or attendant. Catheters and bougies have, by mistake, been slipped into the bladder and later required operative removal. A deep injury to the vaginal portion of the cervix by means of a screw driver was recently re-

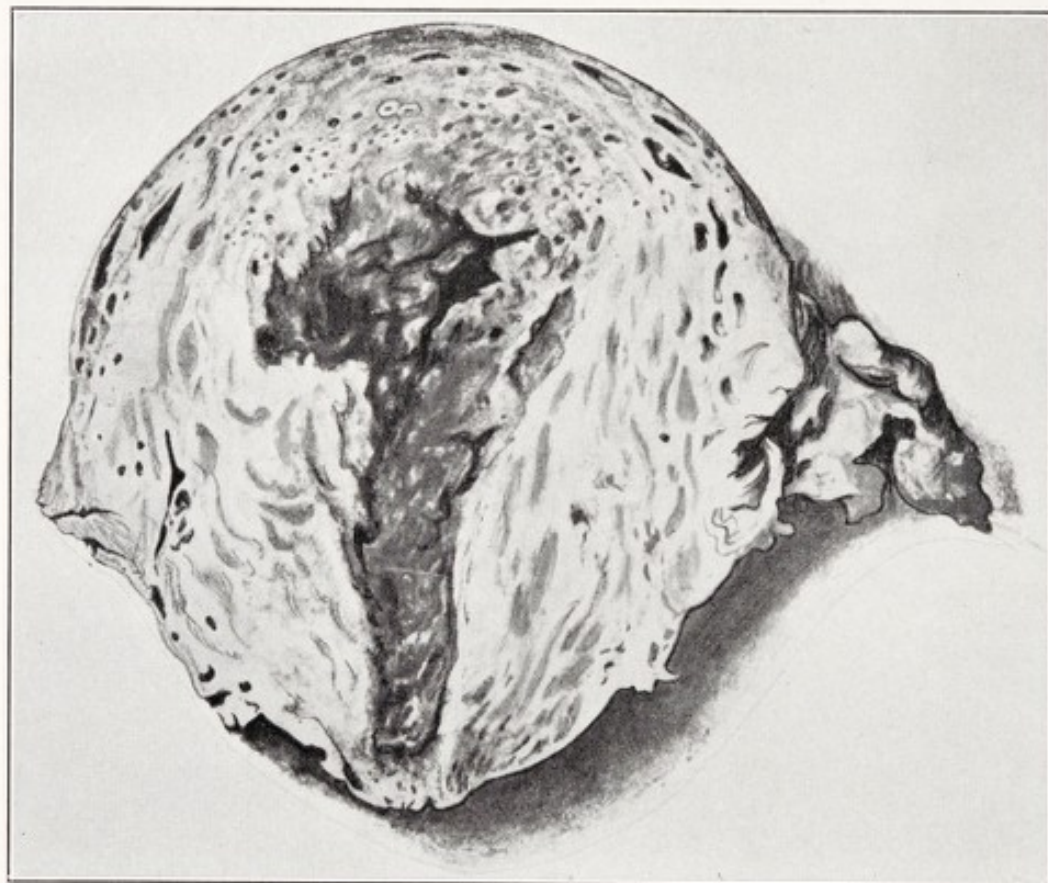


Fig. 137.—Physometra of the uterus due to gas bacillus infection. (Brütt.)

ported by F. Müller. Vesico-vaginal and recto-vaginal fistulae may result from crushing or perforating instruments used in these illegal procedures.

Even greater is the risk due to the introduction of infectious organisms. The pathological processes resulting from infections by the ordinary septic organisms have already been described in Chapter XIV. Owing to the uncleanness and type of instrument employed by many patients it may happen that *tetanus* bacilli are introduced. The mortality of these tetanus cases is even greater than that of virulent streptococcus infections. G. H. Schneider, reviewing the

literature, found 111 cases (including two of his own) with 91 per cent mortality. Both of his cases ended fatally in spite of tetanus antitoxin, and the addition of a hysterectomy. Since the outcome is hopeless when the disease has already manifested itself, Schneider advises *prophylactic administration of tetanus antitoxin whenever* the history suggests a reasonable possibility of contamination with earth, dust from the streets, or animal excreta. Liebhardt calls attention to the uncertainty of bacteriologic findings and the difficulty of finding tetanus bacilli in the secretions, since they do not multiply rapidly.

Infection with the *gas producing organism of Welch and Fraenkel* is almost equally serious. E. Strassmann describes as typical of this

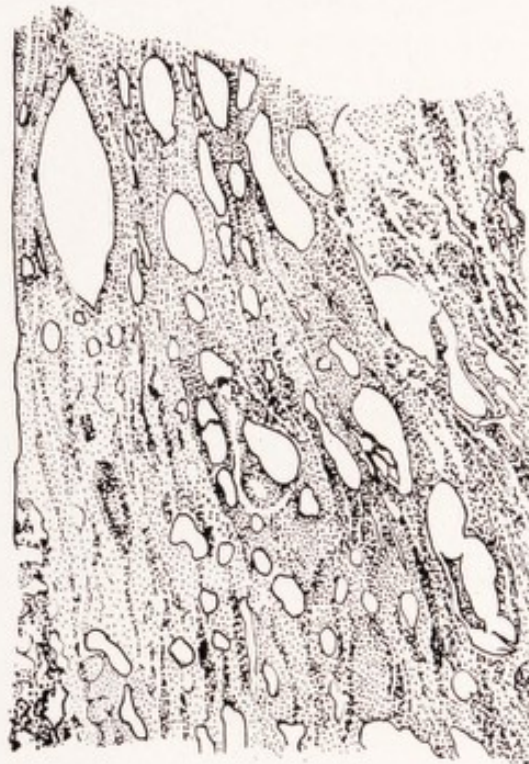


Fig. 138.—Microscopic section of case of physometra shown in Fig. 147. (Brütt.)

infection, icterus, cyanosis, and scanty brownish-black urine. The color of the urine is due to the hemolytic quality of this organism and the hemoglobinuria. In the uterus it produces tympany with necrosis of the retained portions of the ovisac. When the organisms penetrate the uterine wall we have a crackling sensation on palpating the uterus, due to physometra (Fig. 137). In a few cases there has been recovery after drainage, with or without the addition of a hysterectomy. If, however, the organism has entered the blood stream, the outcome is always fatal in a short time, sometimes in a few hours. At autopsy all the organs are found permeated with foamy material (Fig. 138). Such postmortem changes in the organs cannot, however, be definitely

attributed to this organism, since they may be due to agonal changes in the oxidation of the blood, permitting the invasion of gas-forming saprophytes from the intestines. Extension of the infection to the buttocks may produce large areas of superficial necrosis (Fig. 139).

Air-embolism is another frequent accident attending induced abortion. In recent years, owing to the widespread popularity of injecting *pastes* into the uterine cavity by means of a powerful syringe, to bring on an abortion, deaths from air-embolism have rapidly multiplied. The subject of these pastes is discussed in greater detail under the head of Therapeutic Abortion. Here we would especially mention the many cases in which air-bubbles are introduced with the intra-uterine injection of soap solutions. Asch says that these soap-bubbles may be sucked into the venous sinuses and carried to various organs.



Fig. 139.—Bilateral gangrene of the buttocks associated with gas bacillus infection following uterine abortion. (O. Schmidt: Zentralbl. f. Gynäk., 1932.)

Experimental work done by Parade and other tends to the belief that air alone entering the blood stream under normal conditions is not as a rule dangerous. The combination with soap, however, is far more serious. It happens at times that the air-embolism is localized in the brain. Burgerhout relates the history of a twenty-three-year-old maid found unconscious with instruments for abortion beside her. Definite signs of paralysis, respiratory disturbances, eye symptoms, and glycosuria appeared. After ten days there was returning consciousness, but after ten weeks still some amnesia. She finally recovered. Neller, in discussing a similar case with definite brain lesion, claimed that the statement that air cannot pass from the venous to the arterial system in the lungs is false. He seeks to prove this by experiments. Pulmonary embolism with resulting lung infarction is, however, more usual and if a larger vessel is blocked may result in sudden death.

CHAPTER XXIII

STATISTICS OF ABORTION

THE INTRODUCTORY chapter included an estimate of the approximate number of abortions and deaths resulting therefrom in the United States, each year. The figures arrived at, by the best means at our disposal, were 681,600 abortions, with 8,179 deaths, or a death-rate of 1.2 per one hundred abortions. These figures are believed to be minimum, and are based not upon direct observation but upon inferences from the only data available. When we leave the general inquiry into the total size of the problem and turn to studies of special phases, we are on much safer ground, and find considerable help in understanding the social aspects of the subject.

The following pages summarize the available statistical findings in various countries regarding the relation of abortion to such factors as population, puerperal mortality, childbirth, causative agents, age, multiparity, legitimacy, race, religion, urban and rural life, and preventability.

A few of the larger source tables, not essential to the text, have been placed at the end of the volume in Appendix B. The most striking fact in all these statistics is the evidence of the marked increase in frequency of abortion in the last twenty-five years.

Relation to Population

The rate of abortion in any district may be calculated either on the basis of the total population, or on the number of women of child-bearing years. The latter is called by Roesle the *pre-fertility rate*, and is more valuable for comparative purposes as between rural and urban areas, or between two periods of time, since local variations in population make-up are obviated, such as the larger proportion of young women to be found in any town, because of the influx of youth from the country. Roesle shows that changes in abortion rate appear quite different when calculated on the two bases, and cites the German town of Magdeburg where a careful survey was made in 1912 and again in 1927. The differences are shown in Table VIII where it appears that there was a 4 per cent decline in the abortion rate from 1912 to 1927 when calculated on the total population, as compared with a 12 per cent decline in abortions calculated on the pre-fertility rate.

TABLE VIII

ABORTION RATES: GENERAL POPULATION AND PRE-FERTILITY IN MAGDEBURG, GERMANY, COMPARING 1912 AND 1927

(After Roesle: Statistische Jahrbuch der Stadt Magdeburg, für 1927)

(1) YEAR	(2) (3) TOTAL POPULATION		(4) TOTAL ABORTIONS	(5) (6) ABORTION RATIO PER 1,000	
	GENERAL	WOMEN OF CHILDBEARING YEARS: 15-45		TO GENERAL POPULATION	TO WOMEN OF CHILDBEARING YEARS: 15-45
1912	288,000	72,000	1,458	5.1	20.3
1927	298,000	81,000	1,448	4.9	17.9
(Decline)	-----	-----	----	(4%)	(12%)

For the city of Berlin, however, Roesle calculates that the pre-fertility rate was 31 per thousand in 1926 and 33 per thousand in 1927. When we compare the figures for Berlin in 1927 with those for Magdeburg we see that the ratio was almost twice as large in Berlin. This corresponds with the general belief that induced abortions are particularly prevalent in the large metropolitan centers.

From Russia we have accurate figures on the population of Leningrad, and in the year 1926 we find that 21,646 abortions were registered, a rate of 44 per thousand women between fifteen and forty-five years of age. While these figures exceed those of Berlin, the difference may be an apparent rather than a real one, since it is fairly certain that large numbers of criminal abortions fail to be recorded in the Berlin calculation.

Birth Rate.—Engelsmann, in extensive statistics from the city of Kiel, contended that there is no decrease in the number of pregnancies but that the decrease in the birth rate is brought about by the increase in abortions. Specially significant is the decrease in the number of children among fertile families; and also the fact that while the percentage of births is still highest in the laboring classes, these also have the highest percentage of abortions.

This influence of abortions upon the birth rate has been emphasized with some justice in the Soviet government reports. Dr. A. B. Genss, the official statistician on this subject, points out that while between 1910 and 1927 the birth rate in England dropped from 28.4 to 16.7 per thousand (a decrease of 41 per cent), and in Germany it dropped from 34.7 to 18.3 (a decrease of 47 per cent), and while all the other European countries showed a similar decline, the Russian birth rate had only declined from 47.2 per thousand in 1910 to 44 in 1927, thus remaining by far the highest for all Europe.

Legalization of abortion, Genss points out further, has not produced in Soviet Russia any material decline in the birth rate. In illustration of this he cites the figures from Moscow in 1913 and in 1926. In 1913

the birth rate was 32 per thousand, while in 1926 it was 29 per thousand. On a basis of 2,019,453 population in 1926 a continuance of the birth rate of 1913 would have produced 66,000 children. In fact 58,384 children were born that year. There remains, therefore, a deficit of 7,000 children or 3 per thousand. Now the index of abortions was 16 per thousand in 1926 in comparison with 3 per thousand in 1913. If we add the 3 per thousand of 1913 and another 3 per thousand which represents the true increase in abortions, we get 6 per thousand as against 16 actually observed. With some justice Genss interprets the difference between these two figures, amounting to 10 per thousand abortions, as the correct figure for the secret unregistered abortions. His claim, therefore, is that, instead of there being over five times the rate of abortions in 1926, as compared with 1913, the true increase with legalized abortion amounted to but 3.4 per thousand, approximately 30 per cent. Genss' figures are of course based on the assumption that there has been no increase in the percentage of conceptions, and if we consider the extensive birth control propaganda in Russia, we can I believe fairly assume that, even in spite of ostensibly laxer moral conditions, there has been no increase in the ratio of conceptions.

One of the best statistical studies on abortion, although limited in its numbers, has recently come from the Swedish city of Malmo. Lindquist analyzes in great detail 2,047 abortions from 1898 to 1927 with the following general conclusions:

(1) The number of abortions in Sweden in 1920 showed a 27 per cent increase over 1913, whereas confinements were only 10 per cent greater.

(2) The decrease in the married fertility ratio (children per 1,000 married women of 17 to 45 years) was from 245 in 1908 to 90 in 1927. This decrease was only slightly influenced by increased abortions.

(3) The decrease in the unmarried fertility ratio from 52 in 1908 to 19 in 1927 is largely explained by increased abortions.

(4) Registered abortions increased from 121 in 1910 to 282 in 1927.

From New York City we have definite evidence of the increasing number of abortions. Illegal abortions are reported to the Department of Health from hospitals, dispensaries and other sources. Dr. Kahn notes a gradual increase between 1926 and 1929, with a drop in 1930 and a considerable increase by 1933:

1926—1,350	1929—2,568
1927—1,783	1930—2,313
1928—2,380	1933—5,197

Dr. Kahn's report is confirmed by the survey of puerperal mortality in New York for the three years 1930 to 1932 made under the direction of a special committee of the New York Academy of Medicine. This study which excluded cases classified as "criminal abortions" (p. 52) showed that the death-rate from abortion had nearly doubled in these years. (See Table IX.)

TABLE IX
ABORTION DEATH-RATES FOR THREE YEARS IN NEW YORK CITY (1930-1932)
(From Maternal Mortality in New York City, 1933, p. 54)

YEAR	(1) TOTAL DEATHS	(2) DEATHS FOLLOWING ABORTION	(3) PER CENT OF ALL DEATHS	(4) RATIO PER 1,000 LIVE BIRTHS
Total Three Years	2,041	357	17.5	1.0
1930	675	91	13.5	0.7
1931	708	127	17.9	1.1
1932	658	139	21.1	1.3

In the analysis of 2,097 abortions observed in the Cincinnati General Hospital from 1918 to 1932, W. M. Millar found that while the marriage index in Cincinnati rose during this period from 100 to 137 and the birth index increased from 100 to only 104, there was a jump in the abortion index from 100 to 361. This increased frequency was most pronounced in the years from 1928 to 1932, for with a decrease in the number of births from 9,062 to 8,261, there was an increase in the number of abortions at the Cincinnati General Hospital from 171 to 278.

In *Australia*, Worrall quotes the report of the Director General of Public Health to the effect that the number of abortions have increased at a startling rate, from 11 per cent of all female patients treated in 1928 to 15 per cent in 1931. In the latter year there were treated at the Royal Northern Coast Hospital, 904 abortions, with 29 deaths.

Ratio of Abortions to Confinements

The studies of Kopp, Macomber and Plass, quoted in the first chapter, indicate a ratio of one abortion to two and a half confinements in the cities, and one to five in the country districts. In Williams' text book on obstetrics the ratio is given as one abortion to four or five confinements. A similar estimate (1 to 5.9) is given by Whitehouse for England.

More complete data are available from *Germany*, where the ratio given by Schottelius for Hamburg in 1919 was 8,707 abortions to 16,779 confinements, or a ratio of one to two. Nevermann followed

up these figures in Hamburg and found that by 1925 the ratio had increased to two abortions to three confinements. While the abortions had increased from 8,707 to 12,000, the births had only risen from 16,779 to 17,600. Heynemann is convinced that the ratio of abortions to confinements has steadily increased until at the present time in Hamburg the number of abortions equals those of full-term confinements.

The summary, in Table X, of births and miscarriages in all German Maternities from 1902 to 1930, shows a relatively low proportion of abortions; but this does not represent the actual rate in Germany since the great majority of inductions are done illegally, and outside the hospitals. Even these incomplete figures, however, indicate a steady increase in frequency, from a ratio of 3 interruptions to each 100 births in 1902 to 16 in 1930, the most marked difference being between the periods immediately preceding and following the War.

TABLE X
ABORTIONS RECORDED IN GERMAN MATERNITIES, 1902 TO 1930
(J. A. M. A. 102: No. 9, 1934.)

(1) PERIOD	(2) TOTAL NORMAL AND PREMATURE BIRTHS	(3) TOTAL ABORTIONS	(4) RATIO ABORTIONS TO 100 BIRTHS
1902-1904	104,757	3,357	3
1911-1913	190,471	8,466	4
1917-1919	164,707	19,222	12
1920	83,024	8,027	10
1923	70,413	8,681	12
1924	79,964	10,679	13
1925	102,227	11,319	11
1926	110,751	12,354	11
1927	113,632	15,229	13
1928	123,445	18,924	15
1929	132,712	21,093	16

Latzko, in Vienna, found an even more marked increase, the ratio of abortion to confinements increasing from 19 to 57 per 100, or trebling between 1898 and 1913, as shown in Table XI.

TABLE XI
RATIO OF ABORTIONS TO CONFINEMENTS (VIENNA)
(After Latzko: in Halban-Seitz Handbuch VII, 1, p. 561.)

(1) YEAR	(2) TOTAL CONFINEMENTS	(3) TOTAL ABORTIONS	(4) RATIO PER 100 CONFINEMENTS
1898	1,148	218	19
1908	1,894	613	33
1913	3,611	2,068	57

From Poland the figures are not quite so high. In Warsaw in 1921 there were 1,138 abortions and 3,403 confinements, a ratio of one to three.

France, that has always had a rather low birth rate, is reported by Balthazard, Lacassagne and Doleris to have an average of 500,000 to 600,000 abortions every year, making a proportion of practically one interruption to every delivery.

According to Mme. Lebedeva, the average in the small towns of Russia is about one abortion to four confinements, or 25 to 100; but in the large cities, such as Moscow, it is 70 to 100; and in Leningrad in 1929, there were recorded 38,500 confinements at term and 53,000 registered abortions, or a ratio of 138 abortions to 100 confinements.

Types of Abortion

The most general etiological grouping of abortions is by type, whether spontaneous, therapeutic, or illegally induced. The third type is the most common, according to all authorities, here and abroad, the exact proportion varying according to the character of the population and the source of the figures.

Town and Country.—In large cities the proportion of criminal abortions may run as high as 75 to 80 per cent, while in the country districts the figures will appear lower. Heynemann for 1922 gives the proportion of such abortions in Berlin as 89, Hamburg 70, and Munich 66 per cent. Plass in an inquiry among country practitioners in Iowa and surrounding states, found that abortions were grouped as 34 per cent spontaneous, 5 therapeutic and 61 criminal, among all reported by 81 doctors with a combined maternity experience of about 51,000 deliveries.

A California report on 876 abortions, tabulated by C. A. Du Puy of Highland Hospital, indicates a smaller proportion of induced, 340 (35 per cent) as compared with 566 spontaneous (58 per cent) and 70 of unknown origin (7 per cent).

Maternal Deaths.—When the computation is made on the basis of maternal deaths following abortion, the percentage of those reported as criminal is large, but not so large as when figures are gathered by other means. The Children's Bureau study of Maternal Mortality in Fifteen States reports a total of 1,825 abortions, and among the 1,588 cases where the type was recorded, gives the distribution as 37 per cent spontaneous, 13 therapeutic and 50 per cent criminal. It is further believed that most of the remaining 237 cases were probably

induced, judging from the high ratio of septic abortions among them, which was nearly as high as among those recorded as induced. It is noted by the Children's Bureau that these figures cannot be taken as representative of the distribution of types among abortion not resulting in death.

Clinic Figures.—As noted before, the data on abortion assembled in birth control clinics are in some respects believed to reveal prevailing conditions more exactly than those from other sources, because of the way in which they are gathered and the psychological factors involved. Dr. Kopp's book, "Birth Control in Practice," presents more details about more cases than have been analyzed elsewhere; and the findings, being similar to those of other studies, may be taken as representative of reports from maternal health centers in general.

In the 10,000 case histories, 417 were of women who had never been pregnant, and 9,583 of women who had been pregnant from one to twenty times or more, with 38,985 pregnancies or about four apiece, a quarter of all having had five or more. In all, 4,573 women reported no abortions, and 5,010 reported one or more. Altogether there were 11,172 abortions or more than 28 per cent of the total number of pregnancies. If to the abortions the 872 stillbirths are added, this makes a total of 12,054 prenatal deaths or nearly a third of all the pregnancies.

As to type, of the 11,172 abortions, 3,165 (28 per cent) were spontaneous, or one in every twelve pregnancies; only 340 (3 per cent) were therapeutic, an incidence of less than one per cent of the pregnancies, leaving 7,677 (69 per cent) which were terminated deliberately. This makes *one induced abortion in every five pregnancies*. Of these, 4,378, or one in 9 were terminated by a physician; 1,125, or one in 33, by a midwife; and 1,863, or one in 25, by the woman herself. The complete details are given in Source Table A in Appendix A, showing the number of abortions in accordance with the order of pregnancy, and the agent of termination; and certain important features of the situation are summarized in Table XII.

In "A Study of Pregnancy Wastage," R. K. Stix reports an investigation based on personal interviews of 991 women whose records were obtained through the Birth Control Clinical Research Bureau in the Borough of Bronx, New York, from Jan. 1, 1931, to June 30, 1932. This group was largely Jewish, and naturally did not include women who had become sterile or had died of abortion. Her more important findings were:

"Seventy per cent of pregnancies terminated in live births, 20 per cent in illegal abortions, and the remaining 10 per cent in spontaneous abortions, therapeutic abortions, ectopic pregnancies, and stillbirths.

"Catholic women had a higher percentage of live births and a lower percentage of illegal abortions than did the other religious groups, but there were more illegal abortions per woman among Catholics than among Jews.

"The per cent of pregnancies illegally aborted increased as marriage lengthened, though because of increased use of contraceptives the actual number of abortions was not higher in the later than in the earlier periods of married life.

"The proportion of pregnancies terminated by illegal abortions increased rapidly during the past twenty-five years."

TABLE XII

PREGNANCIES AND ABORTIONS REPORTED BY 10,000 APPLICANTS FOR BIRTH CONTROL IN NEW YORK CITY

(Summarized from M. E. Kopp: Birth Control in Practice, Source Table XXII. For details see App. B.)

(1) ORDER OF PREG- NANCY	(2) TOTAL PREGNANCIES	(3) TOTAL ABORTIONS	(4) (5) (6) (7) PER CENT OF PREGNANCIES TERMINATED BY ABORTION OF EACH TYPE				(8) (9) (10) (11) PER CENT OF ABORTIONS* INDUCED BY:			
			TOTAL	SPONTANEOUS	THERAPEUTIC	INDUCED	PHYSICIAN	MIDWIFE	SELF	UNKNOWN
Total	38,985	11,172	29	8	1	20	57	15	24	4
First	9,583	1,000	10	6	1	4	68	11	19	2
Second	8,101	1,585	20	7	1	12	64	13	21	2
Third	6,271	1,955	31	9	1	21	64	13	22	1
Fourth	4,593	1,736	38	9	1	28	59	15	24	2
Fifth	3,242	1,333	41	9	1	31	58	16	25	1
Sixth	2,273	1,054	46	12	1	34	56	16	27	1
Seventh	1,579	712	45	11	1	33	57	15	26	2
Eighth	1,071	519	48	13	1	35	52	19	28	1
Ninth	709	348	49	12	0.1	37	53	20	26	1
Tenth	482	239	50	12	1	37	48	20	32	-
Eleventh	327	172	53	12	2	39	45	15	40	-
Twelfth	231	135	58	13	0.4	45	41	18	41	-
Thirteenth	157	101	64	13	3	48	34	21	43	2
Fourteenth	98	60	61	10	1	50	39	22	39	-
Fifteenth and over	268	223	84	2	1	81	9	3	5	83

*Author gives percentage of induced abortions by each agent of induction in terms of total pregnancies instead of in terms of total inductions as here given.

Age of Mother and Number of Pregnancies

From the Children's Bureau we quote the following statements on age and parity, which are summarized in Table XIII, and detailed in Source Table E.:

TABLE XIII

AGE AT DEATH OF WOMEN WHO DIED FOLLOWING ABORTION AND FROM OTHER PUERPERAL CAUSES

(Summary of Table 64 in Maternal Mortality in Fifteen States, Children's Bureau Publication No. 223, p. 111)

AGE PERIOD	(1)	(2)	(3)	(4)	(5)	(6)
	PER CENT DISTRIBUTION BY AGE AT DEATH					
	TOTAL DEATHS ALL CAUSES	FOLLOWING ABORTIONS OF EACH TYPE				NOT FOLLOWING ABORTION
TOTAL REPORTED		SPONTANEOUS	THERAPEUTIC	INDUCED		
(Total, Age Reported)	(7,350)	(1,825) including unclassified	(589)	(205)	(794)	(5,525)
Under Fifteen Years	*	*	*	--	*	*
15, under 20	12	10	7	8	12	12
20, under 25	21	22	19	26	22	21
25, under 30	21	24	22	21	26	20
30, under 25	19	21	24	20	20	19
35, under 40	18	16	17	15	16	18
40 and over	9	7	11	9	4	10

*Less than 1 per cent.

"The proportion of the maternal deaths that were preceded by abortion increased with the age of the mother up to the age of 30 and decreased thereafter. A larger proportion of the women who died following abortion (45 per cent) than of all women dying from puerperal causes (40 per cent) were from 25 to 34 years of age.

"More than half (52 per cent) of the spontaneous abortions occurred at 30 years of age and over, as compared with 44 per cent of the therapeutic abortions and 41 per cent of the induced. The age at which the largest number of induced abortions occurred was from 25 to 29 years (26 per cent); of the therapeutic abortions, 20 to 24 (26 per cent); and of the spontaneous abortions, from 30 to 34 (24 per cent). It is of interest that 12 per cent of the women who had induced abortions were under 20 years of age, as compared with 8 per cent of those who had therapeutic or spontaneous abortions. The age distribution of women whose deaths followed abortion but for whom the type of abortion was not reported was practically identical with that of women whose abortions were reported as induced.

"Abortions preceded the deaths of 18 per cent of the known primiparae and 26 per cent of the known multiparae in the study. Nearly half (49 per cent) of the deaths of the 526 women of unknown parity were preceded by abortions. Among the primiparae for whom type of abortion was reported, 31 per cent of the abortions were spontaneous, as compared with 40 per cent among the multiparae. The

deaths of known primiparae were preceded in 8 per cent of the cases by induced abortions, in 5 per cent by spontaneous abortions, and in 3 per cent by therapeutic abortions; for 2 per cent the type of abortion was not reported. Among known multiparae death was preceded by induced abortions in 11 per cent of the cases, by spontaneous abortions in 9 per cent, and by therapeutic abortions in 3 per cent; for 3 per cent the type was not reported" (p. 111).

The New York Academy of Medicine report for 1930 to 1932 calls attention to the fact that the larger percentage of abortion deaths did not occur among the primigravidae or in the lowest age groups but that this was found in the period from 35 to 39 years and in women who had been pregnant six or seven times, as seen in Tables XIV and XV.

TABLE XIV
ABORTION DEATHS BY AGE OF MOTHER
(From Maternal Mortality in New York City, Table 16, p. 57)

AGE GROUPS	(1) ALL DEATHS	(2) ABORTION DEATHS	(3) PER CENT OF ALL DEATHS
Total	2,041	357	18
15 to 19	108	20	19
20 to 24	429	85	19
25 to 29	559	96	17
30 to 34	449	64	14
35 to 39	358	73	20
40 years and over	138	19	14

TABLE XV
ABORTION DEATHS BY GRAVIDITY
(From Maternal Mortality in New York City, Table 17, p. 58)

GRAVIDAE	(1) ALL DEATHS	(2) ABORTION DEATHS	(3) PER CENT OF ALL DEATHS
Total	2,041	357	18
I	867	134	16
II	351	47	13
III	236	33	14
IV	176	37	21
V	115	22	19
VI	64	15	23
VII	51	15	29
VIII and over	127	20	16
Multigravidity not reported	16	8	50
Gravidity not reported	38	26	68

These figures, while suggestive, do not tell the whole story with regard to age and parity because we do not know the distribution of ages for all women delivered in any given year, nor the total deliveries of each order of gravidity, or parity.

Corroborative evidence is obtained from Dr. Kopp's statistics indicating that induced abortion is primarily a problem of the mother with many children, the percentage steadily rising from 4 per cent in the first pregnancy to 28 per cent in the fourth and 48 in all over the ninth. While the physician's help to terminate pregnancy was sought in 3 per cent of the total first pregnancies, this percentage rose to 8 in second pregnancy, to 13 per cent in the third and to 16, or over five times as much in the fourth pregnancy. In the case of midwife induction of abortion, these percentages rise from 1.5 in the first pregnancy to eight times as much in the fourth pregnancy. The natural desire of every woman to have a child is evidenced by the fact that in the first pregnancy only one in nine was terminated before viability and half of these were unintentional or spontaneous abortions. On the other hand, when we come to the fourth pregnancy we find that about one in three pregnancies ended as an abortion and that over three-fourths of these abortions were intentional (Table XII and Source Table A).

In Russia, where legalized induced abortion is discouraged among primiparae, Genss has found that only 3 per cent occur below twenty years of age. In the larger towns the majority were in women between twenty and thirty years of age with one or two children, and in the country districts the period of greatest frequency of abortion was in women between thirty and forty years of age with three or four children. In contrast to these figures are those given by Kordobovskij who found that 2,656 women with legal abortions in Lugansk had an average of only 1.7 living children.

Genss gives us also some very interesting figures showing the distribution of abortions and births to the age of mothers in the city of Moscow in 1926, as shown in Table XVI. Here the abortion rate grows steadily with age, so that after forty, nearly half of the pregnancies are interrupted.

TABLE XVI
ABORTION IN RELATION TO AGE OF MOTHER (MOSCOW)
(After Genss: *Abort auf dem Lande*, 1926.)

AGE GROUPS	(1) NUMBER OF WOMEN	(2) TOTAL BIRTHS	(3) TOTAL ABORTIONS	(4) TOTAL CONCEPTIONS	RATE PER 1,000 WOMEN			(8) PER CENT OF CONCEPTIONS ENDING IN ABORTION
					(5) BIRTHS	(6) ABORTIONS	(7) CONCEPTIONS	
All Ages	609,790	58,394	31,986	90,380	94	54	151	35
15-19	102,809	2,593	1,151	3,744	25	11	36	31
20-29	212,314	39,611	20,216	59,827	146	74	220	31
30-39	189,675	14,622	9,436	24,058	80	52	132	39
40-49	104,992	1,568	1,183	2,751	14	12	26	46

Relation to Marriage

The increase in the number of abortions, generally observed throughout the world, has been due less to laxity of morals than to underlying economic conditions. This is seen by the fact that the considerable majority, of even the illegal abortions, occur in married rather than unmarried women. Dame Louise Mellroy, in a report submitted July, 1929, states that in England before the War induced abortion had been mainly resorted to by unmarried women but that at present it was most frequent among the married.

Among younger individuals, however, this is not the case. Thus in *Hamburg*, Ofderdinger (1925) found that the percentage of illegitimacy among women with abortions under twenty years of age was 63 per cent; between twenty and twenty-five years, 40 per cent; between twenty-five and thirty years, 14 per cent; between thirty and thirty-five years, 3.5 per cent; and between thirty-six and forty years, 1.6 per cent. In *Breslau*, Riechelt found (1930) that abortions were more frequent among the unmarried, 1,179 of the patients being unmarried and 691 married. Out of 201 confessed criminal abortions, he found 174 were unmarried and 27 married.

In the *United States*, figures based on the maternal mortality statistics are as follows: of the 1,825 women in fifteen states who died following abortions, 186 or 10 per cent were unmarried, whereas, 1,638 women were married. In the New York City report it was shown that the deaths following abortions occurred in 16 per cent among the married, as compared with 45 per cent among the unmarried pregnant women. The total number of abortion deaths among the married was very much greater. In the Philadelphia report we find that of the 162 deaths from septic abortion, 114 were of married women and 48 were in illegitimate pregnancies. "This ratio of almost three to one" says Dr. Williams, "indicates clearly that the cause of self-induced or criminal abortion is not, as has been commonly believed, the result of illegitimate pregnancies."

In Lindqvist's study of abortion in *Malmö, Sweden*, we find the following statements: "A definite increase in abortion rate from 1910 to 1927 occurred in married multiparae, increasing with the number of children. Approximately 10 per cent of abortions in I-parae are criminal, 50 per cent in II-parae, and 80 to 90 per cent in women with three or more children and in unmarried women. Among the unmarried, 90 per cent who had abortions were of the lowest and poorest social strata. Factory workers under 20 years were the most common type; but of the married women, abortion was not particularly com-

mon among women whose husbands belonged to the poorest classes. The majority belonged to the lower middle class."

Roesle has made an interesting comparison between three small German towns (Magdeburg, Halle and Lubeck) and Leningrad, showing the relation of abortion to the number of previous pregnancies among the married and unmarried (Table XVII).

TABLE XVII

ABORTION IN MARRIED AND UNMARRIED: REPORTED GRAVIDITY AND MONTH OF GESTATION

A. DISTRIBUTION OF ABORTIONS ACCORDING TO GRAVIDITY IN GERMANY AND RUSSIA
(After Roesle: Statistische Jahrbuch der Stadt Magdeburg, p. 125)

(1) PLACE AND PERIOD	(2) MARITAL STATUS	(3) TOTAL ABORTIONS	(4) (5) (6) (7) PER CENT ABORTIONS IN GRAVIDAE			
			I	II	III	IV AND OVER
Magdeburg (1925-1927)	Married	3,359	9	22	25	44
	Single	1,559	65	23	8	4
Halle (1919-1923)	Married	3,015	12	23	20	45
	Single	892	74	17	5	4
Lubeck (1925-1926)	Married	606	7	21	28	44
	Single	220	74	15	5	6
Leningrad (1925)	Married	9,976	4	17	20	59
	Single	3,162	29	25	16	30

B. MONTH OF GESTATION AT ABORTION, REPORTED IN VIENNA, MAGDEBURG AND HALLE
(From Peller: Fehlgeburt und Bevölkerungsfrage, Tab. XLVI, p. 140)

(1) PLACE AND PERIOD	(2) MARITAL STATUS	(3) (4) (5) (6) (7) PER CENT ABORTIONS BY MONTH OF GESTATION				
		UP TO SECOND	THIRD	FOURTH	FIFTH	SIXTH AND OVER
Vienna (1900)	Married	9	23	28	22	18
	Single	5	15	24	25	31
	Married	8	25	30	24	13
	Single	7	17	28	29	19
Magdeburg (1910-1913)	Married	38	32	16	7	2
	Single	30	34	16	13	6
Halle (1919-1923)	Married	27	38	20	11	5
	Single	26	33	22	13	6

In Germany the proportion of married women who abort their first pregnancies was relatively high, from 7 to 12 per cent, as compared with 4 per cent in Leningrad. Among married women with four or more children, on the other hand, abortion was more frequent in

Russia than in Germany. The unmarried women in the German cities brought on abortions in their first pregnancies in from 65 to 74 per cent of the cases, whereas in Leningrad the absence of the marriage tie did not impel women to resort to abortion as a shield, and it occurred in only 30 per cent of the first pregnancies.

Relation to Duration of Pregnancy

Since induced abortion increases in its dangers as the pregnancy advances, and since spontaneous abortion is more frequent in the second and third months owing to the fact that the ovum is not yet so firmly attached to the uterus, it is not surprising that the incidence of all types of abortion is very much greater in these months than later. This difference has been emphasized in Russia by the refusal of the government to tolerate the induction of abortion after the third month except under very rare conditions. Genss gives the interesting figures shown in Table XVIII, indicating that under the old regime the proportion of abortions after the third month amounted to nearly one quarter of all secret or illegal abortions; whereas by 1926, even the illegal abortions performed after the third month had declined to 13 per cent, while only one half of one per cent of the legal abortions were produced in the fourth month or later.

TABLE XVIII

COMPARATIVE DISTRIBUTION OF ABORTIONS ACCORDING TO MONTH OF GESTATION IN RUSSIA AND IN MAGDEBURG AND BresLAU, GERMANY

(After Genss, Roesle, and Küstner)

(1) PLACE, YEAR, AND TYPE OF ABORTION	(2) (3) (4) (5) (6) PER CENT IN EACH MONTH OF GESTATION				
	FIRST	SECOND	THIRD	FOURTH	FIFTH AND LATER
RUSSIA					
1912 Secret	0.5	42	33	14	10
1926 Illegal	1	57	29	8	5
1926 Legal	1	86	12	0.3	0.2
GERMANY					
Magdeburg (Roesle)	0.4	8	34	31	23
Breslau (Küstner)	—	25	48	16	11

In Roesle's statistics from Magdeburg there was no appreciable difference in time between the spontaneous and criminal abortions, both types occurring as follows:

Month	Per Cent
First	0.4
Second	8.2
Third	33.6
Fourth	31.4
Fifth	15.9
Sixth	7.2

Heynemann quotes O. Küstner who found among 1,571 cases at the Breslau clinic the following distribution: in the second month, 25 per cent; in the third, 48; in the fourth, 16; and the remaining 11 per cent in the next two and a half months. These German figures have been added to Genss's in Table XVIII, to show the relative success of the Russian policy of keeping abortions early, as reflected even in the illegal cases.

Among 7,366 intentional interruptions, reported by Dr. Kopp, 27 per cent occurred in the first month; more than twice as many, 58 per cent, in the second month; while 13 per cent waited till the third month; and only 2 per cent until the fourth month or later, to terminate the undesired pregnancies. The details in Table XIX show that spontaneous and therapeutic abortions were relatively more advanced, 49 and 38 per cent, respectively, being in the third month or later, as compared with 15 per cent of the induced.

TABLE XIX

ABORTIONS BY AGENT OF TERMINATION ACCORDING TO MONTH OF GESTATION IN VARIOUS TYPES OF ABORTION

(After Kopp: Birth Control in Practice, Modified from Master Table XXIX)

(1) TYPE OF ABORTION AND AGENT	(2) (3) (4) (5) (6) ABORTIONS IN EACH MONTH					(7) (8) (9) (10) PER CENT IN EACH MONTH			
	TOTAL	FIRST	SEC- OND	THIRD	FOURTH AND LATER	FIRST	SEC- OND	THIRD	FOURTH AND LATER
Total	10,533	2,222	5,602	1,994	715	21	53	19	7
1. Spontaneous	3,060	279	1,284	978	519	9	42	32	17
2. Therapeutic	307	33	159	87	28	11	51	28	10
3. Induced	7,166	1,910	4,159	929	168	27	58	13	2
By:									
a. Physician	4,279	1,039	2,625	518	97	25	61	12	2
b. Midwife	1,108	292	608	173	35	26	55	16	3
c. Self	1,779	579	926	238	36	33	52	13	2

The Children's Bureau figures on this point are also of interest. The period of gestation was reported for 1,461 of the 1,825 women dying after abortion (Table XX). In 38 per cent it was less than three months; in 30 per cent, three months; in 15 per cent, four; and in 17 per cent, five or six months. More than half of the induced abortions were in the first two months, as compared with a quarter of the spontaneous, and an eighth of the therapeutic.

Relation to Religion

Religion does not seem to be an appreciable factor in restraint so far as evidenced in the histories analyzed in New York City by Dr. Kopp. While out of 5,010 women who had aborted, 44 per cent were

TABLE XX

PERIOD OF GESTATION AMONG WOMEN WHO DIED FOLLOWING ABORTION OF EACH SPECIFIED TYPE

(From Maternal Mortality in Fifteen States, Children's Bureau Pub. No. 223, p. 107)

GESTATION	(1)	(2)	(3) (4) (5) (6) (7) (8) DEATHS FOLLOWING ABORTION OF EACH TYPE						(9)
	TOTAL DEATHS		SPON- TANEOUS		THERA- PEUTIC		INDUCED		TYPE NOT RE- PORTED
	NUM- BER	PER CENT	NUM- BER	PER CENT	NUM- BER	PER CENT	NUM- BER	PER CENT	
Total	1,825	--	589	--	205	--	794	--	237
Period Reported, Total	1,461	100	501	100	201	100	610	100	146
Less Than Three Months	548	38	127	25	24	12	336	55	61
Three Months	443	30	150	30	60	30	185	30	48
Four Months	220	15	100	20	47	23	50	8	23
Five Months	119	8	58	12	28	14	25	4	8
Six Months	131	9	66	13	42	21	14	2	9
Period Not Reported	364	--	88	--	4	--	184	--	88

Jewish, 28 per cent were Protestant, and 26 per cent were Roman Catholic, this was about the representation of these three religions in the whole group studied. It was found that more Jewish and Protestant than Catholic women had abortions, but it was observed that a relatively large proportion of all the Catholic applicants reported abortions, and they had had more abortions per capita than either Protestants or Jews. The number per woman averaged 2.35 among the Catholics, 2.25 among the Jews and 2.20 among the Protestants. Source Table B, in Appendix B gives further details on this subject. The per cent distribution among the various religious groups is as follows:

	PER CENT OF		
	TOTAL PREGNANT	TOTAL WITH ABORTIONS	WITH ABORTIONS IN EACH GROUP
Jewish -----	42	44	54
Protestant -----	30	28	49
Roman Catholic -----	26	26	52
Other -----	2	2	61

In the group of patients, whose records were analyzed by R. K. Stix, there had been 686 illegal abortions. Of these 509 (74 per cent) were done by a physician; 135 (20 per cent) were done by a midwife; and 42 (6 per cent) were self-induced. It is of special interest that, whereas among the Jewish group 88 per cent were done by a physician, among the Catholic and Protestant groups these ranged from 49 to 51 per cent. Corollary to this, we find that among the Jewish

women only 7.5 per cent employed midwives, while about 41 per cent employed midwives among the Catholic and Protestant women.

Relation to Race and to Urban or Rural Groups

Race.—The figures from the Children's Bureau, for the United States, as given in Table XXI, show 1,568 deaths following abortion among white women and 257 deaths among colored women. Relating these figures to the number of live births of white and colored in the years and the states of the study, we find 15 deaths following abortion per 10,000 live births among white women as compared with 21 among the colored, as shown in the accompanying chart in Fig. 140. The excess among the colored consisted primarily of spontaneous abortions. The death rates following spontaneous abortion were 4.5 among white and 9.5 among the Negroes, per 10,000 live births. According to Holmes, Mussey and Adair, this difference may in part be explained by the frequency of myoma of the uterus in Negroes, and in part laid to the poorer economic conditions, together with ignorance concerning principles of cleanliness, and to the improper medical care rendered these colored patients. It is to be noted that the total rate of maternal mortality among the colored was nearly twice that of the whites, and that the deaths from abortion do not account for the discrepancy.

TABLE XXI

TYPE OF ABORTION AND MORTALITY RATE COMPARING WHITE AND COLORED AND URBAN AND RURAL AREAS

(Rearranged from Table 65 in Maternal Mortality in Fifteen States, Children's Bureau Publication No. 223, p. 112)

COLOR AND AREA	(1) ALL TYPES	(2) (3) (4) (5) ABORTIONS BY TYPE			
		SPON- TANEOUS	THERA- PEUTIC	INDUCED	NOT REPORTED
Total Number	1,825	589	205	794	237
<i>Rate per 10,000 Live Births</i>	<i>15.5</i>	<i>5.0</i>	<i>1.7</i>	<i>6.7</i>	<i>2.0</i>
White Women	1,568	474	189	729	176
<i>Rate</i>	<i>14.8</i>	<i>4.5</i>	<i>1.8</i>	<i>6.9</i>	<i>1.7</i>
Colored Women	257	115	16	65	61
<i>Rate</i>	<i>21.3</i>	<i>9.5</i>	<i>1.3</i>	<i>5.4</i>	<i>5.1</i>
In Urban Areas	993	274	103	488	128
<i>Rate</i>	<i>21.5</i>	<i>5.9</i>	<i>2.2</i>	<i>10.6</i>	<i>2.8</i>
In Rural Areas	832	315	102	306	109
<i>Rate</i>	<i>11.6</i>	<i>4.4</i>	<i>1.4</i>	<i>4.3</i>	<i>1.5</i>

In New York City, deaths following abortion among Negroes were 23 per cent of the total puerperal deaths in that race, while they were only 17 per cent among the whites. In Philadelphia septic abortion deaths occurred in 131 white women (22 per cent) and in 31 colored women (26 per cent).

Urban and Rural Areas.—According to the Children's Bureau statistics the mortality rate from abortion was higher in the urban than in the rural districts, being 22 as compared with 12 per 10,000 live births. As shown in Fig. 140, the difference was most marked in induced abortions, where the rate was 11 in the urban areas, as compared with 4 in the rural districts.

In the United States, so far as our information goes, there is a definite increase in the number of abortions in the large metropolitan centers, whereas at least the one report by Dr. Plass from rural districts in the Midwest indicates that no noticeable increase has occurred

MORTALITY RATES for DEATH FOLLOWING ABORTION of VARIOUS TYPES

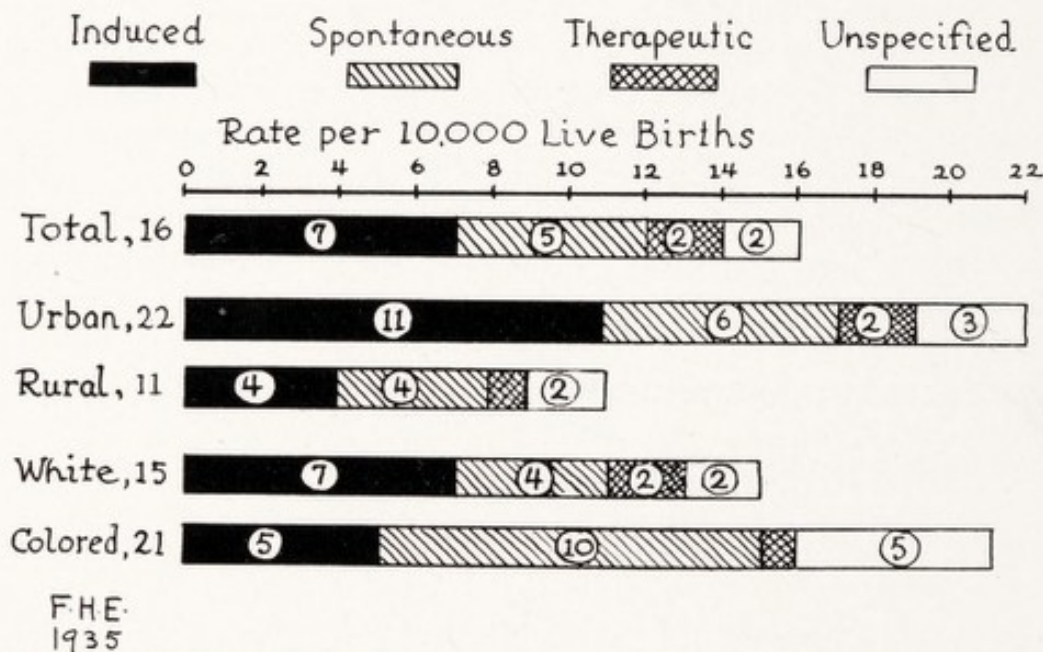


Fig. 140.—Comparative mortality rates following abortion of various types, among white and colored women, and in urban and rural areas. (From Maternal Mortality in Fifteen States, Children's Bureau Publication No. 223, p. 112, 1934.)

in this area. These figures were obtained from 81 physicians, of whom 26 stated that there was an increase in abortions, and 55 stated that there was no such increase. The division of abortion deaths according to the fifteen states studied in the report of the Children's Bureau showed that induced abortion was highest in the state of Washington (23 per cent), and in other Pacific Coast States, and lowest in Alabama (3 per cent).

In Czechoslovakia, however, a recent investigation by H. Hecht showed that abortions were about as frequent in the rural areas as in Prague. Women of middle age reported on the average 3.8 abor-

tions apiece in Prague, and 3.5 in rural territories. The information was obtained by direct questionnaire of 1,300 married women, two-thirds of whom were from rural areas.

There seems also to be a definite difference in the rural and urban groups as to the factors justifying induction of abortion. Genss found that in Russia illness was a much more common cause of legalized abortion in the country districts than in towns, 30 per cent compared with 19 per cent; and that in the country districts the desire to conceal the pregnancy was far greater (7 as compared with 2 per cent in the cities). The figures given in the League of Nations report for 1930 show that in the Soviet Union the registration of abortions is less complete in the country districts and that secret abortion is far more common there. In eight provinces of Russia the number of legalized abortions per thousand women showed striking differences, the registration in urban areas amounting in the totals to over ten times the rural rate (see Table XXII).

TABLE XXII
AGE AT ABORTION IN URBAN AND RURAL DISTRICTS
Rates from Eight Provinces in the Soviet Union (After Genss:)

AGE GROUPS	AVERAGE RATE OF ABORTIONS PER 1,000 WOMEN	
	RURAL DISTRICTS	URBAN DISTRICTS
Total 15 to 49 years	3.38	35.40
Under 17 years	0.11	0.92
18 and 19	1.16	11.69
20 to 29	4.73	48.35
30 to 39	5.54	40.41
40 to 49	1.84	10.19

In Germany also, as indicated by the puerperal mortality figures, we find that the incidence of abortion deaths was 2.1 per 1,000 in the towns and 0.8 per 1,000 in the country.

Relation of Abortion to Puerperal Septicemia

United States.—In the studies of maternal mortality stimulated during the past few years by the White House Conferences on Child Welfare, we find the statement made repeatedly that septic abortion is the outstanding factor in keeping the puerperal death-rate so high. Comparison of our puerperal mortality rates with those of countries in which abortion rates are kept under a separate head is not justified. Indeed, Adair, among others, raises the question whether deaths from induced abortion should properly be included in our studies of puerperal and infant mortality.

Maternal Mortality in Fifteen States.—In the completed report of the Children's Bureau (1934) the subject of abortion is given special study. The following paragraph is italicized in the original (p. 103):

"Probably the most outstanding finding of this study is that one-fourth of all the maternal deaths followed abortion. Almost three-fourths of the deaths following abortion were due to puerperal septicemia, and these deaths from sepsis following abortion constituted nearly half of all the deaths from septicemia, the greatest single cause of maternal mortality."

Puerperal septicemia was the cause of 1,324 or 73 per cent of the 1,825 deaths following abortion. Of the 794 deaths following induced abortion, 722, or 91 per cent, were due to puerperal septicemia.

The deaths following abortions make a striking contribution to the maternal mortality rates from puerperal septicemia, as shown in Fig. 141, where the proportion of septic deaths among all the deaths is seen to be 40 per cent, but only 30 per cent of the non-abortion deaths as compared with 73 per cent of those following abortion. Criminal abortions caused one-fourth of all the deaths assigned to puerperal septicemia.

In the lower part of the chart the distribution of deaths from septicemia following various types of abortion may be seen to vary from 21 per cent in the therapeutic, and 60 in the spontaneous, to 91 in the induced cases. The high proportion of septic cases among the deaths following abortion of unknown type indicates a strong probability that these were largely induced. (See also Table XXIII.)

TABLE XXIII

SEPTIC ABORTION AND DEATHS BY TYPE OF ABORTION

(Modified from Maternal Mortality in Fifteen States, Children's Bur. Pub. 223, p. 106)

TYPE OF ABORTION	(1) TOTAL ABORTIONS	(2) (3) SEPTIC ABORTIONS	
		NUMBER	PER CENT
Total	1,825	1,324	73
Spontaneous	589	354	60
Therapeutic	205	44	21
Induced	794	722	91
Type Not Reported	237	204	86

Puerperal septicemia was recorded as "obvious and unmistakable" in connection with 2,948 of the total 7,380 maternal deaths. The 1,324 cases of septicemia following abortion thus constituted 44 per cent of deaths from septicemia as compared with a total incidence of 25 per cent of abortion among all deaths, and indicate the special hazard of abortion.

This connection was emphasized in the local reports from various cities:

In "Maternal Mortality in New York City," it is stated that abortion deaths, 357 out of the 2,041 puerperal deaths, constituted 17.5

**ABORTION & SEPTICEMIA AMONG WOMEN
DYING FROM PUERPERAL CAUSES
FROM 15 STATES OF U.S.A. 1927-'28**

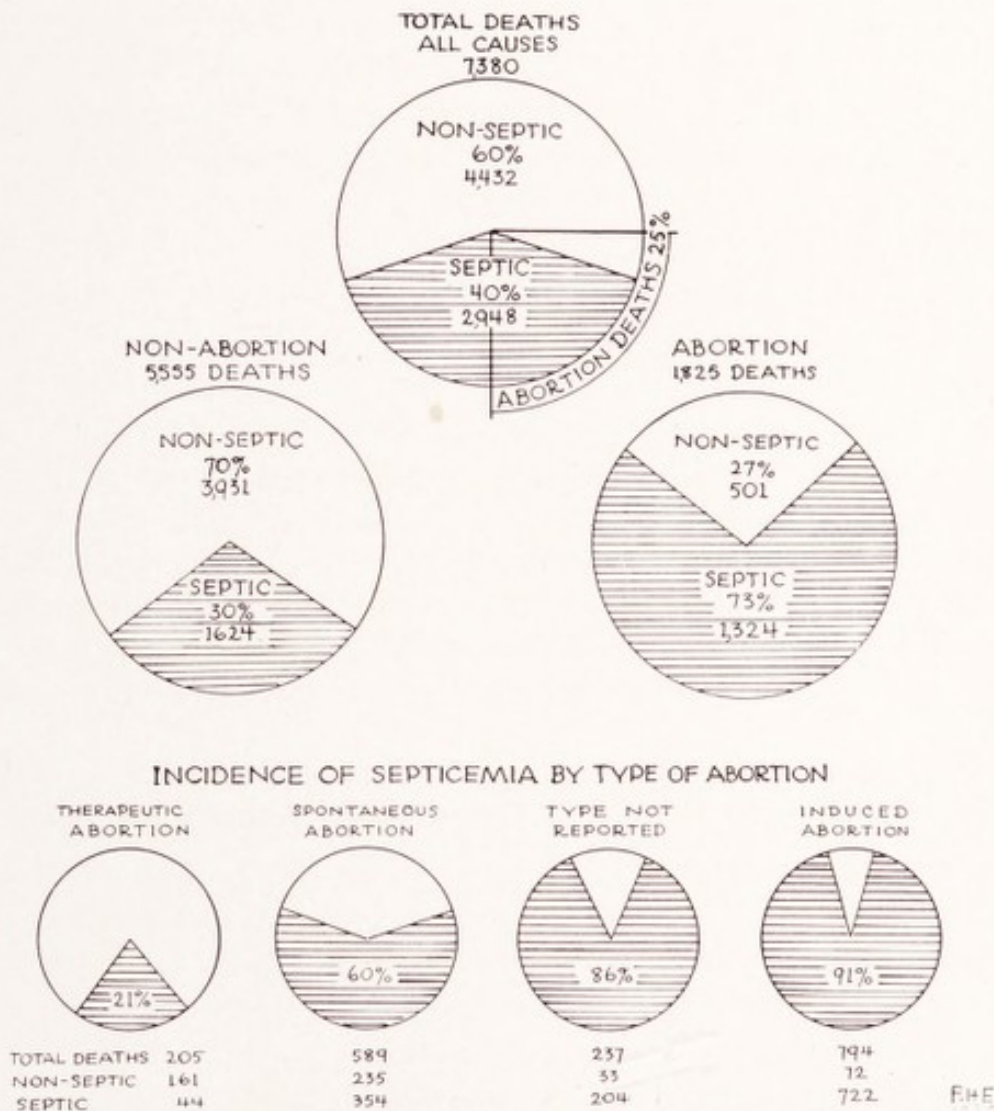


Fig. 141.—Rôle of abortion and septicemia in maternal mortality. Lined portion of each circle represents proportion of deaths reported as septic. (From data given in Maternal Mortality in Fifteen States, Children's Bureau Publication No. 223.)

per cent of the total; and the incidence of septicemia in the confessedly induced cases reached 97 per cent, as shown in Table XXIV. In this report the cases recorded as spontaneous predominated, as all known illegal cases were omitted.

TABLE XXIV

ABORTION DEATHS BY TYPE OF ABORTION AND INCIDENCE OF SEPTICEMIA
(From Maternal Mortality in New York City, Table 15, p. 55)

TYPE OF ABORTION	(1)	(2)	(3)		(4)		(5)	(6)
	ABORTIONS		WITHOUT SEPTICEMIA		WITH SEPTICEMIA			
	NUMBER	PER CENT	NUMBER	PER CENT	NUMBER	PER CENT	NUMBER	PER CENT
Total	357	100	95	27	262	73		
Spontaneous	192	54	58	30	134	70		
Induced	108	31	3	3	105	97		
Therapeutic	47	13	32	68	15	32		
Type Unknown	10	2	2	20	8	80		

In the Philadelphia review of Maternal Mortality from 1931 to 1933, under the direction of P. F. Williams, we find the following statement: "One of the outstanding facts of this survey is that 22.5 per cent or over one-fifth of the total deaths studied, 162 of the total 717, were caused by septic abortions. Of the 639 puerperal causes of death, over one-fourth came under this category" (p. 45). There were 188 deaths following abortion, of which only 26 were non-septic, and 162 were septic. Of the 26 non-septic cases, 22 were spontaneous and 4 induced, while of the 162 septic cases interference of any kind was denied in 57, leaving 105 that were induced. Of these, 56 were self-induced, 46 were induced by some one other than the patient, and 3 were therapeutic abortions. Sixteen of the 46 criminal cases were classified as homicides. In Williams' opinion, a considerable number of the septic cases in which interference was denied were probably induced.

A brief report on maternal mortality in the city of Cleveland, during 1931, shows that 50 out of the total 151 puerperal deaths, or one-third were due to abortion. In over 70 per cent of these deaths sepsis was the cause. Further points of interest in this report are that practically all infected abortion patients die in hospitals, and that out of nine puerperal deaths assigned to a midwife five were due to septic abortion.

From Colorado a few statistics are available through the investigations of E. D. Burkhard. From 1928 to 1932 inclusive there were 725 puerperal deaths, and of these 153 or 21 per cent were acknowledged to be induced abortions. In addition to these cases a certain number of the 257 deaths from puerperal septicemia can also be fairly attributed to abortion. Burkhard would have these deaths included as homicides so that our maternal mortality rate could be cleared of this unfair addition.

Statistics gathered by L. R. Smith for 1927 in Michigan show that abortions caused 231 of the total of 819 puerperal deaths or 28 per cent; while the proportion of those dying from septicemia following abortion was even higher, 181 out of 359 total septicemias, or 50 per cent.

In the city of Magdeburg, Germany, we find that the death rate from sepsis following abortion is seven times greater than that following childbirth. In the years 1924 to 1927 there were in Magdeburg 17,382 confinements with 24 maternal deaths from sepsis, a ratio of 1.4 per 1,000 confinements. During the same four years there were reported 6,497 abortions with 61 maternal deaths from sepsis, a ratio of 9.4 per 1,000 abortions. We have also figures available from Berlin for the years 1922 to 1926. These show that in 1922 out of 626 maternal deaths from puerperal sepsis 503 (over 80 per cent) followed abortion and for the five years, 1922 to 1926, the total was 2,387 maternal deaths following sepsis of which 1,886 occurred after abortion, or 79 per cent.

Naujoks (1927) found that in Koenigsberg, Prussia, the puerperal sepsis mortality was divided between births and abortions as follows:

	<i>Births</i>	<i>Abortions</i>
1922 -----	123	503
1923 -----	100	459
1924 -----	89	389

Thus with some absolute decline in death rate, the ratio of sepsis deaths following abortions was 4 times as great as that following childbirth.

Great Britain.—The Interim Report of the Departmental Committee on Maternal Mortality and Morbidity (1930) showed an increase in the ratio of deaths from abortion to total female deaths from 1.9 per 1,000 in the five-year period, 1919 to 1923, to 2.6 in the period from 1924 to 1928. Figures available for 1926, 1927, and 1928, on the proportion of abortion deaths to total puerperal mortality, show that there were in 1926, 308 cases (11 per cent); in 1927, 297 cases (11 per cent); and in 1928, 301 cases (10 per cent). The 1928 figures did not include 57 coroners' cases which would have brought the total to 358 cases. Even so, the British figures are considerably lower than those in the United States and Germany.

From *Switzerland* we have unusually complete reports giving the comparative death rate following childbirth and abortion. These figures show that during the last thirty years, the number of births has decreased from 97,028 to 69,006, and that the rate of maternal

mortality following puerperal fever has been reduced by one-half. On the other hand, deaths due to abortion still remain at a high level and exceed 20 per thousand stillbirths. (For details see Appendix B, Source Table C.)

Relation to Preventability

One of the most interesting features of the New York report was the effort made to analyze maternal deaths according to preventability. The question whether a particular death was or was not preventable is difficult to answer, and the resulting judgment must be taken as the opinion of the committee in charge of the investigation and not necessarily final. Naturally when it came to abortion the percentage judged to be preventable was very high. Abortion deaths were divided into therapeutic abortions 47, of which 32, or over two-thirds, were said to be preventable, and other abortion deaths 310, of which 239, over three-quarters, were preventable. Dividing these preventable deaths according to the responsible agent we find that in the therapeutic abortions the physician was blamed 28 times and the patient 4 times. The other 310 abortions, including a large number of septic cases, showed that responsibility rested upon the physician in 41 cases (17 per cent), upon the patient in 197 cases (82 per cent) and ascribed to the midwife in one case. It should be recalled again that the New York report did not include known cases of "criminal abortion."

The Analysis Committee in the Philadelphia report found that in the 26 non-septic abortion deaths, one-half were preventable, 6 times due to the doctor, 7 times due to the patient. Of the septic abortion deaths 76 per cent (123 out of 162) were preventable, and responsibility was ascribed in 15 cases to the physician, and in the remaining 108 cases (88 per cent) to the patient. The latter group consisted of the illegal abortions in which the patient directly or through a second party secured the operation.

A quotation from this report is of interest, as showing the complicated nature of the material and the difficulty of arriving at an acceptable judgment:

"The Analysis Committee regarded the following case as an example of error in technic on the part of the physician. A woman, a little over two months pregnant, had an apparently spontaneous abortion at home and was referred to the hospital because of bleeding. Pieces of placenta were removed from the cervix digitally and the vagina was packed. The following day a curettement was done. Within two days a febrile reaction occurred, becoming septic in type.

A right-sided mass developed. Repeated transfusions were given as well as other supportive measures but death followed in a few weeks.

"The Analysis Committee selected the next case to illustrate error in judgment on the part of the physician. A woman had repeated hemorrhage during the third month of pregnancy. The vagina was packed on admission to the hospital. Two days later a dilatation and evacuation was attempted but was unsuccessful as the cervix was hard to dilate, but the history stated the uterus was packed. On the third day a dilatation and evacuation was done and a transfusion was given for hemorrhage. The patient developed a septic temperature and died on the eleventh day after the final operation. This case was one of a number where the uterine cavity was entered more than once.

"In placing the responsibility upon the patient, the Analysis Committee attributed such deaths as the following, to ignorance of the probable results of the induction of abortion. A thirty-four-year-old patient, gravida five, second month, inserted a piece of wood into the cervix. After a week of intermittent bleeding, an abortion occurred. Fever had been present, but now became septic in type. Death occurred eighteen days after induction.

"The Analysis Committee considered the following case typical of a non-preventable death in septic abortion. A thirty-three-year-old woman, having had ten pregnancies and with seven living children, aborted spontaneously at the second month. After bleeding for two weeks she called a physician who prescribed rest and medication. Even with help of her unemployed husband, the nursing care of her small children prevented her from following directions. A phlebitis developed, accompanied by chills, sweats and vomiting. The patient finally entered the hospital on the twenty-fourth day and died six hours after admission" (p. 48).

Sharp criticism of the methods of handling abortion by physicians is also voiced in the Children's Bureau report. They say (p. 114):

"The most frequent operation in the management of these abortions was curettage (usually with sharp instruments, which is a procedure definitely to be condemned). It is clear that many physicians did not consider fever a contra-indication for curettage; yet in those cases in which it was known that fever existed and curettage was done, 94 per cent of the deaths were due to sepsis. In marked contrast is the fact that only 50 per cent of the deaths of the women who were afebrile at time of operation were due to sepsis. In not a few cases the history of an induced abortion was not discovered until after the patient had been curetted or even after she had died. Evidently a careful history in many of these cases was not obtained.

"As pernicious vomiting was the principal indication for 112 of the therapeutic abortions, it would seem that the physicians had delayed in doing the abortion or had been called in consultation too late to save the patient's life, or else had improper technique.

"This study shows very clearly the seriousness of the problem created by the great number of abortions that are induced each year. It also shows that the practice of curetting every patient who has an abortion is common. Physicians must be made to appreciate the seriousness of curetting these potentially septic cases. The manage-

ment of an abortion calls for the best medical care that can be given, and in many of the cases in this series it is obvious that such care was not given."

Additional Data on Abortion Mortality

Liepmann claims that the maternal deaths from abortion have been underestimated rather than overestimated. Figures such as those of Schottelius for Hamburg, with 183 deaths out of 8,107 abortions or 2.3 per cent, and Benthin of 1.9 per cent, are considered insufficient. Schaefer from Berlin cites 6,270 abortions with 3.25 per cent mortality. Bleichröder found a death rate of 3.36 per cent in 2,617 abortions. Kiefer reported 152 deaths out of 3,800 abortions, 4 per cent. Dietrich's figures were even as high as 4.5 per cent mortality. Com-michau in Jena finds an increasing mortality of abortions from 0.39 per cent (1910-1914) to 3.58 per cent (1915-1918) and 5.4 per cent (1919-1926).

Discrepancies.—There is an apparent contradiction between figures pointing on the one hand to a decline in the mortality rate following abortion, and on the other hand pointing to an increase in abortion deaths. This can readily be explained. In the years before the war non-criminal abortions were treated by physicians very largely outside of hospital conditions, very often without due care for asepsis. The criminal abortions, on the other hand, were in great part done by midwives or by the patients themselves. This led naturally to a high percentage of infection, hemorrhage and perforation, with a resulting high mortality. Since the war, in most countries, there has unquestionably been a marked increase in the number of abortions, associated undoubtedly with an increase in the total number of deaths following abortion.

A careful analysis of statistics of various countries, however, convinces one that the actual mortality from abortion has in the larger cities shown a definite decrease (see Fig. 142). This can readily be explained in the case of the spontaneous abortion by better medical care, especially a fuller appreciation of the risks of infection, and better facilities for hospitalization resulting in a larger number of these cases obtaining hospital care. In the case of the criminal or illegal abortion, women have come more and more to abstain from personal attempts, or the employment of the midwife. The professional abortionist, usually a physician, has paid greater attention to asepsis in his manipulations and simpler methods of procedure, with the result that relatively fewer deaths have occurred. An additional factor in the lowering of the death rate, although not a lowering in the total number of deaths, is that in the past ten years these criminal proce-

dures have been done more frequently in married women having several children, than in the unmarried, and as a rule have been done within the first two months, owing in part to earlier diagnosis of pregnancy by the Aschheim-Zondek test.

SUMMARY

From this review of the statistical evidence on abortion we cull a few of the more striking facts:

POST WAR ABORTION DEATH RATES

Deaths per 1000 Abortions

1919-1929

Reported by Peller from Büdinger

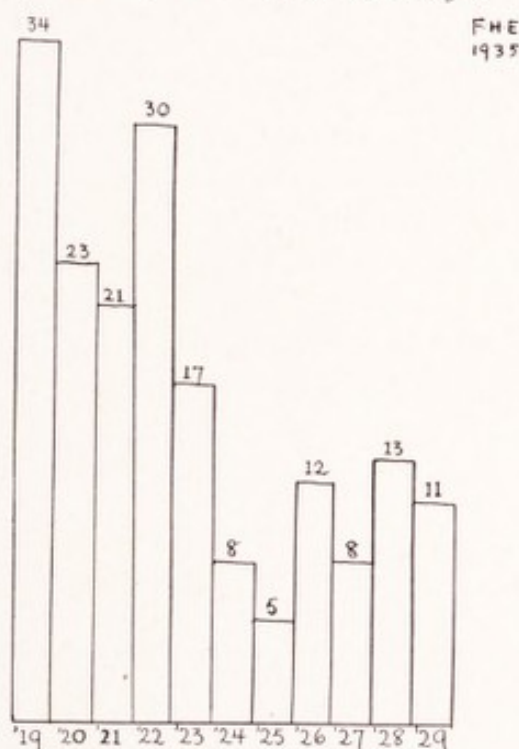


Fig. 142.—Fall in abortion deaths in Germany during decade following War. (From Büdinger, as reported by Peller in *Fehlgeburt und Bevölkerungsfrage*, Stuttgart, 1930.)

(1) An approximation of the truth concerning abortion can be arrived at by collecting evidence independently on three points: the total number of abortions, the abortion death rate, and the total abortion deaths. This must show that the total number of abortions times the death rate equals the abortion deaths.

For the United States the figures obtained showed that 681,600 abortions times a death rate of 1.2 per cent equalled about 8,000 abortion deaths annually.

(2) In the past forty years there has been a marked increase in the number of abortions, due to a widespread resort to induced interruption. The years immediately following the war and the recent period of depression have shown the most pronounced increase in the number of abortions.

(3) With the decrease in birth rates during this period, the ratio of abortions to confinements has changed from 1 to 7 forty years ago, to 1 to 3 at the present time. In some industrial centers the number of abortions approximately equals the number of full-term deliveries.

(4) Of the total abortions only 25 to 30 per cent are spontaneous, 10 to 15 per cent are therapeutic and about 60 to 65 per cent are illegally induced.

(5) Over one-half of the illegal inductions of abortion are done by physicians, one-fifth by midwives and the remainder by the patients themselves.

(6) The vast majority of all abortions equalling 90 per cent occur among married pregnant women, especially those between 25 and 35 years of age who have had several children. The recent increase in abortions has been primarily in this group. Among unmarried pregnant women the greater proportion of abortions occur in the younger age groups.

(7) Abortions, both spontaneous and induced, occur most frequently in the second and third months of gestation.

(8) The religious affiliation of the patient has relatively little influence on the incidence of abortion.

(9) The rate of abortion deaths is half again as high among the negro as among the white women in this country, but the total maternal death rate among negroes is twice that of the whites.

(10) The number of abortions and the number of abortion deaths is proportionately twice as great in the cities as in country districts.

(11) Abortion constitutes the greatest single factor in our high puerperal mortality, one-fourth of the total amount. Of the deaths from puerperal septicemia alone, abortion is responsible for practically one-half.

(12) Analysis of the causes of death following abortion shows that in about three cases in four the deaths were preventable.

(13) Evidence points to some diminution in recent years in the death rate from abortion owing to improved technique by the abortionist and a widening of indications for legalized abortion in many countries. This is more than counter-balanced by the increase in the total number of abortions, so that the abortion deaths still show an increase.

CHAPTER XXIV

ECONOMIC AND DOMESTIC ASPECTS OF INDUCED ABORTION

SO POWERFUL and universal is the instinct for motherhood that, when a woman is impelled to do away with the child within her body, we may feel sure the fault lies primarily with the special conditions under which she is living. Here and there selfish reasons may enter into the problem, but certainly in the vast majority of cases external factors are largely responsible. The medical reasons which make interruption of pregnancy necessary, as already discussed, are usually beyond our direct control. Indirectly, however, some control can be effected even here by the prevention of conception in these women, since only a small portion of the medical conditions indicating abortion arise during pregnancy. Pregnancy should, as a rule, never have been allowed to occur, and for this situation we physicians must ourselves largely take the blame.

The underlying faults in our social structure that have led to the present alarming number of abortions can be grouped under five heads:

- (1) Economic distress
- (2) Occupational changes
- (3) Illegitimacy
- (4) Domestic relations
- (5) Fear of confinement.

(1) **Economic distress** is at the root of the largest number of induced abortions. In Russia, where each woman must give the reason for the interruption of pregnancy, a tabulation of the records of hundreds of thousands showed that poverty and bad living conditions were emphasized in over one-half of the cases. While other countries have no similar tabulation of reasons for desiring abortion, there is general agreement that a direct relationship exists between induced abortion and destitution. In Dr. Kopp's analysis of 11,172 abortions in New York City, there was evidence of an increasing number of inductions with the increase in family; when the number of children was over three, women could less frequently afford to pay a physician for their abortion and had to resort to a midwife, or more often were compelled to terminate the pregnancy by self-instrumentation.

The distressing conditions under which some women have to face a new pregnancy have been revealed by numerous investigations on maternal welfare here and abroad. Sydenstricker's survey, reported at the Washington Conference on Birth Control in 1934, showed that the highest birth-rates occurred among unemployed workers; that is to say, those in the worst economic status, and these findings have been reinforced by later studies.

Liepmann, in Germany, calls attention to the living conditions of 280,000 women with five or more children. One thousand five hundred and seven families lived in one room; 29,880 lived in two rooms including the kitchen; 89,089 lived in three rooms including the kitchen; and 82,079 lived in four rooms including the kitchen. Living conditions were found to be bad for 45 per cent of the families with pregnant mothers. Liepmann argues that it is unjust to compel these women to give birth to children under such circumstances. Associated with these cramped home surroundings there are usually insufficient heat and ventilation, while improper and insufficient food, want of clothing and inadequate sanitation complete the picture. Can we wonder that when women are faced with a new pregnancy they grasp at any means of interruption? Even the payment of a fee to a doctor or midwife is less costly than having another mouth to feed and another body to clothe and care for. Under social conditions such as these the surprising thing is not that there are so many abortions, but that there are not more of them. Only the long discipline of patient suffering has enabled women to carry on under these handicaps.

(2) **Occupational changes** in the past fifty years have also materially influenced the incidence of induced abortion. With the spread of the Woman's Suffrage Movement throughout the world and the newer economic independence of women, the revolt of womankind against the age-long domination of man has finally materialized. There can be no question that more consideration must be given to the right of women to control their own bodies. It will take generations, however, before any radical changes occur, for the vast majority of women everywhere are still subservient to men.

Unusual ability in artistic, intellectual and administrative fields has enabled some women to add materially to the progress of the human race, and when this work is interrupted by the physical disability of a pregnancy, the question of what is justified demands fresh consideration. In Russia the answer has been that until more certain methods of contraception are available, abortion should be permitted.

R. K. Stix points out the changed attitude of the younger generation toward abortion. She writes: "The early abortions in the

youngest group of women were frequently followed by planned pregnancy. In many cases the patient went to an abortionist because she was the breadwinner in the family and could not afford to lose her job, much less produce another mouth to feed. A year or two later if her husband was working, she gave up her job and planned a baby or two. In comparing the same periods of married life throughout, it is apparent that the younger the women the larger the proportion of pregnancies illegally aborted."

Thus far all laws and social regulations on abortion have been man-made, and women, who are the chief sufferers, have had no chance to express their views in any referendum. An indication of what such a vote might show is given by two recent questionnaires. One was sent out in Denmark by the social democratic women's organization in the province of Aarhus. A secret ballot of 632 taken on September 12, 1932, showed 558 (88 per cent) favoring social-economic indications for abortion, 32 (5 per cent) opposed, and 42 (7 per cent) neutral. The other was taken among all graduate women physicians in Germany. Of 2,836 questionnaires sent out, 2,761 were returned with answers, 1,352 of which were comparable. Only 6 per cent of the women physicians favored retention of the present laws on abortion. The majority favored considering the social-economic factors, and the general health of the woman in the indications for abortion.

(3) **Illegitimacy** is no longer the dominant factor in induced abortions that it was a generation ago. Nevertheless, a considerable number of these cases still occur. The Children's Bureau Report notes that while 90 per cent of the women dying after an abortion were married, abortion was a more frequent cause of death among the 509 unmarried mothers than among the married, the rates being one in three as compared to one in five deaths.

In many instances the illegitimacy is the result of bad living conditions and insufficient supervision in the home. This in turn is due many times to too many children in the families of the poor. The mother is kept so busy with her latest newborn that the older ones are left to shift for themselves, the boys being tempted to take up a criminal career, and the girls to lead a loose sexual life. The records of our reformatories present ample evidence of how large a part is played in criminality and illegitimacy by the breakdown in family life due to poverty and too many children.

Much has been written about the degeneracy of our youth and how the automobile, the movies with their suggestive plays, the so-called "trial marriages," and the ever increasing tendency toward nudity have been factors in loosening moral restraint and thus increasing the

incidence of illegitimate pregnancy. I question whether this is the case. The very absence of innocence in the present generation makes for less frequent betrayal of the girl by her seducer. The girl who nowadays engages in illicit relations with a man is almost always fully aware of the risks involved and usually employs measures to prevent conception and the transmission of disease, or insists on his doing so.

In cases of rape and in girls under the age of fifteen, where no moral obloquy can be charged against the patient, there is a widespread feeling that interruption of pregnancy should be permitted. Among older individuals, the legalization of abortion for illegitimacy would unquestionably lead to less restraint in sex relations. In Russia it was reported that some women had as many as eleven abortions a year. Furthermore, by the proper supervision of these girls during pregnancy and at confinement, a healthy child may be born and the girl given a chance to resume her place in society. Only too often nowadays such a child will be more fortunate than its mother, for every year many hundreds of adoptions give these illegitimate children a place in a home where the craving for parenthood has been denied and where every provision is made to rear the baby to be a useful member of society.

(4) **Domestic relations** seriously influence the incidence of illegal abortion. Cross-questioning the expectant mother who has resorted to interference will frequently elicit a record of drunkenness or sexual depravity by the husband. It certainly is not strange that the mother under such conditions will undergo any physical risk or suffering to prevent the birth of another being that will be compelled to live under such sordid conditions, without a fair chance for normal development. Time and again the husband seeks escape from his responsibilities by deserting the mother of his children when he hears that a fourth or fifth one is on the way. Faced with the sole care of her family, shall such a woman be compelled to carry on with her pregnancy? If society denies the right of abortion in such a situation, society must also assume directly and promptly the care and protection of mother and children. This it fails utterly to do at the present time. Russia seems to have developed a simple and direct method of compelling the father to assume financial responsibility for all of his children, regardless of his relation to their mother. It would be well to consider how much of this legislation could be incorporated in our social order.

(5) **Fear of Confinement** should rarely justify an abortion in the present age of painless delivery and improved obstetrical care. Great

progress has been made in this field in the past generation so that we can hardly sympathize with the woman who wishes to end her pregnancy simply because she is unwilling to endure the discomfort and moderate suffering attendant upon childbirth.

Corrective Measures.—Foremost among the measures suggested to improve the social-economic conditions making for abortion is a more equitable distribution of wealth, and one of the ways to accomplish this is by means of *taxation*. As pointed out by Peller, the State has for centuries sought means to devise methods of taxation to curb the tendency to abortion and thus stem the decrease in population. Spain in 1623 decreed laws by which the father of six male children was freed from all taxes. Louis XIV in France gave a State pension of 1,000 pounds to members of the nobility with ten children and 2,000 pounds to those with twelve children. Ordinary citizens received one half of this amount under similar conditions.

In Fascist countries this problem has been solved not merely by lowering the taxes of the father of large families, but by giving a bonus for each additional child. In Italy and Germany a special reward of merit is given to the parents of a dozen or more children. This policy of stimulating a large progeny for purely nationalistic and military reasons must be distinguished from the laws of a socialist state that seeks to aid those who have assumed their full obligation as parents by having several children. A state might very well provide certain tax exemptions and preferential employment for the father of several children, graduated in accordance with their number up to, say, four or five. If beyond this number there were no additional exemptions, it should prove a restraint upon too excessive a family.

In the future, birth control will doubtless prove an important factor as a check upon unlimited families. For the present we must, however, make provision for the care of these unwanted pregnancies rather than have the mother resort to abortion as a solution of her dilemma. The present federal income tax laws with their exemption for each child under eighteen years of age present a beginning in this direction, but the amount involved is too meager to be of much assistance. Among the poorer classes, who are below the taxable group in their income, some aid can be given by government regulations, giving preference to fathers who have a large family to support. It is to be hoped that some plan can be worked out to increase the financial stability of such families without at the same time stimulating them to add unduly to the number of their children. All measures that lead to a wider distribution of wealth will certainly improve

living conditions among the poor and thereby decrease the necessity of resorting to abortion as a release from increasing poverty.

"Eine Kartothek zu § 218." An amazing book appeared in Germany in 1931, consisting of the case records of 426 artificial abortions done during one year's time by a small-town practitioner whose name is not given, but whose authenticity is vouched for by the late distinguished Berlin professor of public health, Dr. A. Grotjahn. With absolute frankness, the reasons for which the abortion was sought are given, so that the book represents a valuable addition to our understanding of the underlying social factors in induced abortion. In 127 additional cases the abortion was refused, sometimes because it seemed possible to bring about a marriage and carry the pregnancy to term. In general, however, it appears that abortion was done on very slight pretext, and in some instances as often as two or three times a year on the same patient.

Grotjahn's comments on this record are interesting. He suggests a method of maternity insurance, by which the State would levy an assessment graded in accordance with the number of dependents (single, no child, one child, etc.), so that an income could be provided by the State for the support of additional children. He calls attention to the French laws, according to which every head of the family with more than three children under thirteen years of age is entitled to a monthly stipend from public moneys. Widow and orphan insurance already exists in Germany, and Grotjahn believes a small amount of insurance would suffice to supply free maternity care and maternal instruction to needy families. Such compulsory maternity or parenthood insurance would supply funds that would avoid the necessity of having expectant mothers seek employment to earn enough for their support.

From *Italy* we have two reports on the social aspect of induced abortion. Della Mano, calling attention to the recent increase of criminal abortion in Italy, says that poor living conditions, ignorance, and insufficient pressure on the responsible man are the main causes. Wider establishment of maternity homes would help the situation. Palmieri's study is concerned with an analysis of 100 illegitimate pregnancies that were carried to term although means for inducing an abortion were known to the mothers. The reasons given for not doing an abortion were, in the order of their importance: (1) fear of sickness or death, 23; (2) religious reasons, 17; (3) love of the child, 17; (4) desire to dispose of the child immediately after birth, 13; and (5) fear of legal prosecution, 12.

Ivany, studying the abortion problem in Yugoslavia, criticizes the recent laws (1930) that attempt to compel registration of all abortions, punishment of all mothers who aided their induction, and the appointment of a special commission of three (health officer, gynecologist and practitioner) to decide in doubtful cases as to the necessity of a therapeutic abortion. He claims that it is the duty of physicians to cure the sick and not to serve as police officers to notify the courts of criminal offenses. Through maintenance of secrecy, confession of criminal interference can be obtained in 75 to 80 per cent of these cases and the proper management of such abortions greatly helped. Ivany's recommendations are:

- (1) To restrict the indications for abortion to medical conditions (not social or eugenic);
- (2) To establish maternal welfare clinics in every center with contraceptive advice;
- (3) To raise the social and economic status of the unmarried pregnant woman and the working class as a whole;
- (4) To give public instruction on the value of life and the dangers of abortion; and
- (5) To pass laws eliminating all taxes for families with many children.

Voices are raised at times in conservative England against the routine punishment of illegal abortion where poverty is the underlying cause. In 1931 the late Mr. Justice McCardie tried two married women at the Leeds Assizes for procuring their own miscarriages. Instead of sentencing them, he bound them over with the following statement: "The law of abortion, as it exists, ought to be substantially modified. It is out of keeping with the conditions that prevail in the world to-day. Here is a woman of most excellent character, brave in the midst of sorrow and much burdened. She has had seven children born in poverty, reared in poverty, almost doomed to poverty all of their lives. She has had no money; her husband was lazy and earned nothing. The burden fell on her. She was tired out with this burden of bearing children to a husband who would not support them. They were living on charity. I think it should be recognized that we live in the world of 1931 and not in the medieval world."

Improvement in the economic status of midwives would, in the opinion of O. Lajos, help to decrease abortion in such countries as Hungary, where a large portion of obstetrical work is done by these women. If they were given sufficient funds to carry on their practice conscientiously and honestly, there would not be the temptation to supplement their income by the practice of illegal abortion.

The economic factors leading to induced abortion in Russia are fully discussed in Chapter XXVI. The legalization of abortion by the Soviet Government is an interesting experiment in the solution of this problem. The low abortion death-rate and the abolishment of secret abortions in Russia must be balanced against the increased tendency to frequent interruptions and the serious after results to the health of the mother.

For American and Western European conditions, legalized abortion as adopted in Russia would probably be a mistake. Even if it has merely served to make us stress more strongly the importance of contraception as the fundamental remedy for induced abortion, the Russian experiment has been enlightening. Many of those who are now most rigidly opposed to all forms of social experimentation are descendants of the very group of pioneers who, one hundred and fifty years ago, undertook that great social experiment which was embodied in our Republic—an experiment that made all Europe stand aghast. Some method of trial and error must be attempted if we hope ever to make progress in correcting the underlying causes of induced abortion.

Our present laws are certainly antiquated. Ostrich-like we have buried our heads in the sand and refused to look facts in the face. This does not mean, on the other hand, that we should adopt radical and rapid changes in our laws and social regulations. Rather it seems to me we should follow Anglo-Saxon traditions by seeking to effect a gradual modification of existing conditions. Let us first of all clear our law books of those mid-Victorian regulations by which birth control and abortion are classified as obscenities. By liberalizing the medical indications for therapeutic abortion, by lessening the taxes of those with many children, and improving the income and living conditions among the poor, illegally induced abortion, so often a dangerous health-destroying procedure, may be reduced to a minimum.

CHAPTER XXV

THEOLOGICAL AND ETHICAL ASPECTS OF INDUCED ABORTION

IN ANDREW D. WHITE'S interesting "History of the Warfare of Science with Theology in Christendom," we learn how the religions of the world, following upon the footsteps of new scientific discoveries, have been compelled to revise and reinterpret their doctrines to conform to these newly found truths. The creation of man, the deluge, the movement of the sun and stars, the evil spirits responsible for disease, each in turn has been the occasion of a heated debate that terminated in the reluctant acceptance by the Church of the facts revealed by science. Nor has this struggle between theology and science reached an end. While fundamental matters of spiritual belief have remained unchanged by science, those dogmas of the Church which deal with the material things of life are still often at variance with the truth, and block the path of progress and reform. By so doing, they are responsible for much unnecessary suffering, disease and death.

Because it touches so closely upon the very sources of human life, the question of the conscious control of birth by artificial means (through contraceptives and abortion) has been a matter of vital importance in the creed of all religions. The Greeks and Romans, to be sure, did not consider it sinful to bring on an abortion, but in the Talmud of the Jews, dating from 300 B.C. to A.D. 500 and still accepted by the orthodox, there are many proscriptions against the interruption of pregnancy. The Rabbis were of the opinion that before the fortieth day there was no animation in the ovum; hence, at this stage it was certainly not a criminal offense from the Jewish point of view to induce an abortion. Morally, however, it was considered wrong. For the woman this error was not considered so great as for the man, upon whom the duty of reproduction and multiplication was most incumbent. After the fortieth day interruption of pregnancy was considered criminal. It was, however, punished only by a fine. After labor had started, the legal status of the fetus altered. It was still considered *pars viscerum matris*, but when the fetal head had emerged during labor, it became a separate life, and killing it constituted murder. When, however, it was a question of killing the fetus to save the mother's life, not only was such an act permitted, but it

became obligatory. Distinction was also made in the Talmud between a Gentile and an Israelite. If a Gentile killed a fetus the offense was a capital one since he was suspected of the worst motives; but in the case of a Jew the offense was not a criminal one.

From its very inception the Christian Church took a strong stand against any interference with the life of the fetus. In the second century Tertullian voiced the views of the Christian Fathers when he said: "Murder being once for all forbidden, we may not destroy even the fetus in the womb. To hinder a birth is merely a speedier homicide; nor does it matter whether you take away a life that is born or destroy one that is coming to birth." Two hundred years later, Gregory of Nyassa announced that "one identical life principle exists from conception to death."

According to the doctrines of the Church, the fetus as the inheritor of original sin was certain of eternal damnation if it perished without baptism. There was some difference of opinion, however, as to when the fetus could be said to be a living being. It was proposed to divide pregnancy into two unequal parts: a short one varyingly estimated between forty days (following the ancients) and three months, during which time the embryo was considered a mere vegetative substance devoid of real life and therefore subject to destruction without accusation of crime; after this period the fetus became animated and possessed a soul. According to St. Augustine and St. Thomas, a male fetus was imbued with life from the fortieth day after conception, whereas a female fetus did not become animated until the eightieth day. The canon law states: "*non est homicida, qui abortum procurat antequam anima corpori est infusa.*" (It is not homicide to procure an abortion before the soul has entered the body.) Canon law decreed that women who aborted in the first, or vegetative, period were dismissed with a minor punishment such as a pilgrimage or a year of penitential exercises, whereas later interruptions were punished by long imprisonment or death. Imprisonment, deportation, or whipping was decreed for abortions brought on before fetal movements were felt, and death for cases of more advanced gestation.

The State embodying in its laws the decrees of the orthodox church maintained this inflexible attitude concerning the punishment of abortion throughout the Middle Ages up to modern times, when, in Protestant countries at least, some modification in favor of the mother was permitted. The Catholic Church has, however, remained adamant against this tendency of modern times. In the Papal Encyclical of 1931, this position is again clearly stated. The doctrine of the primitive sin inherent in all human beings, absolved only through the in-

tervention of Jesus by means of baptism, is the foundation stone of the Catholic faith. It is more fundamental than the commandment, "Thou shalt not kill." The destruction of life, as in warfare, has been countenanced by the Church on the basis of self-defense. The killing of a wrong-doer, or one who is classified as a wrong-doer, is condoned without punishment. It is less the destruction of the fetus than its death without baptism that weighs in the balance, in the Catholic faith.

The recent developments in gynecological surgery, particularly in the treatment of tubal pregnancy and in operations for tumors complicating pregnancy, have raised new questions for the Catholic Church, questions that require reinterpretation of old doctrines, in the light of our newer knowledge. The sterilization of holy water and its use in various operative procedures on the pregnant woman are now being resorted to increasingly. Altogether, it seems possible that the Church may in time consent to the sacrifice of the fetus in certain cases, provided that the cardinal principle of baptism be adhered to by the introduction of sterile holy water through a catheter into the uterus, thus saving mothers with serious diseases, as of heart or kidney, whose lives are now sacrificed.

In spite of the clear pronouncements of the Catholic Church on abortion, and similar strictures on contraception, there is apparently no striking difference in the birth-rate of Catholic countries as compared with others. A similar decline is shown in both: thus Montreal, a Catholic city, has a birth-rate of 32.8 as compared with 29.8 in Moscow; and Chicago's birth-rate is 19.9, while that of Catholic Vienna is only 11.6, according to J. Wolff.

Because the factors that determine a birth-rate are so numerous, generalizations are risky, especially those involving comparisons between different countries. A simpler and more reliable index is to be found in the relative incidence of abortion and contraception among Catholic and Protestant women of the same environment and period. As found by Dr. Kopp, among the 5,010 applicants to the birth control clinic in New York City who reported abortions, Catholic women were present in the same ratio as they were in the whole 10,000 studied (26 per cent in both); whereas the Protestant women reporting abortions formed a slightly lower proportion than that borne to the whole group (28 as compared with 30 per cent). Mrs. Robinson, studying the ratios of Catholics to total applicants in birth control clinics in New York, Chicago, Newark and Cleveland, found that they apply in about the frequency to be expected from their numbers in the population.

Historically, the attitude of the Protestant Church has been somewhat more conciliatory than that of the Catholic. Frederick the Great of Prussia protested against the iniquity of inflicting capital punishment for abortion, and since that time in Germany less severe measures were employed. In Denmark and other Protestant countries self-induced abortions have been treated leniently. Yet we find at the present time that the same Lambeth Conference of Anglicans and Episcopalians which in 1930 approved the principle of birth control, considered that abortion in general was "sinful and abhorrent to right minded people." In spite of these statements by the Church, therapeutic abortion for medical indications has been universally sanctioned in all Protestant hospitals. The saving of the mother's life, and even the preservation of her health, by means of induced abortion has met with no criticism in Protestant communities and has been approved in the teaching of all medical schools except those directly under Catholic control.

If we turn now from the theological viewpoint, bound down as it must be by dogma and infallibility, to the purely ethical or moral viewpoint, we again meet with difficulties. Our ethical ideas of right and wrong are not absolutely fixed. They have changed with the evolution of our social structure and a wider conception of the brotherhood of man. Kings are no longer *sacrosanct*, slavery is no longer condoned, wives no longer swear to obey their husbands. Many things that were considered sinful in the Middle Ages are now considered right, and *vice versa*. There is no such thing as a fixed standard of morality. The only cardinal principle that seems to permeate the ethics of all countries is "Do unto others as you would have others do unto you."

Murder, the premeditated destruction of human life, has always been considered wrong, since it is directly subversive of this cardinal principle. Yet, for the sake of King, Church or country, such murders have been countenanced and even acclaimed by the masses; and in self-defense or in defense of those dear to us, the killing of another has been justified in all times. What, then, shall be our attitude toward the destruction of the being lying within its mother's womb?

Science has swept away any argument as to a vegetative or animate period in the development of the child. We know from incontrovertible evidence, especially the development of uni-ovular twins, that all the essential factors in the development of the future child are determined at the first union of the two sex cells and that life begins then and there. From that very moment, even before it has become im-

planted in the uterine mucosa, we must, if we are logical, have regard for both ovum and mother. Society, in drawing up its code of right and wrong, must be just to both of them. It must insist that, although the growing embryo is but a shapeless mass of cells, it is not part and parcel of the mother's body, to be disposed of as she sees fit. Nor, on the other hand, is it fair that the health of the mother or her usefulness in the social order be undermined by the development of this new being whose continued existence is so precarious and whose value to the world is relatively of such dubious importance. Potentially, having reached maturity, the mother is the creator of many such human beings, and her life must therefore be given first consideration.

Lord Riddell, the late British jurist, in his "Medico-Legal Problems," says: "Logically the life of the microscopic embryo with its potentialities may be as sacred as that of the fully grown man, but human affairs are not governed by logic. Therefore we find that for nearly 3,000 years, the laity have not regarded the fetus as a human being. This may not be logic, but it is common sense. Abortion is anti-social and illegal unless performed for an adequate medical reason. But when such reason exists, there is no ethical objection. The doctrine that the mother is to be sacrificed or risked for the benefit of the unborn child is a resuscitated relic of the Dark Ages and biologically unsound. On strictly ethical grounds, saving the mother's life or health is more laudable than the observance of theoretical ideas regarding the viability and rights of the fetus. As Dr. Ballantyne says, when summarizing ideas (of which he disapproved by the way) (*Ante-Natal Pathology*, p. 459), 'The mother's life has a value because she is what she is, while the fetus only has a possible value on account of what it may become.' Perhaps I may be permitted to add that consciousness may well be the test. What evidence is there that the fetus possesses this quality? The whole tendency of modern life is to abandon forms, however venerable, and to concentrate on realities. The ethical propriety of lawful abortion must be considered from that aspect" (p. 34).

Looking at the problem more from a sociological than a legal point of view, Sigismund Peller in his book "Fehlgeburt und Bevölkerungsfrage" (p. 276) makes the following argument: "According to Tandler, the egg is the property of the mother only up to its impregnation. Out of a portion of the mother springs a being that demands shelter from the mother and is entitled to protection by society. This shelter cannot be taken away from the newly formed being without sufficient reason. The soundness of these reasons, which may be medical as well as eugenic, economic and social in nature,

must be judged by society. The result is that society may intervene in this matter on its own account!" While infanticide is regarded as a horrible crime in all Western countries, abortion is regarded differently, and Peller goes on to say: "One can oppose it by worldly laws and theology, by nationalistic arguments, but many people no longer have the feeling that abortion runs counter to morals and ethics. . . . When a feeling of shame is observed in women seeking abortion, it is not because of their desire to have the pregnancy terminated . . . but only because of the illegality of the act. . . . The assumption that the fetus in the mother's body is already an individual, whose destruction is equivalent to murder, has at the present time no longer the same acceptance that applies to other ethical and moral laws."

Presumably the existing views governing the moral conduct of the individual are stated in the laws that society has formulated. Yet we find that many of these laws are antiquated and are kept on the statute books only because of the technical difficulty of having them repealed. Assuredly it must be said that our laws only in part represent the existing opinions of the masses. Take for example some of the laws relating to drink and the observance of the Sabbath. Nor, on the other hand, does public opinion as expressed in the press, in the pulpit, or in public gatherings give us a true picture of the real opinions of men and women. Rather should we say: "By their deeds shall ye know them." When we try then to estimate the real opinion of the world at large on abortion, we cannot base it upon the existing laws, nor upon the sermons, lectures and written utterances, but rather upon the actions of the individual, when he is compelled to meet a particular situation. We are amazed at the frankness with which decent women discuss this matter among themselves or with their physician. Every physician will testify that it is without any feeling of guilt that most women speak of induced abortions in the consultation room. The most striking evidence of the attitude of the public is the fact that, even when positive evidence of guilt is brought in the trial of an abortionist, he is rarely punished by the jury before which the case is tried.

Peller differentiates this "secret" opinion of the masses from the viewpoint publicly expressed: "Public opinion in an absolutist state," he says, "is restricted, and the press cannot give a true measure of the feelings and opinions of the public. It is no wonder that in such a state the actions of the people are in sharp contrast to 'public opinion.' It is surprising that the same thing is also true in democratic countries, whose press suffers no limitations and is not stifled

by restrictive laws. Do these representatives of public opinion, opposing abortion as they do, truly portray the honest belief of the masses? If this is true, then we must assume that public opinion concerning the admissibility or objectionableness of abortion stands in sharp contrast to the actions of a large portion of the population; if this is false, then so-called 'public opinion,' including of course the voices of those physicians who are concerned with this problem, stands in contrast to the conviction of the people whose views have as yet not been formulated in public utterances. The former conclusion might be correct if the group of people who make use of artificial abortion were small in number. This would correspond to the situation that prevails in such matters as robbery, murder and theft. Since, however, the number of individuals who make use of abortion is large, since induced abortion is an everyday occurrence, it is not possible that the prohibition of abortion expresses the true opinion of the masses; in this case we must assume that there is a gulf that separates so-called 'public opinion,' and the 'secret,' but real, convictions of the people" (p. 252).

The time that has elapsed since the movement for birth control and broader indications for therapeutic abortion began, is too short for the "real convictions" of the people to have crystallized. Within the next two or three decades it is quite possible that a material change in our viewpoint on these matters will have taken place.

Rongy's book, "Abortion, Legal or Illegal," shows how the number of criminal abortions may actually be stimulated by the presence of stringent laws that are loosely enforced. Young girls in distress are lured to the abortionist by paid intermediaries under police protection. Naturally such conditions undermine the morals of a community and should be eradicated. In seeking ways of doing this, one should bear in mind that modification of the present unenforceable laws is a fundamental requirement of reform.

It seems difficult, however, to follow Rongy in his sympathy for the plight of the young physician who is tempted to slip into the golden, but inglorious, life of an abortionist. The fact that in his early years of practice there are financial difficulties does not make him any less culpable for accepting the bribe of a generous fee to interrupt the patient's pregnancy. After all, the same temptations for unlawful gains exist in other professions. We would do well not to waste any sympathy on the predicament of the doctor.

Concerning the money paid to the abortionist, few figures are available. Through personal interview R. K. Stix obtained information from twenty women as follows: The highest price was \$200, and the

lowest \$2.00 with about \$60 as the average. The two-dollar abortions were done by a man described by the patient as a "doctor." She assured the author that his patients were given slips of paper with numbers on them and waited in line. She also said she thought his instruments were rusty.

Again quoting from Lord Riddell, we find the ethical position of the physician put in the following words (p. 22): "A woman who becomes pregnant must be prepared to undergo the ordinary discomforts of pregnancy and to take the ordinary risks. Therefore the practitioner must not be influenced by the adjurations of the patient or her relations to relieve her of these. Nor must he be influenced by economic considerations or by his sympathy for a woman who finds herself in a distressing situation involving perhaps social ruin. In short, the medical man must confine himself to the medical and surgical aspects of the case."

With the above statement I am in general agreement, except for the last sentence; for, it seems to me, it is also the moral obligation of the physician, who more than anyone else sees the unhappiness, the disease and death that follow in the wake of this plague of abortion, to be the leader in pleading for some more equitable solution of this problem. It is not enough for him to live up to the letter of the law, it is his duty as well to see to it that unjust, unenforceable laws are modified in accordance with the *real* convictions of the people, and that underlying social conditions leading to the prevalence of induced abortion are corrected.

CHAPTER XXVI

LEGALIZED ABORTION IN THE SOVIET UNION

NO BOOK on abortion written today can be complete without special consideration of the movement in Soviet Russia to legalize abortion. The true significance of this unique experiment must be left for future generations to decide. Certainly the present opinion of the majority in other countries is that this movement is in many ways detrimental to the human race. In all fairness, however, a brief review of the measures originally adopted and their modification in subsequent years should be given, with an analysis of the results thus far obtained. In any problem into which social doctrines and religious and anti-religious bias enter so largely, it will be difficult to separate truth from exaggeration. It has been my endeavor to give as accurately as possible the facts as they have been presented by various writers, Russian, German and American. My visit to an *abortarium* (hospital for abortions only) in Moscow in 1930 gave me an opportunity to check personally some of these statements.

Legislation

Approximately two years after the Soviet Revolution, on November 18, 1920, the Russian Health Commission (Narkoomsdrav) issued the following pronouncement:

"In the past ten years, not only in the U. S. S. R., but throughout Western Europe, the number of abortions has markedly increased. The laws of all countries have fought this evil by punishing both the pregnant woman who submitted to an abortion and the physician who performed it. These means of combating abortion have nowhere shown any results. On the contrary, they served to drive it into subterranean channels. Women became the victims of greedy, unscrupulous charlatans and physicians who made a business out of the secrecy of the operation, with the result that fifty per cent of the aborted women suffered from infections and four per cent died."

The Proletariat decided that efforts should be made to explain the physical dangers entailed by such operations, and to make better provision for the expectant mother before, during, and after confinement. Realizing, however, that economic conditions necessitated some reduction in the size of families, the Commission decided to take steps

to legalize abortions so that the risks heretofore encountered by these procedures should be minimized. Such abortions could, however, be done only by registered physicians and without any pay or remuneration. No midwife or nurse was permitted to do such an operation. The abortion could only be done openly in the hospitals. Any person who performed an abortion under other conditions was to be punished by imprisonment. No qualified doctor was permitted to refuse an abortion, although he was permitted to discourage it if he saw fit. Abortion must not be performed if the pregnancy had advanced beyond two and one-half months, and only in case of serious danger to the woman's life could it be done for the first pregnancy. The woman concerned must not be allowed to go to work for two weeks after such an abortion. She must stay in the hospital for three days after operation.

After a few years, however, it was found that the Soviet Government could not provide hospital accommodations for all the women who desired such instrumental interruption of their pregnancy. Hence, in 1924 preference was given: *first*, to women who had one child but were without means of support; and *second*, to women who, though married and having means of support, had had several children. A special commission was appointed to determine whether, in a given case, an abortion should or should not be done.

This reduction in the number of women to whom this service was given was followed promptly by a considerable increase in the number of illegal operations performed, with resulting increase in morbidity and mortality. The number of hospital beds available for these cases was far too few to take care of even such as in the opinion of the Commission were suitable for abortion. Hence, a further change in policy was necessitated. Heretofore no charge had been made for any abortion. It was decided that in the majority of cases the income of the family was such that a small charge proportionate to this income could be made, and with the funds thus supplied special hospitals could be built and equipped. This led to the establishment of abortaria in the larger cities of Russia.

In Moscow in 1930 there were two abortaria, each of 250-bed capacity, with a hospitalization limited usually to three days. This permitted of approximately fifty abortions a day, making a total of about 43,800 abortions a year in these two institutions. On the day that I visited Dr. Madjuginsky's abortarium in Moscow (July 20, 1930) a total of fifty-seven abortions were performed. Dr. A. Stone, of New York, reported that, according to Dr. Madjuginsky, 91,000 abortions were done in Moscow in 1931.

The increased hospital facilities obtained by charging for the abortions did enable the government to reduce the incidence of illegal or secret abortions in large measure. Even so, the evidence from various sources leads to the conclusion that there are still a considerable number of abortions being done outside of the law. It would seem that the very legalization of abortion has led some women to regard more lightly the moral and religious scruples that in the past had restrained them from undertaking such measures.

The fact that in a considerable number of cases the women were unable to meet even a minimal charge for the abortion led to a division of the cases into free and pay patients. The Commission which formerly had decided whether or not an abortion should be done, now confined its attention merely to the economic status of the individual. Any pay case, with certain minor restrictions, was accepted, but in order to obtain free service the individual had to prove her inability to meet the charge, before the Commission. The method of determining the amount to be charged was unique. The monthly pay of all members of the family was added together, divided by the total number in the family, and 25 per cent of this per capita sum was charged. Thus, in a family of five persons with a total joint income of 100 roubles (a rouble equals 50 cents), the charge would be five roubles (100 divided by five equals 20, times 25 per cent equals five). The proportion of free patients was about 20 per cent, although on the day I visited the Moscow abortarium there were twenty free cases out of the total of fifty-seven. Persons whose family income was less than forty roubles were given abortions free of charge. In no case was the fee greater than forty roubles for an abortion.

With increasing experience, the later detrimental effects of these wholesale abortions have become more and more apparent, so that in the past four years there has been a determined effort to combat the increase in abortions by widespread propaganda and increased facilities for birth control by contraception. There has also been a further limitation in the accepted indications for abortion, so that at the present time they are restricted as follows:

- (1) Primigravidae are not aborted, except for medical complications, unless, after careful explanation of the dangers, they insist upon its being done.

- (2) No abortion is done except in the first three months of pregnancy (twelve weeks after last menstruation).

- (3) No abortion is done earlier than six months following a preceding abortion.

According to Dr. Stone, every effort is made to induce women to restrict the number of abortions by the use of contraceptive measures. On the walls of the waiting room of the abortarium are such signs as: "Let this abortion be the last one"; "Interruption of the first pregnancy is particularly harmful"; "Better to prevent than to interrupt"; "Go to the Prophylactarium (birth control clinic); you will avoid abortions" (Fig. 143). Specimens of early embryos are displayed in jars to show the extent of fetal development in the early months.

The organization of the health department to care for the abortion cases has undergone various changes. In 1930 when I was in Moscow



Fig. 143.—Signs hung in the waiting room of a Russian abortarium. The largest one reads: "Go to a Prophylactarium [birth control clinic] and avoid the necessity of another abortion." (Enlarged from motion picture film.) (Courtesy of Drs. Charles S. Gelber and A. Stone.)

this work was done under the supervision of the Assistant Commissar of Health. His chief adviser was Dr. Genss, who collected statistics and directed research on the treatment of abortion and birth control. Dr. Genss had frequent conferences with all who were actively working in abortaria, at which time results were discussed, and new methods of treatment, such as the use of intrauterine instillations of pastes, were planned. More recently Genss was transferred to Tiflis, and the work is now under the direction of Dr. Bernstien, a woman physician. Dr. Boligna, also a woman, is now head of the Birth Control Section of the Institute for Mother and Child. In an interview which Mrs. Alice Withrow Field, author of "Protection of Women and

Children in Soviet Russia," had with Dr. Boligna in November, 1933, the following changes in policy and conditions were recorded:

(1) Abortions had decreased in the cities and industrial centers by ten to twenty per cent due to:

- (a) Ease of procuring birth control advice.
- (b) Longer establishment of abortaria, which conduct a deterrent educational campaign.
- (c) Easier living conditions and better facilities for infant care.
- (d) Greater social pressure against abortion.
- (e) Lower fertility in urban centers (questioned by some).

(2) Abortions had increased in towns, villages, and rural or backward communities because of:

- (a) Establishment of abortaria and state hospitals in many smaller and remote places.
- (b) Campaign against the practice of secret or illicit abortions.
- (c) More recent breaking down of marriage morality without as yet a proper development of social morality.
- (d) Greater fertility of rural communities.

According to Dr. Boligna, these changing trends in abortion show that, where abortion is legalized, there occurs in the course of years a decrease in the number of abortions without any increase in illegal abortions. On the other hand, in certain remote districts such as Baku, where they attempted to discourage all abortions, the hospitals were filled with incomplete abortion cases that had been induced illegally. Hence, the policy of restriction was abandoned, and facilities previously limited to the larger centers were extended throughout the Soviet Union to the most remote districts.

Statistics

The statistical study of legalized abortion in Russia is hampered by the difficulty of obtaining accurate figures concerning abortion in the Czarist days, when it was done in secrecy, and the present difficulties in gathering figures from so vast a country with such a varied population. Essentially the figures obtained come from a relatively small area, including the large cities, and certain country districts, such as the Ukraine, in the European section. What is going on in Asiatic Russia is but little known. It is a fair assumption that among the Mohammedan population legalized abortion has not yet become widespread. Their religion, with which the Russians do not as yet dare to interfere, is firmly opposed to such measures. Mohammedan women

object to any medical examination. Genss calls them a stupid and backward race. Sterility is regarded by them as a serious misfortune and a ground for separation by the husband. According to Kras-silnikian, abortion is very rare among the Kalmucks, the Kirgis and the Burjat peoples.

The most accurate figures come from Moscow and Leningrad. According to Genss, there were in the year 1927 a total of 201,480 legalized abortions in all the cities of Soviet Russia. That the number has been steadily increasing year by year is evident from Genss' reports, as shown in the accompanying table of figures. (Table XXV.)

TABLE XXV
BIRTHS AND ABORTIONS IN MOSCOW AND LENINGRAD
(After Genss:)

PLACE AND YEAR	(1)	(2)	(3)	(4) (5)		(6)
	TOTAL POPULATION	TOTAL BIRTHS	TOTAL ABORTIONS	RATES PER 1,000 GENERAL POPULATION		RATIO ABORTIONS PER 100 BIRTHS
				BIRTHS	ABOR- TIONS	
MOSCOW						
1914-----	1,754,900	54,405	5,537	31	3	10
1921-----	1,176,600	36,000	6,723	31	6	19
1925-----	1,855,000	57,537	18,071	31	10	31
1926-----	2,019,453	58,384	31,886	29	16	55
1927-----	2,083,000	53,369	40,001	26	19	75
LENINGRAD						
1914-----	2,217,500	55,460	—	25	—	—
1924-----	1,221,000	31,601	6,692	26	6	21
1926-----	1,535,000	42,608	21,646	28	14	51
1928-----	1,700,000	38,463	53,562	23	32	139

According to Genss, this marked increase in the number of abortions is not a real one, but only due to the fact that, with increased hospital facilities and better understanding of the dangers of secret abortion, women have preferred to seek the legalized channels. He claims that the maintenance of the birth-rate in the general population proves this contention, and that in the Czarist days there were just as many abortions, only they were not cared for in hospitals. This of course assumes that the number of conceptions in those days equalled the number under present conditions, a fact which is far from having been proved. Furthermore, his own figures show a decline in the birth-rate in Moscow from 29 per 1,000 in 1926 to 26 in 1927, and a similar drop in Leningrad. In fact, the bulk of evidence points to an actual as well as an apparent increase in the abortion rate, for in

the past five years, during which the number of secret abortions has apparently been stationary, the total number has shown a steady increase.

An analysis by S. Peller of 99,154 abortions in the Ukraine in 1927 shows a striking difference between large cities, small towns and country districts, when the rate is calculated on the basis of 1,000 women of childbearing years:

	LARGE CITIES	SMALL TOWNS	COUNTRY DISTRICTS
Births	65	88	166
Abortions	55	65	28
Total conceptions	120	153	194

It is evident from these figures that in the cities the fertility ratio (conceptions per 1,000 women) is greatly reduced, probably by better contraceptive measures, but on the other hand the proportion of abortions to births is about five to six. In the country districts, on the other hand, with a fertility ratio more than 50 per cent higher, the proportion of abortions to births is about one to six. Apparently country women, owing to better economic conditions and inaccessibility to abortion hospitals, are more inclined to have large families. In the small towns the actual number of abortions per 1,000 women is greater, and contraceptive control is less frequently practiced. Karpov has noted a slow but steady increase in the number of abortions in country districts. There are still very many abortions done by the laity among the farming classes, but gradually more and more are resorting to legalized medical abortion. Karpov has noticed that from July to October the number of abortions is much greater owing to the necessity of working the crops. He also maintains that many more spontaneous abortions now occur as a result of pelvic disturbances following legalized abortion. In some districts of Ukraine he found that, between 1925 and 1928, accompanying a drop in the birth-rate from 42 to 34, there was an increase in the abortion rate from 3 to 10 per 1,000 women. But while 64 per cent of abortions in 1925 showed previous bleeding, suggesting outside interference, the percentage in 1928 was only 37.4 per cent.

Age Distribution.—The age of women resorting to legalized abortion, according to the cases tabulated by Mescerina (Moscow, 1925), varies from 135 women under twenty years, 1,716 from twenty-one to thirty years, 805 from thirty-one to forty years, to 41 over forty years. Karlin finds the smallest number of abortions under twenty years, the greatest number between twenty-one and twenty-five. On

the other hand, when abortions are compared to births, the proportion of abortions is greatest in the decade between forty and fifty (Peller).

Occupation.—Professor Pajewsky reports that women with jobs are less inclined to resort to abortion than housewives in corresponding situations. His figures, based upon 24,500 cases of legalized abortion in Leningrad in 1927, are shown in the accompanying table. (Table XXVI.)

TABLE XXVI
ABORTION RATES ACCORDING TO OCCUPATIONAL STATUS
(24,500 Cases Reported by Pajewsky, from Leningrad, 1927)

OCCUPATIONAL STATUS OF WOMAN OR HUSBAND	ABORTION RATES PER 1,000 WOMEN 15 TO 49 YEARS	
	WOMEN GAINFULLY EMPLOYED	WIVES NOT GAINFULLY EMPLOYED
Factory Worker -----	55	62
Clerical Worker -----	33	47
Independent Trade -----	11	16
Unemployed -----	31	84

Indications.—More interesting are the “indications” for the abortion. Genss analyzed the reasons ascribed for asking for abortion by 5,365 women: the largest group, totalling 1,657 (31 per cent), gave poverty as the reason; a second group of 1,566 (29 per cent) asked for it on account of large families; a third group of 1,114 (20 per cent) consisted of widows or unmarried women desiring to conceal their personal relations; a fourth group of 593 (11 per cent) gave such health reasons as debility, serious complications at delivery, sickness of husband; and a fifth group of 435 (8 per cent) stated that they were unhappily married, or that the husband was a drunkard or had deserted them.

Mescerina, Obgarova and Subina give poverty as the cause in 1,586 abortions; nursing mothers, 416; too many children, 233; medical reasons, 196 abortions. The percentage distribution given by Daron is: poverty, 44; unmarried, 11; work and study, 15; too many children, 12; unhappy married life, 9; living conditions, 5; and fear of confinement, 4 per cent.

It can be seen from this that “illegitimacy” plays but a small part in the frequency of legalized abortion; but in Russia there is no such legal distinction as in other countries between children born in and out of wedlock.

Krassilnikian cites multiparity as the most common associated factor: among 7,641 women, 17 per cent had no children; 30 per cent

had one child; 20 per cent had two; and 33 per cent had three or more children. Similarly Mescerina gives the following figures: among 2,676 women, 140 were nulliparae; 670 had one child; 1,249 had two to four; 617 had five or more children. Nevertheless, Schiffinger found many women with but one child and a monthly income of 40 to 50 roubles, who claimed poverty as a reason for demanding abortion, while other women did not ask for it although they had three children and an income of but 30 roubles a month.

The abuses to which legalized abortion may lead are best exemplified by those cases in which abortions were repeated at short intervals. Bykov refers to two women, one of whom had 15, the other 17 artificial abortions. Hernett gives statistics from married women in Moscow in 1925 showing 49 per cent aborted for the first time; 27 twice; 13 three times; 6 four times; and 5 per cent five times or more.

Mortality and Morbidity

Most important are the claims made by the adherents of legalized abortion that the procedure is not dangerous, and that by its adoption a very material reduction in maternal mortality is obtained from that in the years in which these abortions were performed secretly by midwives, charlatans and unscrupulous physicians. Genss states that the mortality of legalized abortion is practically nil. That this statement is open to question seems likely when we note the effort to explain deaths as due to other causes. Thus, Dr. Genss informed me that the two deaths occurring in 1929, the year previous to my Russian visit, were due to an unrecognized gonococcal infection in one case, and in the other to streptococci found in the spermatozoa of the husband.

However, the death rate is extremely low. Thus, M. Levit in 1931 found that in 175,000 abortions done in hospitals there were nine deaths, or 5 per 100,000, whereas in 53,000 done outside of hospitals there were 16 deaths, a rate of 30 per 100,000; making a total of 228,000 with 25 deaths, or 10 per 100,000 abortions. In the course of five years at the government hospital at Tambov, Odrova performed 709 abortions with two deaths from peritonitis, one perforation and five serious complications. Professor Snegireff reports a mortality of 0.44 per cent in 3,364 abortions done in 1926-27, with a febrile course in 8 to 12 per cent. In Moscow (1926) there were 29,306 hospital abortions without a death, while of 2,683 outside, illegal operations there were 35 deaths (1.2 per cent). In Saratov in 1925 the reports were 2,366 hospital abortions without a death and 1,026 in-

complete abortions (illegal) with 7 deaths (0.7 per cent). According to Dr. Madjuginsky, the death-rate was one in 20,000 legalized abortions.

All in all, there seems no reasonable doubt that, by limitation of cases largely to multiparae less than three months pregnant, under aseptic hospital conditions, a physician whose special skill is developed by performing 25 to 30 abortions daily can reduce his mortality rate to about one one hundredth of one per cent; that is, to one in ten thousand cases.

Complications.—Perforation is a complication that is more dreaded than severe infection. Such perforations occur, according to Levit, 164 times in 191,000 abortions (0.09 per cent). Breitfus reports an average of one perforation to 440 abortions (0.23 per cent), while Madjuginsky, in four Moscow hospitals, reports 45 in 60,058 (0.07 per cent). The latter informed me personally that in 20,000 abortions done in the previous year (1929) there were four perforations, all operated on by him without a death. Owing to the fact that almost all these perforations are recognized promptly at the time, and usually subjected to a laparotomy before complications arise, the mortality from this accident is relatively low.

Sequelae.—Even the most enthusiastic of the Russian advocates of legalized abortion are, however, appalled at the growing evidence of serious pelvic disturbances, endocrine dysfunctions, sterility, ectopic pregnancy and other complications following in the wake of artificial abortions. It is this aftermath of the interruptions of pregnancy that has led the government to renewed efforts to reduce the frequency of such interference, fearing that it may eventually lead to a deterioration of their race. Levit, in Snegireff's clinic in Leningrad, reports that out of 1,000 abortions 18 per cent had a rise of temperature to over 100° and that among these women there was a high incidence of subsequent sterility and ectopic pregnancy. Out of 204 ectopic pregnancies, he obtained a history of previous artificial abortion in 61 cases. In 1,520 gynecologic patients without any history of infection outside of an artificial abortion, 20 per cent had lesions resulting from the previous curettement. Confinements following upon a legalized abortion are also more likely to be complicated. Serdukoff compared 1,723 deliveries without previous abortion with 681 deliveries following upon abortions. He found long labors, postpartum bleeding, adherent placenta and other complications much more common in the latter group. More important still are disturbances of internal secretion following abortion. This is manifested by sterility and various asthenic conditions.

In the monograph by Krassilnikian entitled "Russische Erfahrungen mit der Freigabe der Abtreibung, eine Lehre für Deutschland," published in Berlin (1930), the author presents a diatribe against the Russian practices and stresses especially these undesirable sequelae of interruption of pregnancy. He presents evidence from Russian sources indicating that in 43 per cent of aborted women there was pelvic pathology of some sort, and that 15 per cent of the women had been entirely well previous to the abortion. Belgajeva, from Professor Braude's clinic in Moscow, found that 133 out of 912, or one in seven aborted women showed complications such as bleeding, salpingitis or parametritis within ten days following operation. She calls attention to the slow regeneration of the endometrium following these procedures and maintains that it takes three weeks before the patient has fully recovered. The vast majority, however, leave the hospital on the third day and get no subsequent gynecologic care unless serious complications occur. She calls attention to the economic loss to the country resulting from the hospitalization and subsequent debility of these women.

Tolmasoff calls attention to the frequency of menstrual disturbances in the form of dysmenorrhea, amenorrhea, or oligomenorrhea subsequent to abortion. Functional neuroses such as hysteria, neurasthenia, psychasthenia, depression, loss of libido, have been noted by many writers quoted by Karlin. He cites a statement by Zomakion that "there is no pathologic process in the female genital tract in whose etiology artificial abortion does not play an important rôle." The frequency of these troublesome sequelae has induced the government to supervise more carefully the after-care of abortion patients. The women are paid for a two-week absence from their jobs and at the end of that time, ten days after they leave the hospital, must report at the Point of Medical Consultation which they visited before their abortion, for a final examination. At this time they are given contraceptive advice and materials, and any pelvic conditions that remain are given appropriate treatment.

The Russian Abortarium

No one who has not visited a Russian Abortarium in action can fully appreciate the gruesomeness of these wholesale abortions. The following is taken from a communication published in the *American Journal of Obstetrics and Gynecology* in July, 1931:

"I was most anxious of course to see things at first hand and so looked forward to the next day when I was to visit one of the large abortaria in the Arbat district of Moscow. There were two of these

in Moscow, each with a capacity of about 250 beds and devoted solely to the handling of the induced abortion cases. The diagnosis and operative indications were made in dispensary rooms on the first floor. No Aschheim-Zondek tests were employed.

"The Arbat Abortarium was a rather dingy three-storied building, one division of which was devoted to the free cases and the other to the pay cases. Each division had its own operating room, the better one being for the free cases. In this room, approximately 15 by 20 feet, were two ordinary treatment tables. I arrived at 11:30 in the morning, accompanied by four other American physicians who were visiting in Moscow at the time. We were greeted by Dr. Madjuginsky, who was expecting us. The morning's work had already begun. In the free operating room two patients were being curetted, one by a man, the other by a woman physician. The patient lay in the lithotomy position, clothed merely in a hospital jacket and without any special drapes.

"On the table to one side lay the instruments spread out on a sterile tray, consisting of a Sims speculum, two tenaculum forceps, a set of graduated Hegar dilators, two large open curettes, one sharp and one dull, the loop measuring 3 cm. long and 1.2 cm. wide, a dressing forceps, and a wooden stick applicator covered with alcohol-soaked cotton. A small number of gauze sponges were available but not often used. A single pair of rubber gloves was divided between the operator and his nurse assistant, in each case the ungloved hand being kept as far as possible from direct contact with the instruments used in curetting.

"When we entered the room, both operations were in progress and blood was flowing freely, though without unusual hemorrhage, as with long sweeps the curette brought away pieces of placenta and ovisac. There was scarcely a groan from either of the patients throughout the procedure, and with a surprising speed it was completed and the patient lifted on a stretcher and taken away to make room for the next one. After watching about six operations here, we proceeded to the private operating room where we stayed a longer time. Dr. Madjuginsky did none of the operations himself, but stood ready to answer any questions and show us what we wanted to see. He said that patients were admitted the evening before at 5:00 P.M., when the urine was tested and the cervix examined for evidence of gonorrhea. The patient was given a bath and enema, and the vulva shaved. The following morning without any preliminary medication of any sort and without any anesthesia the patient got up on the operating table, was placed in position and the external genitals scrubbed with tincture of soap for one to two minutes, followed by a lysoform vaginal douche. Then sterile stockings were slipped on. The operator and nurse were in the meanwhile scrubbing their hands for about three minutes. No gowns or sterile dressings were employed, only a towel slipped under the hips just before beginning the operation. A Sims speculum was then introduced and the cervix caught with a tenaculum forceps. The nurse held these instruments, while the operator wiped out the vagina with lysoform or bichloride solution and then took the wooden applicator soaked in alcohol to clean the

cervix. Dilatation of the cervix with graduated Hegar instruments was begun, the gloved finger being in each case held at a point on the dilator to prevent perforation of the uterus. Dilatation proceeded until the large Recamier curette could be introduced and curettement begun, first for several minutes with the blunt curette and then for a shorter time with the sharper one. As a rule, the operator before beginning assured himself of the exact size of the uterus by a bimanual examination. All of the women whom we saw operated upon that morning were multiparae, although Dr. Madjuginsky told us that one of the women operated upon before our arrival had not before been pregnant.

"As to anesthesia, we were told that, both to diminish the risk of bleeding and because of the expense, it was employed in less than one per cent of the cases. Since only about 5 per cent of the women aborted were primiparae, necessity for narcosis was reduced. Nevertheless there was ample evidence of severe suffering by many of the women in the process of dilating the cervix and their groans sent shivers down our backs. However, the ability of the Slavic people patiently to endure pain was amply shown by the way these women would cheerfully respond to Dr. Madjuginsky's question and say that it wasn't so bad. Some few even smiled as they slid over from the table onto the stretcher and were taken away.

"The morning that we visited the abortarium of Dr. Madjuginsky there were done 57 abortions, of which number 20 were done in the free clinic and 37 were done in the pay clinic. The operative work began at 10:30 A.M. and was finished by 1 P.M. We actually saw during the time of our stay between 20 and 25 of these abortions. The speed with which this work is done can best be seen when we figure that the one hundred and fifty minutes operating time with four tables being used (two in each room) would allow for the 57 operations that morning, a trifle over ten minutes for each procedure. These ten minutes were consumed as: one minute getting on and off the table; three minutes preparation; and six minutes of actual curettement. That a considerable amount of skill and clockwork efficiency was demonstrated cannot be gainsaid.

"Even more interesting was our subsequent visit to the post-abortion wards. Every bed was taken in these overcrowded rooms (14 beds to a room that should hold only 7 or 8 at the most). The only empty ward was the one that had been occupied by the patients leaving that day, the bedding of which was being aired for those who were to enter that evening. Stolid indifference characterized the faces of most of the women, although to please Dr. Madjuginsky, some of them would laugh and say they felt fine. Only an occasional face showed a pallor indicative of a severe blood loss and none seemed to have a fever. I asked to see the patients' charts and looked over 30 to 40 of them without finding more than three elevations of temperature up to 38° C., all of them subsiding with the passage of clots and tissue in twenty-four hours. In the septic room containing three beds there was but one patient. Her highest temperature was 38.5° C., and she did not seem to be very sick. This abortarium was one of the few hospitals I saw in Russia with screened windows. The patients were allowed

to sit up on the second day, walk on the third day, and leave the hospital on the fourth day after the operation. The total stay in the hospital in Moscow, therefore, was five days. In less well-equipped cities such as Kiev the stay had to be limited to three days owing to the small number of available beds.

"An interesting side light on the abortion question was obtained by my visit to Kiev, where I had a very satisfactory conference one evening with Professor Wittenberg. At his home, where he most courteously received me and my family, he told me of his work with a frank sincerity that was quite convincing. He said that he, like most of his colleagues, had at first been very skeptical of legalized abortion, but that the experiences, especially of the last few years, convinced him that, at least for Russia, it was the lesser of two evils and should be continued. In Kiev there were in 1929 over 8,000 abortions, in 1930 about 10,000. Many women from neighboring villages came to Kiev to have the abortion done under better hospital conditions. Compared with fifteen years ago when abortions were done secretly by midwives and charlatans, there was a marked drop in the number of febrile abortions. In his service at the university, Professor Wittenberg had 15 beds in gynecology, 15 beds in obstetrics, and 25 beds for abortion cases. Out of 5,000 abortions done in two and one half years in his service there were no deaths, one perforation with intestinal injury requiring operation, and two other perforations not requiring operation. Owing to limited bed capacity patients were admitted in the morning and operated on the same day, remaining only forty-eight to seventy-two hours after operation. In place of narcosis, psychotherapy was often attempted by telling the patient that a given local application would relieve the pain. Expense of cocaine and anesthetics made this necessary. In Professor Wittenberg's clinic the charges for abortion were as in Moscow, but there was only one free bed out of the twenty-five. The total abortion beds in Kiev were 75.

"The operative technique in Kiev was as follows: Shave, scrub with soap, give 1-4,000 formalin vaginal douche, apply tincture of iodine to cervix; dilate to No. 10 for two months' gestation and to No. 14 for three months' gestation; curette with large, sharp Recamier curette and use a soft placental forceps like our sponge holders to clean out the cavity. This was followed by an intrauterine irrigation of 1-4,000 formalin solution with a Bozeman irrigator. Up to last year a cervico-vaginal tampon was used but recently only in cases of severe bleeding, and not longer than six or eight hours.

"I asked Professor Wittenberg about readmission for incomplete procedures. He stated there had been about 25 such cases in the past year and that less than one per cent ran a febrile course." (Am. J. Obst. & Gynec., July, 1931.)

Some variations from the above technique have been reported by various writers. Mescerina states that in 1927 in Moscow, after dilatation and curettage in one sitting, the vagina was packed with gauze for 10 to 12 hours. Ziwatoff stimulates uterine contraction by massage through the abdomen, pituitrin and ergot. Odrova found it

necessary to give anesthesia in only five out of 709 abortions; only 20 per cent complained of pain. My impression is that the absence of anesthesia diminishes the tendency to hemorrhage in these cases, but only the stolid type of Russian womanhood could stand such punishment without any sedative or narcotic.

Summary

And now briefly to array the pros and cons of the Russian experiment as depicted by various writers:

In favor of it is the evidence of marked diminution in the number of secret abortions carried out by unscrupulous persons for money, under the worst possible conditions. The comparison of Russian and German reports on the frequency of septic abortion leaves no reasonable doubt that in Germany there are proportionately more deaths from sepsis following abortion owing to the high percentage of outside interferences. The mortality figures in Germany vary from 1.5 to 4 per cent, while the Russian statistics give a mortality of but 0.01 to 0.04 per cent, or one hundredth of the German rate. Even allowing for some later complications resulting in death, the Russian mortality is less than one-tenth as great as that in Germany.

On account of the tremendous increase in the number of abortions in Russia, however, it is very questionable whether there is the same difference between the two countries if we figure the number of deaths in proportion not to the abortions but to the population; that is to say, the number of women between fifteen and forty-nine years of age. Of course, many writers speak readily in round numbers of 1,000,000 abortions annually in Germany, but evidence of such colossal numbers is entirely lacking. With organized contraceptive advice in Germany there was a definite decline in the ratio of abortions in recent years in spite of widespread poverty and unemployment, whereas in Russia the evidence points to a steady increase. The claim is, of course, made that in Czarist days there were as many abortions, only they were done secretly and hence not recorded as at present. This does not take into consideration, however, that with the knowledge that an abortion can be obtained whenever desired, women have been under less restraint than heretofore, resulting in a greater number of total conceptions. Even so, I cannot see how one can escape the conclusion that in a country suffering from economic privation the Russian system of legalized abortion leads to a definite diminution in maternal mortality.

On the other hand, with the diminution in maternal mortality rate there is undoubtedly a marked increase in absolute maternal morbid-

ity. The evidence of this, accumulating especially in the past five years, has led Russia to adopt a policy that makes it increasingly embarrassing for women to ask for repeated abortions. While the methods employed are those of persuasion rather than compulsion, the government has let it be understood that loyalty to the Communist program requires a limitation of such operative interference.

As early as 1927 Sujetin called attention to the spread of legalized abortion among country people, where economic distress was not a factor. He asked the government to organize educational propaganda to stimulate motherhood, else the farms would soon become depopulated. Sellheim calls attention to the change of sentiment among Russian physicians as the physical harm to the women in subsequent years became apparent.

Among the methods employed by the Russian authorities to check the spread of legalized abortion without promoting a return to the old days of secret interference are determined efforts to dissuade all primigravidae from abortion. On leaving the abortarium every patient is given an explanation by the nurse of the dangers of repeated abortion and the advisability of employing contraceptive measures. They are referred to a contraceptive clinic for such instruction. An important deterrent is that members of the Communist Party are asked not to resort to abortion except for important reasons of health. The growth in numbers and in influence of these members will doubtless show in the coming years a definite decrease in the resort to such measures by the citizens at large.

This chapter cannot be concluded without again emphasizing the fact that in the Russian experiment we have the first serious attempt in any country and in any age to solve this problem of abortion. Heretofore the world has either accepted it as an uncontrollable evil, or by vain punitive methods has driven it underground where it flourished more than ever. Never before in such a short period of time has the world acquired such a fund of information, both medical and social, helping toward a solution of this problem. We may prefer to have such an experiment carried out in some country other than our own, but regardless of the outcome, the facts that are being brought to light will be of the greatest value in our analysis of these fundamental problems of reproduction.

CHAPTER XXVII

LEGAL ASPECTS OF INDUCED ABORTION

LAWS, BASED in theory upon abstract moral principles, are in reality the outgrowth of many other widely different factors, such as religious dogma, national policy and social custom. The varying attitudes toward the punishment of abortion in different countries and at different periods illustrate this fact. While in Orthodox and warlike Judea abortion was taboo, contemporary Greece, with its more democratic government and religious freedom, had laws that with a few exceptions permitted interruption of pregnancy. A little later we find in Imperial Rome a tendency to punish abortion lightly, save when the husband considered that his wife was trying to deny him the privilege of offspring to which he was entitled. At the same period the early Christians upheld in their ideals the sanctity of human life, and made abortion a serious crime equivalent to murder.

As Christianity became the dominant influence in the Western World, all European countries enacted laws that punished by death any person who committed this crime. The ravages of war and disease in the succeeding centuries, however, prevented any excess of population, so that abortion was relatively uncommon. In fact, it was not until the last fifty years that the industrial revolution with its greater emphasis on women's rights and on freedom for the individual, in combination with a lower infant mortality, led to increased resort to abortion. At first the tendency, both here and abroad, was to control this evil by making the laws more rigid and the punishment more severe, but as this failed to stem the tide of increasing abortions, other measures were resorted to. Since the World War, laws have been passed in some countries widening the medical indications for therapeutic interruption of pregnancy, the widest interpretation being in the 1920 law of the Soviet Union, permitting abortion by physicians, and providing hospital facilities and special care for patients.

But on the whole we find that the law in most countries has followed far behind effective public opinion. The medical profession has, as a rule, paid but little attention to what was written in the statute books, so long as public opinion, through the decision of the courts and the action of prosecuting attorneys, justified certain indications for abortion. An amazing situation has existed, and still exists throughout Eu-

rope and America, by which leading obstetricians might almost without exception be sentenced to years of imprisonment if the law as it stands were strictly enforced. I know of no other instance in history in which there has been such frank and universal disregard for a criminal law. In Germany some doctors have even argued that since abortions done for proper medical reasons are tolerated without interference by the courts, it would be better to leave the law unchanged, lest some quack take advantage of the wording of a new statute. Thus by common consent we have become lawbreakers, until a slow-moving world will make the law conform to us instead of having us conform to the law.

Abortion Laws in Foreign Countries

It would be beyond the limits of this monograph to attempt an adequate analysis of the laws on abortion in all the countries of the world. I have therefore selected only a few concerning which information was readily accessible.

England.—According to Parry, four acts of Parliament in modern times deal with the crime of abortion. These are (a) 43 George III c 58 (1803); (b) 9 George IV c 31 (1828); (c) 1 Victoria c 85 (1837); (d) 24 and 25 Victoria c 100 (1861).

Each of these laws repealed the preceding one and the second one of Queen Victoria passed in 1861 as part of the "Offenses against the Person" Act is the prevailing law, although subject to changing interpretations in many decisions since that time. In the laws passed during the reign of George III and George IV, abortion if done when the woman was quick with child was punished by "Death, as in cases of Felony, without benefit of Clergy." The Victorian laws modified this to make all abortions punishable by deportation or imprisonment for from three years to life. In case of the death of the woman the sentence was death. Mr. Justice Hawkins in 1881 in pronouncing sentence on an abortionist stated: "That the offense amounts to willful murder is the law as it at present stands, and as in all human probability it will exist in time to come." Yet since the beginning of the present century the death sentence has not been enforced for this offense.

According to Lord Riddell the Act of 1861 provides that punishment be inflicted only if the person *unlawfully* administered the drug or used the instrument that led to the miscarriage: "The term 'unlawfully' is not defined, but obviously denotes a wrongful act, done intentionally without just cause or excuse. An adequate medical or surgical reason is the only just cause or excuse recognized by law for procuring a miscarriage. . . .

"The essence of the offense," says Lord Riddell, "*is a guilty intent*. An honest effort to save the life or health of the mother is not illegal, although the practitioner may commit an error of judgment in performing an operation subsequently regarded by other practitioners as unnecessary. He will not be liable to conviction if he honestly believes that what he does is required to save the mother's life or health" (p. 20).

It will be noted that this interpretation of the word "unlawfully" in the English laws is not very definite. Dr. Helen Lukis at a meeting of the British Medical Association on July 21, 1933, urged establishment of a committee on abortion law for these reasons:

First, legalization of abortion in Russia had created a demand for abortion in England.

Second, owing to economic crisis and possibly as an offshoot of birth control teaching, women were having more recourse to abortionists than in the past, and

Third, "because the law was uncertain on this point and juries hesitated to commit themselves on it."

At the same meeting a statement was made by Dr. L. A. Parry "that in law the procuring of abortion was punishable by penal servitude for life, and there was no legal exception made for the performance of therapeutic abortion, unless pregnancy had proceeded to the seventh month and the operation was done to save the life of the mother." (Lancet 2, 1933, p. 256.)

In *Scotland* procuring an abortion is an offense at Common Law. Anyone who feloniously causes or procures an abortion either by drugs or instruments is guilty of a very serious crime.

In *India*, on the other hand, the law specifically permits a therapeutic abortion for saving the life of the mother, and the punishment for an illegal abortion may be merely a fine.

Germany.—In no country has there been such a prolonged and bitter conflict to change the laws on abortion as in Germany. "Paragraph No. 218," which is the designation of the present law, has been the topic of many ardent debates in the medical societies. Paragraph 218 of the Imperial Laws (1871) was as follows:

"A pregnant woman, who intentionally brings on an abortion, or kills her child within the womb, shall be punished by confinement in a penitentiary up to five years.

"If moderating circumstances are present, an imprisonment for not less than six months is decreed.

"The same punishment is also prescribed for any person, who with the consent of the pregnant woman brings to her or employs any means to bring on an abortion."

In two succeeding paragraphs confinement in a penitentiary up to ten years is ordered if the person aiding in the abortion receives payment for such services; and punishment, not less than two years' confinement in a penitentiary, if the abortion is done without the knowledge or consent of the woman. Should the woman die as a result of the abortion, the imprisonment is for ten years up to a life sentence.

The Imperial Law was modified in 1926, when the punishment for such offenses was reduced to not less than one day's imprisonment for the woman, and a period of only three months' confinement as a minimum for the person inducing the abortion. The law had no exemptions, and the struggle to have therapeutic indications for abortion (done by a physician) legally recognized did not meet with success until 1933, when the new enactments passed by the Hitler government established that abortion based on genuine medical indications is not subject to punishment when demanded and performed by legally qualified physicians.

In Berlin, in the fall of 1933, a council of physicians adopted criteria for the conditions under which a therapeutic abortion may be permitted:

- (a) For each district of Berlin a staff of consultants in the various specialties is appointed, who reviews the cases in which abortion is asked.
- (b) Reliable evidence that a danger threatens the life or health of the mother must be presented.
- (c) The abortion can only be done in public hospitals or private clinics approved by the medical council.
- (d) Decision on eugenic indications must be left to the so-called "hereditary health" courts created by the new sterilization law.
- (e) The execution of the abortion must be entrusted to a specialist.
- (f) Abortions done by physicians contrary to these regulations or by laymen are severely punished.

Austria.—According to Austrian law in keeping with Canon Law, abortion is equivalent to murder. The law is worded similarly to the German statutes of 1871. In 1912 a modification was enacted, ameliorating the punishment of women who performed an abortion as a consequence of great poverty or to avoid the disgrace of illegitimacy. Professional abortionists were given a longer sentence, as was also any person who caused the death of the woman through an abortion.

France.—In the Napoleonic code (1810) abortion was punished by imprisonment at hard labor, and even an unsuccessful attempt was an offense against the law. A slight modification in 1864 made both the agent who procured the instruments and the woman who attempted the abortion free of punishment, if the attempt was unsuccessful. If an abortion resulted, all those who had assisted in the operation as well as the physician or midwife, were punished by imprisonment at hard labor.

While French medical literature contains reports of many therapeutic abortions done in hospitals and clinics, the law in fact makes no exception in favor of the medical profession. A physician was recently convicted, although the claim was substantiated that the abortion was done for medical reasons.

In 1920 the law against abortion was reinforced by a new regulation which made the prevention of conception a penal offense, and even propaganda for birth control a serious crime. Two large organizations are now combating both of these laws, which are favored only by clerical and imperialist forces.

The earliest group in France to combat reactionary legislation in this field was *La Ligue de la Régénération Humaine*, founded in the nineties by the sociologist, Robin. The *Ligue* still exists and issues a paper called *La Grande Reforme*, espousing birth control and a liberalization of the abortion laws. The editor is M. Eugene Humbert, who with his wife Jeanne served a long prison sentence for birth control propaganda in 1921.

Italy.—According to the laws of 1889 any person who procures an abortion is punished by imprisonment from four to seven years. In the case of physicians or health officers who perform an abortion the punishment is increased by one sixth. On the other hand, if the abortion is procured to save the woman's honor or the honor of a mother, a wife, a sister, other relatives, or an adopted daughter, the punishment is reduced by one to two thirds. If the husband procures the abortion contrary to the wishes of his wife, he is given added punishment. The recent efforts of the Mussolini government have been directed toward stricter enforcement of the existing laws. Hence we find that in 1929, physicians were required to report to the authorities all cases of abortion within two days of their occurrence. In case of failure to make such a report the physician was to be punished by the local authorities and the matter was to be reported to the medical societies, so that steps could be taken to exclude him from practice.

Hungary.—Paragraph 285 of the Hungarian Penal Code denies permission to the physician to produce an abortion even for medical reasons. It protects the life of a fetus against attacks threatening it, by regarding the induction of abortion as a crime against human life and prosecuting it as *manslaughter*. It does not follow that every person committing such a crime is punished. It is understood, humanly speaking, that a physician trying to help his fellow out of a desperate situation may be exonerated, but he cannot claim exemption from the law on such grounds. At a session of the Hungarian Gynecological Society on April 28, 1932, A. v. Schulez argued in favor of a conformity

of abortion law and therapeutic abortion practice. All abortions, he said, were now legally wrong and justifiable abortion was not clearly defined. Many physicians opposed this viewpoint, claiming that any legal authorization of abortion would throw the door wide open to abuse by professional abortionists.

Japan.—The Japanese laws on abortion resemble, in the main, the Imperial German enactments except that the punishment is somewhat less severe, varying from three months' to five years' imprisonment. In case of death or injury to the health of the mother the penalty is increased.

In 1932 a group of women organized an Association for Reformation of the Abortion Law and sought to broaden the indications for abortion by physicians to include: (1) cases of rape or seduction; (2) mental or physical hereditary infirmity; (3) destitution; (4) in case of divorce. The authorities gave little encouragement to the effort to make such a change. Under the stress of financial depression and overpopulation abortion has increased to such a degree that some reform in the present laws seems only a matter of time.

The Abortion Law in the United States

For the very complete tabulation of the abortion statutes in the states and territories of the United States, given in Appendix A, and for much of the material given in the following pages I am indebted to Mr. Thomas E. Harris of the Columbia University Law School. Even a cursory examination of these records will make evident the oftentimes contradictory and ridiculous character of our present legislative attempts to control the practice of abortion, as pointed out by Mr. Harris in "A Functional Study of Existing Abortion Laws" in the *Columbia Law Review* for January, 1935.

Federal Laws.—The Federal laws upon this subject are of necessity limited merely to the interstate transportation or importation of literature, drugs, and instruments that might be used for purposes of abortion. That these laws are sufficiently antiquated is evidenced by the fact that in the main they date back to the well-known Comstock legislation of 1873 dealing with the mailing of obscene books, and other pornographic matter.

These laws are fully given in Dickinson and Bryant's "Control of Conception," page 252 ff. Here it need only be stated that by the United States Code (Sec. 334, Title 18) "every article, instrument, substance, drug, medicine or thing which is advertised or described in a manner calculated to lead another to use or apply it for preventing conception or producing abortion . . . is hereby declared to be non-mailable mat-

ter;" and the person who shall knowingly deposit such matter for mailing or delivery "shall be fined not more than \$5,000.00 or imprisoned not more than five years, or both."

A further law (U. S. C., Sec. 396, Title 18) prohibits the importation and transportation of books, pamphlets, circulars, cards, etc., giving information about abortion, with similar punishment for the offender.

In the Tariff Act of 1930 the importation of any literature, any medicine or any articles "for causing unlawful abortion" is prohibited and any government officer who knowingly aids any person to import such material to be used for procuring abortion "shall be subject to a fine of not more than \$5,000.00 or by imprisonment at hard labor for not more than ten years, or both." (U. S. C., Sec. 305, Title 19, Ch. 4.)

In none of these statutes is any exception made or implied for the medical profession in their treatment of cases requiring therapeutic interruption of pregnancy, except in the Tariff Act which specifies "unlawful abortion." In spite of this the importation and mailing of medical texts is permitted without government interference.

While not to be grouped as Federal laws, the statutes of the District of Columbia, passed by Congress, may perhaps be interpreted as representing the views of the country as a whole. It is therefore of some importance that one of the best laws on abortion emanates from the District. It prescribes punishment for procuring an abortion, of imprisonment up to five years, or in case of the woman's death, from three to twenty years, but includes the following exemption: "*unless when necessary to preserve her life or health, and under the direction of a licensed practitioner of medicine.*" (Dist. Col. Code, 1929, p. 42, Sec. 33.)

Common Law in the States.—While statutory laws on the subject of abortion exist in every state of the Union, we find that in twenty-two states, mostly in the Eastern and Southern sections of the country, the Common Law is also in force. The prevailing view is that it was not an offense at Common Law for either the mother or another person to destroy an unborn child before it had "quickened." After quickening, its destruction by either person was a misdemeanor unless the destruction was necessary to preserve the life of the mother. If the child died after delivery, from injuries received before delivery, the offense is murder. In Georgia, Iowa, Kansas, Louisiana, Ohio, Oregon and Texas, and in Hawaii the offense is not recognized at all. It should be noted, however, that even in jurisdictions where the woman would not be guilty of an offense if she induced an abortion upon herself, she is guilty of criminal conspiracy, when she arranges to have an abortion induced upon herself by someone else. (Wharton, Criminal Law, Sec. 286.)

Statutory Law of the States.—Statutes have been passed in every state in the Union prescribing punishment for any person who induces an abortion. Even a cursory review of the tabulation of these laws in Appendix A will convince the reader how little thought has been given by our legislators upon their formulation. They are often confused in their wording, and illogical in the penalties inflicted. To begin with, we find that abortion is often wrongly defined, as in the Texas law: "By 'abortion' is meant that the life of the foetus or embryo shall be destroyed in the woman's womb, or that a premature birth thereof be caused." This wide interpretation, including as it does any interference previous to the full-time spontaneous birth of the child, accounts for the frequent reference in the law to punishment "in the event of the death of the child."

The effort in some states to differentiate between the punishment inflicted for abortion before and after quickening, and the punishment if the child is killed or the mother injured as a result of premature induction of labor, is certainly most confusing and illogical. While we are here primarily interested in the laws against abortion, it should be noted that in some states the statutes still technically prohibit such normal obstetrical procedures as the induction of labor in cases of toxemia or hemorrhage. In Louisiana, for instance, all persons are to be imprisoned at hard labor for one to ten years "for procuring premature delivery," an offense that is committed almost daily by the busy obstetrician. If the child dies after being delivered alive, the offense usually remains murder under the statutes. In Texas a separate punishment is prescribed for destruction of a child during parturition. (Tex. Stat., Vernon 1926, Penal Code, Vol. II, Sec. 1195.)

The ancient and medieval distinction between abortions done "before" and "after" quickening crop up in the wording of many of these statutes. In fourteen state jurisdictions we find the punishment is more severe if life has been felt by the mother. Differentiation is also made in some instances between attempted and successful abortions. This corresponds to the interpretation of the Common Law according to which an attempt to commit a felony is only a misdemeanor. There are also statutes punishing all "attempts" to commit a felony of any sort. (Ariz. Rev. Code [Struckmeyer, 1928], Sec. 4896; Mass. Gen. Laws [1932], Vol. II, p. 3206, Sec. 6.)

Attempts in Absence of Pregnancy.—Since women may be subjected to criminal manipulations when pregnancy is suspected but not actually present, and since death may result from infection and perforation following such instrumentation, it is important to observe the laws relating to this matter. A further interest in this subject derives from the fact that the difficulty of proving that a pregnancy actually existed is used

as a subterfuge in the defense of many criminal cases in states where the laws only punish such acts committed on a pregnant woman. In about two thirds of the states, the statutes prescribe punishment only in case of a pregnancy. In the District of Columbia and in 18 states the wording is such as to include criminal procedures in the absence of pregnancy as well. The wording is in three forms: (1) "any woman supposed to be pregnant" (Del., Ind., Ky., Pa., R. I., Vt., and Wyo.); (2) "any woman with intent to procure abortion" (Conn., D. of C., Fla., Iowa, Mass., Ohio, Va., W. Va.); (3) "any woman whether pregnant or not" (Minn., Mo., N. Y., Wash.). In some cases unsuccessful attempts to destroy an unborn child, even though the woman on whom the attempt was made was not actually pregnant, are also punishable (Del. Rev. Code [1915], Sec. 4711; Ind. Stat. [Burns, 1926], Sec. 2435; N. Y. Penal Law, Sec. 80).

Exemptions.—So important are the provisions in our abortion laws specifying exemptions from prosecution under certain circumstances that I have made a map of the United States (Fig. 144), in which these exemptions can be visualized in accordance with the degree of exemption allowed. It will be noted that these vary from Mississippi, where an abortion is permitted by *any* person who acts on advice of a physician, to New Hampshire, where *any* person who wilfully administers a drug or uses an instrument to procure an abortion is punished by fine or imprisonment.

Between these extremes there are various degrees of exemption. In five states (Louisiana, Florida, Massachusetts, New Jersey, Pennsylvania) we find the qualifying adverb or phrase: "unlawfully," "feloniously," or "without lawful justification," which might conceivably justify the assumption of exemption under certain circumstances. No cases holding this interpretation, however, are on record. (Cf. *State v. Shapiro*, 86 N. J. L. 319, 98 Atl. 437 [1916].)

With many minor differences in wording and shades of meaning, the states may be grouped into five general categories according to the nature of the exemptions specified:

Group I. States in which there are no exemptions except such vague terms as "unlawfully," "feloniously," or "without lawful intent." (Six states as listed opposite map.)

Group II. States in which an exemption is made "to save the life of the mother," *without mention of the medical profession*. (Includes 31 states and four territories, as listed.)

Group III. States in which the exemption "to save the life of the mother" is qualified by special mention of medical advice and intervention, *implying* that without it the procedure would not be justified. (Seven states as listed.)

GROUPING OF STATES ACCORDING TO LEGAL EXEMPTIONS FOR INDUCED ABORTION (SEE MAP ON OPPOSITE PAGE).

Group 1. No Exemptions.

Florida	Massachusetts	New Jersey
Louisiana	New Hampshire	Pennsylvania

Group 2. Exemption to save the *life* of the mother.

Alabama	Iowa	New York	Tennessee
Arizona	Kentucky	North Carolina	Utah
California	Maine	North Dakota	Vermont
Connecticut	Michigan	Oklahoma	Virginia
Delaware	Minnesota	Oregon	Washington
Idaho	Montana	Rhode Island	West Virginia
Illinois	Nebraska	South Carolina	Wyoming
Indiana	Nevada	South Dakota	

Group 3. Exemption to save the *life* of the mother, if *medically* advised.

Arkansas	Kansas	Ohio	Wisconsin
Georgia	Missouri	Texas	

Group 4. Exemption to save *life* or *preserve health* of mother, if *medically* advised.

Colorado	District of Columbia	Maryland	New Mexico
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Group 5. Abortion permitted whenever deemed necessary by a physician.
Mississippi.

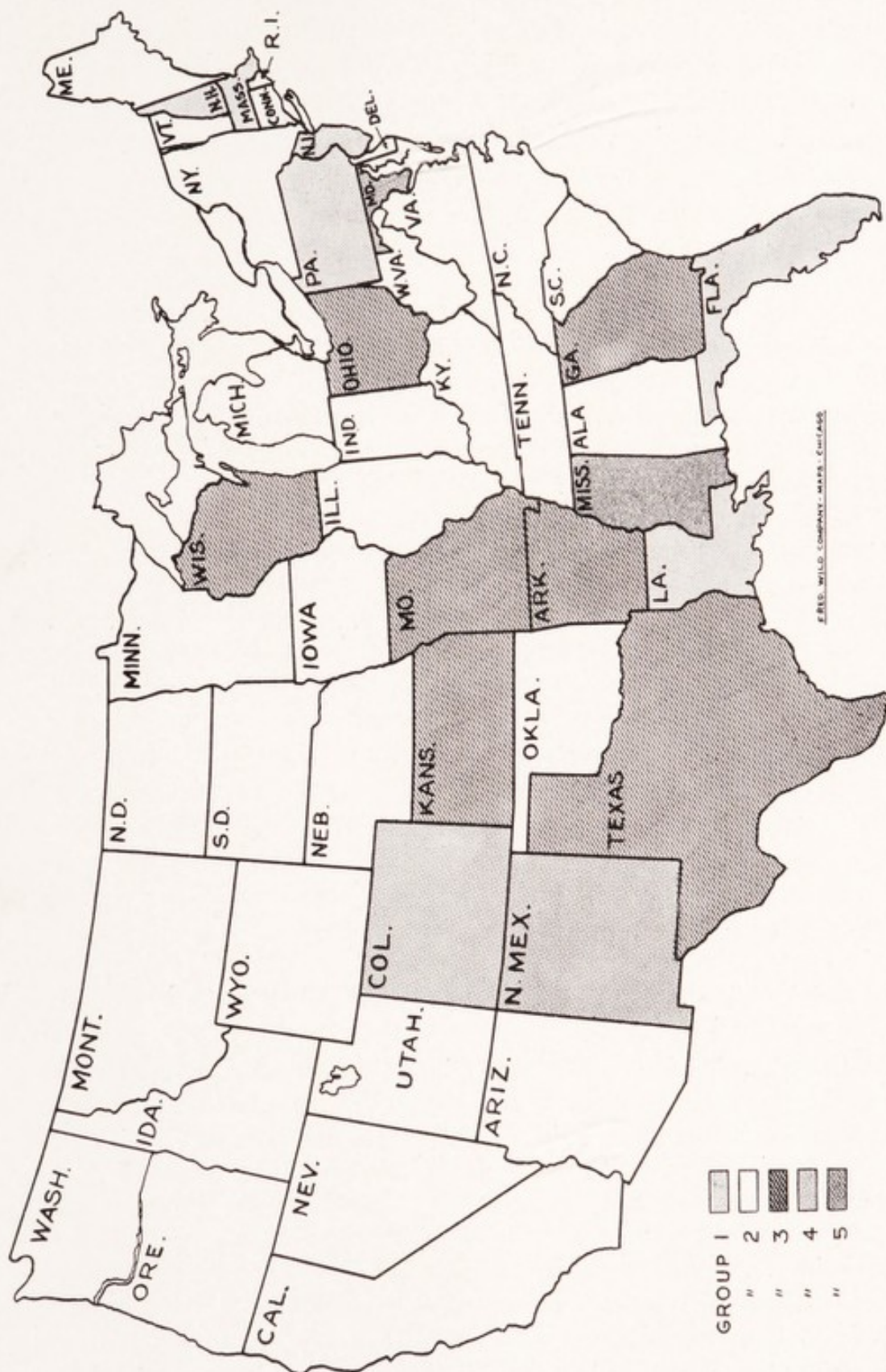


Fig. 144.—Map of the United States, grouping the states according to the legal exemptions for induced abortion. (See explanation of groups on opposite page.)

Group IV. States in which the exemption to save the life or preserve the health of the mother is clearly dependent upon medical judgment, as the abortion must be performed by, or under the direction of, a physician. (Three states as listed and District of Columbia.)

Group V. States in which abortion is permitted whenever deemed necessary by a physician. (Mississippi.)

To Save Life of the Mother.—In the vast majority of cases, 31 states and 4 territories, the law exempts from prosecution *any* person who procures an abortion for the purpose of saving the mother's life. This exemption technically includes every one, regardless of whether he is a physician or not, but since proof must be brought that the abortion was really necessary to save the mother's life, this will be more difficult to obtain, when the abortion is done by a layman than when done by a physician (State v. Rowley, 198 Iowa 613, 198 N. W. 37 [1924]; cf. Copus v. State, 26 Okla. Cr. 366, 224 Pac. 364 [1924]).

If the abortion was induced by a physician, it is usually held that the indictment must allege and that the state must prove that the operation was not necessary to preserve the life of the mother, but in New York a contrary decision was held. (People v. Hammer, 194 App. Div. 712, 186 N. Y. Supp. 132 [1921], *aff'd.*) Proof that the mother appeared to be in normal health before the abortion shifts to the defendant the burden of proving its necessity.

Consultation.—In several instances the law indicates the advisability of medical consultation in deciding the indication for abortion. By inference it requires rigid proof of the necessity of the abortion where such consultation is not obtained. Thus we see that the wording in the case of Georgia is "unless the same shall have been necessary to preserve the life of such mother, or shall have been advised by two physicians to be necessary for such purpose." In the latter event the mere fact that the procedure had been advised by two physicians suffices as proof of its necessity.

Safeguarding Health of Mother.—Since there are far more cases in which the health and safety of the mother, rather than her life, are threatened by pregnancy, it is worthy of special comment that four statutes make provision for such conditions, including Colorado, the District of Columbia, Maryland, and New Mexico. In *Maryland* the exemption specifies that the abortion must be "*by a regular practitioner of medicine . . . after consultation with one or more respectable physicians.*" *New Mexico* likewise requires consultation. (New Mexico Stat. 1929, Sec. 35-310.)

In *Colorado* and the *District of Columbia* the abortion must be done *by or under advice or direction of a physician*. Colorado uses the term

"serious and permanent bodily injury" and the District, "health." (Colo. Am. Stat. Cartwright's Mills, 1930, Sec. 1775.)

In *Mississippi* the exception to abortion as *manslaughter* reads: "unless the same shall have been advised by a physician to be necessary for such purpose." (Miss. Code [1930], Sec. 993.) On the face of it, then, this statute thus amounts to a legalization of *any* abortion done by, or on the advice of, a physician, and is thus the most liberal of all statutes. On analysis, however, it appears that this liberality is only apparent, and due to a mistake in wording. To begin with, the statute does not specify the "purpose" alluded to, and the exception is therefore meaningless. But if the 1930 wording is compared with earlier texts, it is found that the 1892 version contained a clause "unless the same shall have been necessary to preserve the life of the mother," explaining the reference in the last part, "or shall have been advised by a physician to be necessary *for such purpose*." (Miss. Code 1892, Sec. 1157.) The saving clause was omitted in 1906, and the omission perpetuated in subsequent codifications, and the only case on record seems to construe the statute literally as it now stands. (*Ladnier v. State*, 155 Miss. 348, 124 So. 432 [1929].) However, it does not appear that this interpretation has been officially recognized, nor is there evidence that medical abortion is more frequent in this state than elsewhere.

Exemptions "to save the life of the child" appear in the statutes of Connecticut, Missouri, Nevada, New York, South Carolina, Virginia, and West Virginia, and are based on the definition by which abortion is made to include interruption of pregnancy after viability of the child. Criminal attempts to do away with the child by a premature labor are very rare. Convictions have, however, resulted even where no destruction of the child was involved. (*United States v. Hoffman*, 56 Wash. L. Rep. 499 [D. C. Sup. Ct. 1928].)

Death of the Woman.—In the event of the death of the woman upon whom an abortion is done, the law has usually provided more stringent measures to punish the offender. Yet here, too, we see the greatest variety of penalties in the different states. At common law if the woman was with a quick child her death was classified as *manslaughter*, since the abortion itself was considered only a *misdemeanor*.*

If, however, the abortion was performed in such a way as to inflict serious injury or endanger the woman's life, her death was held to be *murder*, regardless of whether or not the child had quickened. (*Clark and Marshall, Law of Crimes*, Sec. 244 and 263d.) It would seem, there-

*The degree of crime for the death is fixed by the nature of the act to which it was *incidental*, and since the abortion was only a misdemeanor, the death could not be a higher crime than manslaughter—thus reflecting consideration of *intent*. Similarly a death occurring in the course of a commission of a felony is murder in first degree, even though unintentional.

fore, at common law, that if the child had not quickened, the death of the woman should not constitute an offense at all if the abortion were induced or attempted by a physician, since the act was lawful and not more dangerous than numerous other operations; but this contention has not been upheld (*Lee v. State* 124 Mass. 398, 86 So. 856, 1920).

An analysis of the statutes shows that in some states the punishment for abortion is not increased in the event of the death of the woman. (Ohio, Oregon, Wyoming, Oklahoma, Pennsylvania, Wisconsin.) In the other states the penalty is greater but the offense ranged in classification from second degree manslaughter to first degree murder as seen in Table XXVII.

TABLE XXVII

DEGREE OF CRIME AND PENALTY FOR PROCURING ABORTION IN CASE OF DEATH OF WOMAN

As Fixed by Statutes in States and Territories of the United States
For Details, See Appendix A, this Volume

(1) OFFENSE	(2) AVERAGE IM- PRISONMENT IN YEARS	(3) NUMBER OF STATES	(4) STATES
Second Degree Manslaughter	One to Five	4	Kan.; Ohio; Pa.; Wis.
First Degree Manslaughter	One to Ten	14	Ind.; Mo.; N. Y.; S. D.; Md.; Neb.; Wash.; Mich.; N. J.; Okla.; Wyo.; Minn.; N. D.; Ore.
Third Degree Murder	Up to 20	2	Fla.; Ga.*
Second Degree Murder	Up to 20	16	Ala.; Iowa; N. C.; Vt.; Ariz.; Mass.; R. I.; Va.; Ark.; Mont.; S. C.; W. Va.; Colo.; N. M.; Tenn.; D. C.
Second Degree Murder	Up to Life	7	Cal.; Ida.; Utah.; Conn.; Nev.; Del.; N. H.
Third Degree Murder	Up to Life	2	Me.; Texas
First Degree Murder	Up to Life or Death Pen- alty	4	Ill.; La.; Ky.; Miss.

*Georgia law specifies "assault with intent to murder."

In some of the states the exact nature of the offense was not stated so that these states had to be grouped in accordance with the amount of the penalty inflicted. Convictions and penalties have at times been contrary to the law, as in a case in North Dakota, where a conviction for second degree murder was sustained despite a statute making such a homicide manslaughter. Apparently neither the court nor counsel discovered the relevant paragraph, an illustration of the confused state of the law and the inadequate consideration given such decisions. (*State v. Reilly*, 25 N. D. 339, 141 N. W. 720 [1913]; see N. D. Comp. Laws [1913, Sec. 9490].)

Prosecution of Criminal Abortion

Failure to Report.—Under the common law of the United States any one who knows of a felony and takes no steps to bring the guilty person to justice is guilty of the offense of "*misprision of felony*" (Clark and Marshall, *Law of Crimes*, Sec. 439; 2 Wharton, *Criminal Law*, Sec. 289). Technically, therefore, a doctor who knows that a criminal abortion has been committed and does not so report, is guilty of this offense, a ruling which is, however, largely obsolete. Nevertheless a physician who is called in after an abortion has been committed should either report to the police, or call another physician in consultation, to avoid suspicion of complicity.

Privileged Communication.—In this matter we are running counter to one of the most cherished of medical traditions, that of privileged communication between doctor and patient. In 1916, the medical profession of Great Britain, through the Royal College of Physicians and the British Medical Association, came out strongly against any breach in the doctrine of "medical confidences." The doctors' action had been stirred by the charge made to a Grand Jury sitting at Birmingham in 1914, on a case of death after illegal abortion, in which the Justice had remarked to the effect that "there were cases when the desire to preserve professional confidence must be subordinated to the duty of every good citizen to assist in the investigation of serious crime. It might be the moral duty of the medical man, even in cases where the patient is not dying, or not unlikely to recover, to communicate with the authorities when he sees good reason to believe that a criminal offense has been committed."

The late Lord Riddell, in his *Medico-Legal Problems* (p. 65) comments on this as follows:

"... This pronouncement led the Royal College of Physicians, London, in January, 1916, to pass a series of resolutions concerning cases of criminal abortion. In these they expressed the opinion that a moral obligation rests upon every medical practitioner to respect the confidence of his patient, and that without her consent he is not justified in disclosing information obtained in the course of his professional attendance upon her. Also that every medical practitioner who is convinced that a criminal abortion has been practised upon his patient should urge her, especially if she is likely to die, to make a statement which can be taken as evidence against the person who has performed the operation, provided her chances of recovery are not thereby prejudiced. If she refuses, he is under no legal obligation (so the College was advised) to take further action. Before taking any steps which may lead to legal proceedings, a medical practitioner will be wise to obtain the best medical and legal advice obtainable, 'since in the present state of the law there is no certainty that he will be protected against subsequent litigation.'

"Before issuing this memorandum the British Medical Association had an interview with the Lord Chief Justice, the Attorney-General, and the Public Prosecutor, when the Public Prosecutor explained that medical men should report abortions attempted or procured by third parties when the doctor was of the opinion that the patient was likely to die. As appears from the resolutions, the College advised their members not to give effect to these wishes. The British Medical Association adopted the same attitude."

After quoting several dissenting opinions on this matter expressed by medical men, and commenting on the fact that since 1916 the practice of abortion has greatly increased, Lord Riddell observes (p. 67) that "considering the prevalence of abortion, the leaders of the profession



Fig. 145.—Traumatic injury of the fetus due to criminal instrumentation, valuable as evidence in legal prosecution. (Halban-Seitz, VIII, Urban und Schwarzenberg, Wien.)

are undertaking a serious responsibility in advising practitioners in such emphatic terms to disregard illegal acts of the most pernicious character.

"To sum up, every one recognizes the necessity and importance of medical confidences. Every one recognizes that they are sacred and precious. But we must recognize also that the rules regarding them exist for the welfare of the community, and not for the aggrandisement or convenience of a particular class. We must recognize also that they must be modified to meet the inevitable changes that occur in the necessities of the various generations. As Cicero says . . . 'Let the good of the people be the paramount law.'"

Mention has already been made of the stringent regulations in Italy requiring physicians to report at once all cases of criminal abortion com-

ing to their notice. In Germany, Hoche and Brandenburg urge physicians to report all cases of puerperal fever. Such information would enable authorities to investigate and at times to obtain evidence for conviction in criminal cases. In every case where the woman dies, the physician should refuse to give the cause of death and so compel an autopsy and coroner's inquest. In the words of Dr. Sidney Smith's book on Forensic Medicine, 1925: "It is no part of a doctor's duty to act as a detective but it is equally certain that it is no part of his duty to act as a screen for the professional abortionist."

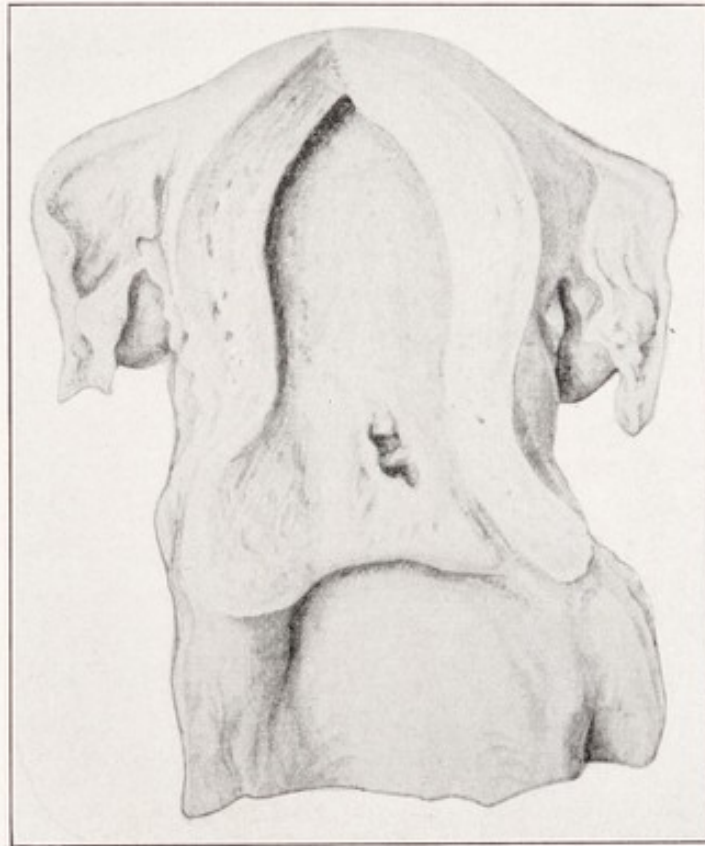


Fig. 146.—Perforation wound in the cervix, followed by fatal peritonitis. Autopsy evidence of illegal instrumentation. (Halban-Seitz, VIII, Urban und Schwarzenberg, Wien.)

Evidence.—The collection of evidence in cases of criminal abortion is so involved in subterfuges and lies that even sworn death-bed statements rarely succeed in bringing the guilty persons to conviction. Every loophole of escape is employed by attorneys for the defense. In the case of the professional abortionist it is made impossible for the woman or any of her family ever to see the person who actually performs the operation.

Oral or written statements are naturally of far less value as evidence than objective findings. Since in many instances the laws apply only in case the woman is actually pregnant, it is important that such evi-

dence should, if possible, include the microscopic examination of all tissues passed by the patient, or obtained by curettement or at autopsy. The presence of chorionic villi is proof that a pregnancy existed. Should the fetus show gross traumatic changes, we can also assert definitely that previous instrumentation has taken place (Fig. 145). An examination of the uterus removed by operation or at autopsy may show partial or complete perforation indicating previous instrumentation to bring on an abortion (Fig. 146).

Evidence concerning the age of the fetus can be obtained by careful measurements and developmental changes. For legal purposes it is also important to know whether the fetus was living at the time of the criminal interference. This will usually be determined by the evidence of fresh blood in the fetal circulation.

In the examination of the patient, crushing or puncture wounds in the upper vagina and cervix point to previous instrumentation. Hinselmann examines all suspected cases with the colposcope, an illuminating magnifying instrument for inspecting the vaginal walls. In two cases of induced abortion he found positive evidence. In one patient there was a small abrasion covered by a pyogenic membrane and in the other a small burn from irritation with soap solution. The gross appearance of the vagina in these two cases was normal.

Convictions.—In testing the efficacy of any law we lay stress on the number of convictions obtained when offenders are brought to trial for breaking it. It is therefore interesting to note how small is the percentage of those indicted, compared with the total of those who have committed abortion, and what a relatively slight proportion of those indicted are convicted. S. Peller has collected full data concerning such criminal statistics in various countries of Europe.

The factors that influence the courts to prosecute these cases more or less vigorously are changing so constantly that, in the opinion of criminal lawyers and medical statisticians, one is not justified in drawing conclusions from the actual number of convictions as to the increase or decrease of criminal abortion.

In *Germany*, according to Peller (p. 136), the figures were as follows:

YEAR	CONVICTIONS
1882-1890	225
1891-1900	374
1901-1905	555
1906-1910	814
1911-1914	1,405
1923-1924	4,653
1925	7,193
1926	6,268
1927	5,313

It is noteworthy that out of an average of 7,122 annual indictments in the years 1924 to 1927 there was an average of 6,101 convictions, or 76 per cent. This high percentage of convictions in Germany differs from that found in other countries. Of those convicted 28 per cent were men and 72 per cent were women.

Figures were also reported by E. Puppel from a study of criminal abortion in Thüringen (1915-1926). There were during this period 236 criminal investigations with 231 indictments; of these, 46 persons were found not guilty, 163 were condemned, and the remainder appealed their cases to higher courts. The active midwives were rarely among those accused of abortion. According to the figures obtained by Lewin from the German Statistical Bureau, the percentage of convictions among the Catholic population showed between 1908 and 1917 a relatively greater increase than among the Protestants. The smallest number was among the Jewish. The figures were: Protestants 7,447; Catholics 3,508; Jews 52.

Liepmann reports that women are more frequently convicted than men. In 1925, out of 7,193 persons condemned, 5,244 were women; in 1926, out of 6,268 persons, there were 4,487 women. The tendency, he says, is to condemn the women on hearsay testimony, while the male professional abortionist goes scot-free. The most recent German figures are from 1930, in which year the number of persons accused were 4,111, of whom 3,648 were found guilty and given a sentence. Of this number 1,105 were men and 2,543 women. This shows a marked decrease from the maximum figures of 1925 when 7,809 were convicted.

In *France* we find that the number of persons accused of criminal abortion is actually and relatively much smaller than in Germany. Lewin gives the figures for the years 1882 to 1911 as for Germany, 13,645 persons, and for France, 2,007 persons. This marked difference depends in part on greater skill in secrecy by those committing abortion, in part on less activity by the prosecuting authorities. The proportion of convictions is also smaller in France, being about a third, as compared with three quarters in Germany, as seen in the following:

YEAR	INDICTED	CONVICTED	
		NUMBER	PER CENT
1920	322	123	38
1921	376	120	32
1923	142	45	32

Regarding the marital conditions of those accused of criminal abortion in France for the 20 years from 1892 to 1911, Lewin gives the following figures: total number, 1,347; unmarried, 559; married, 628, of whom 132 had no children; widows, 160, of whom 34 had no children.

In *England* the figures regarding criminal prosecution show a strikingly small number of convictions. According to Lewin there were in the years 1870-1880 only 12 convictions; 1880-1890, 13 convictions; 1890-1900, 12 convictions; and 1900-1905, 11 convictions.

Interesting statistics from *Austria* are given by Peller. The number of convictions for abortion increased rapidly in the years following the war. They rose from 55 in 1919, to 367 in 1921, and up to a maximum of 619 in 1923, from which peak they declined to 496 in 1928. In Vienna itself the greatest number was noted in 1922, whereas in the country districts the maximum of convictions occurred in 1926, and half of these were of men. An increase in criminal abortions by physicians in recent years is noted. Of the 512 convictions for abortion in 1924 in Austria, 182 were of women who aborted themselves. A relatively high percentage of these women were under 25 years of age and were servants, or of the lower working classes. The married women in better circumstances were rarely punished. This marked difference is doubtless due to the difficulties encountered by the unmarried servant in concealing her condition. As to the punishment inflicted for these crimes, Peller states that 1,761 out of 2,442 persons convicted in Austria in 1924-1928, or about three fourths, were sentenced to a short period of imprisonment, whereas the remaining 681 persons were confined in a penitentiary for varying periods up to five years, only four being sentenced for longer than two years.

The convictions of those indicted for this period were only 21 per cent, as compared with a general average of 49 per cent for all forms of crime. Finally, Peller analyzes the ratios of convictions to the approximated total number of abortions in Vienna for the years 1919-1923. These showed:

Average number of abortions yearly.....	12,000 to 14,000
Abortions per 1,000 women of childbearing age.....	1,900 to 2,200
Total convictions per 1,000 abortions.....	9 to 10
(a) Done by mother.....	3 to 4
(b) Done by abortionist.....	6 to 7

From these figures it is evident that less than 1 per cent of those committing this crime are ever convicted.

Very inaccurate and scanty figures are available regarding convictions for criminal abortion in the United States. Rongy states that the attorney of the New York County Medical Society pointed out that, during a ten-year period of this century, only three abortionists were convicted and sentenced, and all three were pardoned by the Governor. Since the Medical Grievance Committee of the Education Department in the State of New York was organized, in 1926, only one physician has lost his license because of abortionist work.

Mr. Harris was able to secure but meager data on enforcement from the reports of the Attorney-Generals in a few states, for various periods, and notes on convictions in New York and Chicago, as follows:

STATE	YEARS COVERED	INDICTMENTS	CONVICTIONS
Alabama	1894-1932	40	5
	(Omitting 1902-04 and 1908-10)		
Arkansas	1921-1932	27	9
	(Omitting 1923-24)		
Iowa	1927-1932	1	1
Massachusetts	1849-1858	32	0
Michigan	1893-1932	156	40
Minnesota	1911-1930	100	31
North Carolina	1906-1931	158	--
North Dakota	1921-1932	(?)	9
Utah	1896-1932	17	3

"The office of the District Attorney of New York County reports 13 indictments and 4 convictions during 1929-34; the District Attorney of Kings County reports no prosecutions during 1934; the District of Richmond County reports that since January 1, 1932, two have pled guilty to conspiracy to perform an abortion, and were placed on probation.

"The clerk of the Criminal Court of Cook County (Chicago) reports that since 1924 there have been, in that district, 32 prosecutions for murder by abortion, and 6 prosecutions for abortion, which have been followed by 7 convictions for the prior offense, and 2 for the latter.

"Dr. Rypins, Secretary of the New York State Board of Medical Examiners, states that of 47 complaints of criminal abortion which were viewed by the board from September, 1928, to July, 1934, 15 were dismissed by the executive secretary, 20 were dismissed by a subcommittee after an informal hearing, and one after a formal hearing; that the licenses of four physicians were revoked and the license of one physician suspended. (Information from letters to the writer.)" (Columbia Law Rev., Jan., 1935, p. 91.)

New Legislation on Abortion

From what has preceded, the failure of the present punitive laws on abortion to accomplish their purpose must be self-evident. In the face of this failure any new solution should be given due consideration, no matter how revolutionary it may seem to our present ideas. Such a solution has been offered by the legalization of abortion in Russia. Details concerning this law will be found in Chapter XXVI. Here let it suffice to mention a few essential facts. First of all, it must be clearly stated that Russia does not allow all abortions to be done freely without legal interference. On the contrary, Russia has laid down very definite limitations. The laws which are rigidly enforced, prescribe severe punishment for those who act contrary to the orders of the government. All abortions must be done by a physician and, except in outlying districts, the operation must be done in government hospitals.

Furthermore, they cannot as a rule be done after the third month of pregnancy, except for medical reasons. While not absolutely prohibited in first pregnancies, pressure is exerted to make it very difficult for women, who have not previously had a child, to obtain an abortion. Finally, the full weight of official propaganda is exerted to induce women to practice contraception, in order to escape the unavoidable risks of abortion, and birth control instruction is provided freely in government health centers.

The experience of the past ten years is still too meager to draw any positive conclusions from the Russian experiment. However, it is reasonably clear that, quite regardless of an increase in frequency of abortion and the harmful effects upon the health of the women who are aborted, this method results in a definite lowering of the immediate mortality from induced abortions. If we can trust the figures that are available, it would seem that secret illegal abortions, with their high death rate, have been thereby reduced to a minimum. A law that is enforceable and is enforced, would certainly appear to be of more value than a law that is upon the statute books and is not observed. We must await the verdict of the coming generation before deciding to what degree this Russian solution may be applied in other countries.

It is not surprising that this movement toward legalization has had a definite influence on abortion laws in neighboring countries. In *Czechoslovakia* the government has taken steps to permit abortions, not merely for medical reasons but for social reasons as well, as in the case of poor families with three or more children. In 1932 an effort was made to modify the *Polish* penal code, to allow physicians to perform an abortion at the request of patients, if ill health or social conditions rendered it justifiable. Only midwives and quacks were to be prosecuted for inducing abortions. An abortion bill, which failed of passage in *Rumania*, provided for making induced abortion lawful, if done by competent physicians. The bill came to a vote in the Chamber of Deputies and there were just as many votes for as against the bill. The Minister of Justice thereupon decided against its acceptance. In *Germany* the subject of legalized abortion has been actively debated, but the majority of the medical profession, while favoring wider indications, are opposed to anything approaching the Russian laws. In *France* there is active agitation for a change in law, in which leading physicians and jurists work side by side with socialist and members of other radical parties.

Proposed Abortion Law

Destructive criticism of the existing abortion laws is relatively easy. It is far more difficult to attempt constructive suggestions for a model law. It is with great trepidation that I have set upon the task of

formulating a law that embodies some of the more evident changes necessary to conform to current medical practice and public opinion.

To begin with, any law that is to be given present consideration, must be in agreement with "mass opinion" as it exists in the year 1935, and cannot be based on any ideal conditions requiring decades for development. The essentials for such an abortion law can be stated as follows:

- (1) Primarily, consideration for the health of the mother, and secondarily, respect for the unborn fetus as a living organism, capable, if protected, of developing into an individual of value to the community.
- (2) Preservation of the best interests of the family as a whole, including the proper rearing of children already born.
- (3) Freedom from religious bias.
- (4) Punishment for those who seek financial gain from the practice of abortion.

It is also important that such a law should state clearly the definition of abortion as distinguished from premature labor, and that the punishment should conform to the accepted opinion that the destruction of life in the early stages of intrauterine development is not as serious an offense as in later months, or after the birth of the child.

Finally, special emphasis should be laid on the necessity of putting in authority the physician as the guardian of the public health.

With these in mind, I have outlined a draft for a law, putting it, for convenience, in the form of a statute. I realize that it has many deficiencies, and that in any given state, a bill would have to be drawn to conform with existing laws, and legal forms of the state, but I offer it as a basis for discussion by members of the medical and legal professions:

Revised Statute on Abortion

Sec. I. Definitions: By "abortion" is meant the destruction of the life of the child or its expulsion from the mother's womb, before it has become viable; that is, able to sustain life after its birth. After the child has become viable, its expulsion before the normal termination of pregnancy is termed "premature birth."

By "regular practitioner of medicine" is meant any physician licensed to practice medicine by the laws of the State in which he resides.

By "licensed hospital" is meant any institution licensed by state or local authorities to care for the sick.

By "physical depletion of the mother" is meant any condition that produces bodily exhaustion predisposing to disease, such as too frequent child bearing, undernourishment, or excessive family responsibilities.

By "moral irresponsibility of the mother" is meant that at the time of conception the woman lacked the necessary physical or mental control

over her conduct, as when a pregnancy occurs as the result of physical violence (rape), or as the result of sexual relations in women of low mental development, or in girls of immature age, under sixteen years.

Sec. II. (a) Whoever with intent to procure the abortion of any woman, whether pregnant or not, prescribes or administers to her any medicine, drug, or substance, or with like intent uses any instrument, or means, shall be imprisoned for not less than six months, nor for more than two years.

(b) *Provided that* this section shall not apply to any abortion produced by any regular practitioner of medicine, after consultation with another such practitioner and done in any licensed hospital of the state, for the purpose of preserving the mother's life or health, or in cases of physical depletion, or of moral irresponsibility of the mother. The advice of two regular practitioners of medicine shall serve as evidence of the necessity for producing such an abortion.

Sec. III. If the death of the woman, whether pregnant or not, results from such measures to procure an abortion, unless done by a regular practitioner of medicine in the manner and under the conditions prescribed in *Sec. II*, the penalty shall be increased to imprisonment for from two to twenty years.

Sec. IV. Whoever, with intent to produce premature birth and thus procure the death of the child, after it shall have become viable, shall prescribe or administer any medicine, drug, or substance whatsoever, or with like intent shall use any instrument or means, unless he be a regular practitioner of medicine, and employ such measures to preserve the life or health of the mother, or employ such measures in case of serious deformity of the child, shall be deemed guilty of manslaughter.

Comment.—It will be noted in *Sec. IV.*, dealing with premature birth, that no mention is made of licensed hospital, consultation, or special indications for interference, since medical procedures, at this time, are always based on health indications and may have to be done in the home.

To those critics who argue that the insertion of the phrase "in case of physical depletion or moral irresponsibility of the mother" would open wide the door to abuse, and greatly increase the number of abortions, I would answer that if every such abortion were made a matter of hospital record with the reasons justifying it attested to by two regular physicians, it should be possible for authorities to investigate cases, and take away the license of any physician who was attempting to take unfair advantage of the liberal provisions of the law. On the other hand, it would, I believe, greatly reduce the number of secret abortions and would lead to the gradual elimination of the professional abortionist, by making his business unprofitable and dangerous. The success already attained by hospital administrators in the control of unnecessary surgical operations, justifies the belief that a similar control of unjustified medically induced abortions could be exercised.

In some countries the decision regarding the interruption of pregnancy is left to a public commission and the operation done in a public hospital without charge by a public health physician. Whether such a commission could function in our country without interference by politicians and public grafters is open to doubt. I am afraid we are not yet ready for such a step.

Since the licensing of hospitals varies so greatly in the individual states, a more exact definition of the term "licensed hospital" is difficult. Care must be taken of course to prevent the establishment of small private hospitals designed especially for the care of abortion cases. Since the recent New York survey on Maternal Mortality revealed the bad conditions existing in private maternity hospitals, a special law providing for registration and supervision of all hospitals taking maternity cases at any stage of pregnancy would serve to correct these present defects, and prevent the abuses that might arise from a liberalization of indications for abortion as above suggested.

A further question that arises is that of the expenses connected with such hospitalization. In order to prevent the needy patients from again seeking the aid of midwives or cheap abortionists, provision must be made from public or private funds for the free or part-pay care of these abortion cases in our regular hospitals. This is an essential corollary to the success of the project.

Some may criticize the proposed statute as a halfway measure, claiming that any attempt to limit by law the indications for abortion is futile, and will lead to a persistence of the practice of secret interruptions of pregnancy. I do not deny this difficulty. With such a law some women will still resort to the professional abortionist, but I believe their number will be so reduced that this evil will be more than compensated for, by avoiding the deterioration of maternal health that follows in the wake of fully legalized abortion, as practiced in Russia.

Future experience will alone give the final answer to these questions. For the present, the wiser course would seem to be to extend the indications for abortion gradually, so that it may be possible to see what path it is best to follow. For this reason I believe the proposed law would serve our immediate needs adequately.

CHAPTER XXVIII

CONTROL OF ABORTION

ANY ONE who has given thought to the evidence presented in this volume must be impressed with the fact that abortion is probably the most wasteful of known ills in its expenditure of human life and human health. Not all of this waste is avoidable, nor is it quite fair to weigh the life of a tiny fetus in the same balance with that of an adult individual. Nevertheless the problem is a very serious one and demands the careful consideration of any measures that may be suggested for its control.

In the discussion of these measures I have included changes that may reduce the number of spontaneous abortions, as well as consideration of the more complex problem of induced abortion. Of necessity these suggestions must be stated briefly. They are based on the information contained in the preceding chapters. I have grouped them under the following heads:

- (1) Intensive study of the underlying causes of spontaneous abortion and its prevention.
- (2) Better training of physicians in the prevention and treatment of abortion.
- (3) Better hospital facilities for abortion patients.
- (4) Improvement in home and working conditions for the pregnant mother.
- (5) Broader and more humane indications for medical interruption of pregnancy.
- (6) A change in our laws permitting medical intervention in place of the prevalent resort to personal manipulations, or to induction by a professional abortionist or midwife.
- (7) Education of women concerning the dangers of abortion.
- (8) Improved economic and housing conditions among the poor, to decrease the necessity for resorting to abortion.
- (9) Sterilization of those who for medical reasons should not have more children, or any children at all.
- (10) Widespread establishment of maternal health clinics under medical control to teach women *safe and harmless* methods of contraception.

(1) **Spontaneous Abortion.**—Increasing knowledge of the influence of the internal secretions upon the implantation and imbedding of the human ovum warrants the belief that before long we may be able to

prevent many habitual abortions in which a "blight" causes the early destruction of the ovum. It is an important subject for research and warrants expenditure of more time and money than in the past. The influence of dietary deficiencies and focal infections in the causation of habitual abortion also needs further study. If even those means at present available to prevent spontaneous abortion were used to the fullest extent many a fetal death and maternal illness could be avoided. The fault lies largely with the doctor, who has not given these matters sufficient attention.

(2) **Medical Management.**—Not only in the prevention of abortion, but in the management of these cases, the medical profession is poorly trained. The curriculum of our medical schools devotes little time to this subject, and students are often graduated without having had opportunity of assisting in a single abortion. When we consider the time devoted to obstetrics as a whole, and realize that in practice men see one abortion to about three confinements, the proportion devoted to training students regarding the management and complications of abortion is ridiculously small. In post-graduate courses there is also a notable lack of attention given to the subject of abortion and its treatment. It is not surprising therefore that in the surveys made by the Children's Bureau, and the New York and Philadelphia committees on maternal mortality, we find many cases in which death was due to faulty medical treatment. The routine practice of curettement, even in acutely septic cases, results frequently in peritonitis or septicemia, with fatal outcome. Perforation of the uterus by the physician is usually due to some error in judgment or technique that could have been avoided by observing certain fundamental precautions. Many a patient infected by her own primary instrumentation, or that of a midwife or abortionist, loses her life, or is rendered more seriously ill, because of subsequent improper management by a regular physician. It is my hope that this monograph may serve to make clear some of these mistakes. A fundamental requirement for reform, however, is more adequate instruction in the prevention and treatment of abortion in our medical schools and hospitals.

(3) **Better hospital facilities** for abortion cases should be supplied. If there is need for more beds for our confinement cases, surely the need is even greater in caring for abortion patients. The percentage of complications and of operative intervention is far greater in the latter group. Especially if hospitalization of all induced and suspected criminal cases is demanded, the community must have available sufficient free beds to care for these patients properly.

To encourage a patient to turn early and readily to the hospital after non-therapeutic interruption, she should be made to feel that

the removal of a menace to her life or health is the institution's primary intent and entire business. She should be assured that her statement of the cause of her need of care is a confidential communication. Otherwise her fear of having it reported to officers of the law will postpone her resort to the hospital until grave danger is present.

(4) **Improvement in the home and working conditions** of the pregnant mother is urgently demanded. At the present time, if the woman is herself a wage-earner she hesitates to mention her condition for fear of losing her job. In many European countries provision is made by law requiring certain concessions to women who are pregnant, but in the United States, employers have thus far given the matter little consideration. Faced by eventual dismissal, women often resort to abortion. Every expectant mother must be granted special consideration. Not only should she be assured of the continuance of her job, but if her home duties predispose her to abortion, an effort should be made to lighten her burden.

(5) The **medical indications** for induction of abortion have already been discussed at length. Here let me only reiterate the necessity of a more humane point of view by the medical profession. There has been a growing tendency in discussing the indications for therapeutic abortion for doctors to assume the abstract scientific attitude: "*Must* an abortion be done under these particular circumstances?" Is it not also their duty to consider, not only the disease, but the patient as well and ask the question: "*May* not an abortion under these circumstances help to save the health of the mother and the integrity of the family?"

In the propaganda for broader indications for the induction of abortion there have been some who have taken what seems to me an extreme point of view. I cannot agree with Dr. Rongy for instance when he advocates abortion in every case of illegitimacy or advises it in cases of desertion and widowhood. Granted that the health of the expectant mother is good, it is wiser, I think, for the state to make provision for the material and physical welfare of the newborn babe by adoption or by financial support, rather than to legalize its destruction before birth.

When, however, the mother is physically depleted by childbearing and poverty, when she is mentally defective or clearly irresponsible, as in the case of girls under fifteen years, in case of incest or rape, or when the mother's mental instability has reached the stage of attempted suicide, we are justified, I think, in recommending a termination of the pregnancy.

(6) **Legal Changes.**—Co-ordinate with these changes in the indications for abortion must come a change in our laws. Perusal of the evidence contained in Chapter XXVII will convince every one of the need for reform. The ridiculous, oftentimes incomprehensible, and harsh statutes on our books result in such contempt for the law that physicians, laity and abortionists give it little consideration. Yet a proper and more liberal law that *could* be enforced, *would* be enforced. This would help to decrease the dangerous practices that are now undermining the health and often causing the death of our young mothers. As physicians, we have the right to demand a change. Peller says: "The profession has allowed a condition to persist by which the state *tolerates* the breach of the law by us without, however, definitely pronouncing in its favor." To put it more crudely, we are the official "boot-leggers" of abortion. Such a situation is both unfair and undignified. There are, of course, a few good laws, such as those in the District of Columbia, but, by and large, our abortion laws urgently need radical revision.

(7) **Public Education.**—Ignorance is of course at the root of much of the harm that comes from abortion. I refer more particularly to the ignorance of the average woman concerning her physical self and a failure to appreciate all the dangers that lurk about the various measures usually employed to interrupt a pregnancy. Too often all she knows is through "back-stairs gossip" with some neighbor who was lucky enough to "get by" with an abortion in one way or another. She gets the impression that it is an easy and safe procedure. It is of course true that in four out of five cases no serious mishap results. She doesn't hear about the disaster that befell the fifth, for that is usually discreetly hushed up. Fortunately we have made a beginning in the matter of sex education, but we should also see to it that the dangers of induced abortion are clearly explained to every girl who has reached puberty. This can be done in connection with a discussion of the subject of pregnancy.

In daily office routine, a physician frequently has opportunities of discussing these subjects with his patients. He is not worthy of his calling who does not take the necessary time to do this work of education. More than this, the physician has often the chance of directly preventing an abortion by a bit of friendly advice. The first reaction of the mother who unexpectedly finds herself pregnant contrary to her plans is that something must be done about it at once. Often no substantial reason is present why an additional child would be a major calamity, but at that particular moment emotions are stronger than common sense. The tactful physician can here be of the greatest help.

A frank explanation of all the risks involved, immediate and remote, will deter many patients. Many an abortion is done on the impulse of the moment when a friendly word of warning would have served as a check. Especially abortions secured by young couples shortly after their marriage should by all means be avoided, since time and again sterility follows as a result and, although craving children in later years, they are denied this privilege.

(8) **Social and Economic Reform.**—In an earlier chapter I discussed the need for improving social and economic conditions to make it less frequently necessary for poor women to resort to abortion. I will not repeat the various measures suggested there for relief. "Motherhood," says Peller, "that bears the heaviest material and sexual burdens should not be forced by the threat of prosecution or by the curse of the Church to accept additional burdens." It is our duty rather to lighten these burdens in every possible way. Some of the new housing projects that have been undertaken in the poorer sections of our large cities are a step in that direction. But it is only a short step, and the path is very long that leads to the goal of good homes and fair wages for all, whereas we are often confronted with living conditions of acute distress calling, not for theories of social change or legal battling, but for immediate relief.

(9) **Eugenic Sterilization.**—More immediate in its effect and more possible of quick accomplishment (at least theoretically) is the program for sterilization of the unfit. But *who are the "unfit"?* That question is not easily answered. In selecting suitable cases we should be most cautious. While we cannot in a particular individual predict with certainty that the offspring even of an insane or defective woman will be degenerate or defective, the evidence as chronicled in our institutions for the feeble-minded and for the criminal insane certainly points to the strong probability that the child will not be normal. Is it wise to allow the birth of three imbeciles on the chance of the birth of one normal child? And what of the child, normal or not, who has a mentally abnormal or morally irresponsible mother? How much wiser to spend the money used in the lifelong care of these defectives to care properly for the normal, healthy offspring of our normal parents. In the case of certain diseases that definitely follow Mendelian laws of inheritance there can be little argument against sterilization.

Among the "unfit" that should also be sterilized are the mothers with serious, incurable heart, lung or kidney disease. In addition, sterilization must be considered by very fertile couples whose contraceptive measures have failed and to whom additional children

would be an intolerable burden. In such cases the far simpler sterilization of the husband must be given preference. When pelvic operations are done on women of over thirty-five years, who have as many children as they wish, the addition of tubal sterilization adds so slightly to the risk that it is usually to be advised.

(10) **The Rôle of Contraception.**—Of all the measures suggested for the control of abortion none equals in importance the widespread establishment of clinics for contraceptive advice and provision for the free distribution of contraceptive materials among the poor. It is self-evident that by the prevention of the undesired or undesirable pregnancy we can reduce the number of cases requiring abortion to a relatively small number.

Concerning "Abortion and Contraception," the Committee on Maternal Welfare of the League of Nations has made the following impressive statement:

"Both these subjects have aroused considerable interest of late years and, in many countries, the practice of both abortion and contraception has increased, or at least has become far more openly discussed. Exact information as to the prevalence of either is obviously difficult, if not impossible, to obtain.

"From the standpoint of maternal welfare, apart from any moral or legal objections, abortion must be regarded as associated with considerable danger to health, mainly on account of the sepsis which not seldom accompanies it, and also because of the unhealthy condition of the pelvic organs which may be one of its sequelae.

"Salpingitis or pelvic infection may be set up which may lead to chronic invalidism and permanent sterility, and serious damage to the liver and kidneys may be produced by certain chemical abortifacients.

"A threatened abortion often receives no proper medical attention, especially if the woman herself attempted to interrupt pregnancy, and the doctor is frequently not summoned unless acute septic infection intervenes. Cases of abortion are not usually welcome in the maternity hospital because of their potentially septic character, and increased hospital accommodation is urgently needed for these cases, so that the uterus may be properly emptied if the abortion is inevitable, and suitable after-treatment provided. Instruction should be given at the pre-natal clinic as to the dangers of abortion and the importance of seeking medical advice should it occur.

"Apart from the practice of contraception for personal or economic reasons, it may be necessary to avoid pregnancy on account of the mother's own health, and in such cases it is preferable to prevent

pregnancy occurring at all rather than to interrupt it. But it is not sufficient merely to tell a married woman suffering from tuberculosis or heart disease or nephritis that she should not again become pregnant. It is necessary to explain exactly what steps she and her husband should take to prevent this from happening. If the private doctor is not prepared to do this, the information can be given most appropriately at the health centre." (Official No. CH. 1060, 1931, p. 24.)

Naturally no preventive measures can be one hundred per cent successful, and it will certainly be impossible for some time to have them applied widely enough to eliminate undesired pregnancies as a factor in abortion.

Peller believes that in the next few decades birth control will materially reduce the need for abortion and that with this reduction the public will accept the wider medico-social indications for interruption. To accomplish this end, however, we must make every effort to establish maternal health centers in all our larger cities in connection with medical schools, dispensaries, and hospitals, and to seek cooperation of state boards of health to establish similar clinics in outlying districts throughout the country.

The movement for the control of induced abortion is therefore directly dependent upon the success of the movement for medical contraception. The nearer we approach the discovery of a method that is simple, generally available, and one hundred per cent successful in the prevention of pregnancy, the nearer do we get to the control of abortion. Every effort should be made to attain this goal by means of medical research, widely carried out, and endowed with adequate funds.

Perhaps this may seem to some a rather ambitious program. I will not deny this, nor will I deny that many of the proposed measures will take a long time for accomplishment. But unless we make a beginning in this task, nothing will ever be done. No problem in preventive medicine gives greater promise of definite beneficial results. The medical profession must assume full responsibility for the appalling frequency of abortion and its high death-rate, if it fails to attempt correction of these fundamental evils. For this reason it is my hope that this work will not merely serve as a source of information upon the subject of abortion, but that it will stimulate my fellow practitioners to realize their obligation and opportunity of aiding in its control.

APPENDIX A

STATUTES RELATING TO ABORTION

STATUTES RELATING TO THE PROCURING OF ABORTION IN STATES AND TERRITORIES OF THE UNITED STATES, 1934

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For Summary see Notes [35] Columbia Law Review, p. 87 ff. [January, 1935]

FEDERAL LAWS: The following statutes refer to the actual offense of procuring abortion in the several jurisdictions. In addition, the Federal Statutes dealing with mailing, importation, and transportation and other circulation of obscene matter specifically mention the means for, and information about, the production of abortion, and apply in all parts of the country. (*U. S. C. Title 18: Secs. 334; 396; 511; 512. Title 19: Sec. 305.*) (For text, see *Dickinson and Bryant, Control of Conception, 1931, pp. 252 ff.*) Many states have "obscenity" statutes modeled on these Federal Laws.

THE COMMON LAW: According to the prevailing view, it was not an offense at Common Law for the mother or someone else to destroy an unborn child before it had "quickened." After quickening, its destruction was a *misdemeanor*, unless the destruction was necessary, or believed necessary, to preserve the life of the mother. (*Clark and Marshall, Law of Crimes, Sec. 291.*) References are made to the application of the Common Law in particular States.

(1)	(2)	(3)
STATE OR TERRITORY	BASIC ABORTION STATUTE* Section Number Abbreviated Title Contents	PENALTIES AFFIXED, AND COMMENTS (a) For Person Inducing Abortion (b) For Woman Herself (c) In Event of Death of Woman (d) Related Matters

**Italics ours, to indicate degree of crime and exemptions.—Ed.*

ALABAMA. *Ala. Code (1923).*

Sec. 3191. Inducing or Attempting to Induce Abortion, Miscarriage or Premature Delivery of a Woman.

Any person who willfully administers to any pregnant woman any drug or substance or uses or employs any instrument or other means to induce an abortion, miscarriage, or premature delivery, or aids, abets, or prescribes for the same *unless the same is necessary to save her life and done for that purpose*, must, on conviction, be fined not more than five hundred dollars and imprisoned in the penitentiary for not less than two nor more than five years.

- (a) Fine of not more than \$500 and imprisonment for from 2 to 5 years.
- (b) Common Law in force, with a fine of not more than \$500 and imprisonment for not more than 6 months. (At Common Law the woman is *guilty of a misdemeanor* only if the child had quickened.)
- (c) *Second degree murder*, with imprisonment for not less than 10 years.
- (d) This statute and others similar apply to any interruption of the normal course of pregnancy, even though the child survives.

ARIZONA. *Ariz. Rev. Code (Struckmeyer, 1928), Sec. 4645.*

Procuring Miscarriage.

Every person who provides, supplies, or administers to any pregnant woman, or procures any such woman to take any medicine, drug or substance, or uses or employs any instrument or other means whatever, with intent thereby to procure the miscarriage of such woman, *unless the same is necessary to save her life*, is punishable by imprisonment in the state prison not less than two years nor more than five years.

- (a) Imprisonment for from 2 to 5 years.
- (b) Imprisonment for from 1 to 5 years.
- (c) *Second degree murder*, with imprisonment for not less than 10 years.

ARKANSAS. *Ark. Dig. Stat. (Cranford and Moses, 1921.)**Sec. 2358, Administering Drug, etc., to Destroy Child.**Sec. 2598, Abortion:—Punishment.*

Sec. 2358. Every person who shall administer to any woman pregnant with a quick child any medicine, drug or substance whatever, or who shall employ any instrument or other means, with intent thereby to destroy such child, and thereby shall cause its death, *unless the same shall be necessary to preserve the life of the mother, or shall have been advised by a regular physician to be necessary for such purpose*, shall be deemed guilty of manslaughter.

Sec. 2598. It shall be unlawful for anyone to administer or prescribe any medicine or drugs to any woman with child, with intent to produce an abortion or premature delivery of any foetus before the period of quickening, or to produce or attempt to produce such abortion by any other means; and any person offending against the provisions of this section shall be fined in any sum not exceeding one thousand dollars, and imprisoned in the penitentiary not less than one nor more than five years. *Provided, this section shall not apply to any abortion produced by any regular practicing physician for the purpose of saving the mother's life.*

- (a) If child had quickened and dies, imprisonment for from 2 to 7 years. If child had not quickened, or does not die, fine of not more than \$1,000 and imprisonment for from 1 to 5 years. *Penalty for physician, whether or not child had quickened, imprisonment for from 1 to 5 years and revocation of license to practice (Sec. 8280).*
- (b) Common Law in force, with a fine of not more than \$100 and imprisonment for not more than 3 months.
- (c) *Second degree murder*, with imprisonment for from 5 to 21 years.
- (d) *Sec. 2598 does not cover attempts to cause an abortion after the child had quickened. The Common Law is here applied, with a fine of not more than \$100 and imprisonment for not more than three months.*

CALIFORNIA. *Calif. Pen. Code (Deering, 1931), Sec. 274.*

Administering Drugs, etc., With Intent to Produce Miscarriage.

Every person who supplies, provides or administers to any pregnant woman, or procures any such woman to take any medicine, drug or substance, or uses or employs any instrument or other means whatever with intent thereby to procure the miscarriage of such woman, *unless the same is necessary to preserve her life*, is punishable by imprisonment in the state prison not less than two nor more than five years.

- (a) Imprisonment for from two to five years.
- (b) Imprisonment for from one to five years.
- (c) *Second degree murder*, with imprisonment for from five years to life.

COLORADO. *Colo. Ann. Stat. (Cartwright's Mills, 1930), Sec. 1775.*

Administering Noxious Drugs: Abortion.

"... Every person who shall administer or cause to be administered, or taken, any such poison substance or liquid, or who shall use, or cause to be used, any instrument of whatsoever kind, with the intention to procure the miscarriage of any woman then being with child, and shall thereof be duly convicted, shall be imprisoned for a term not exceeding three years in the penitentiary, and fined in a sum not exceeding one thousand dollars; and if any woman by reason of such treatment shall die, the person or persons administering or causing to be administered such poison, substance or liquid, or using or causing to be used any instrument as aforesaid, shall be deemed *guilty of murder* and if convicted be punished accordingly, *unless it appear that such miscarriage was procured or attempted by or under advice of a physician or surgeon with intent to save the life of such woman or to prevent serious and permanent bodily injury to her.*"

- (a) Fine of not more than \$1,000 and imprisonment for not longer than three years.
- (b) Common Law in force, with a fine of not more than \$100 and imprisonment for not more than 6 months.
- (c) *Second degree murder*, with imprisonment for not less than 10 years.
- (d) The proviso regarding intent to save the woman's life is held to qualify the prohibition against abortion as well as the provision for punishment in the event of the woman's death.

CONNECTICUT. *Conn. Gen. Stat. (1930), Sec. 6056.*

Attempt to Produce Abortion.

Any person who shall give or administer to any woman, or shall advise or cause her to use or take anything, or shall use any means with intent to procure upon her a miscarriage or abortion, *unless the same shall be necessary to preserve her life or that of her unborn child*, shall be fined not more than one thousand dollars, or imprisoned in the state prison not more than five years or both.

- (a) Fine of not more than \$1,000 and imprisonment for not longer than 5 years or both.
- (b) Fine of not more than \$1,000 and imprisonment for not longer than 5 years or both.
- (c) *Second degree murder*, with imprisonment for life.
- (d) Connecticut is the only state which prohibits use of contraceptives. (Sec. 6246.)

DELAWARE. *Dela. Rev. Code (1915), Sec. 4711.*

Abortion: Committing or Advising; Penalty; Exception.

Whoever, with the intent to procure the miscarriage of any pregnant woman, or woman supposed by such person to be pregnant, *unless the same be necessary to preserve her life*, shall administer to her, advise or prescribe for her, or cause to be taken by her any poison, drug, medicine or other noxious thing, or shall use any instrument or other means whatever, or shall aid, assist, or counsel any person so intending to produce a miscarriage, whether said miscarriage be accomplished or not, shall be *guilty of a felony* and upon conviction thereof shall be fined not less than one hundred dollars nor more than five hundred dollars, and be imprisoned for a term not exceeding five years nor less than one year.

- (a) Fine of from \$100 to \$500 and imprisonment for from one to five years.
- (b) Common Law in force with fine and imprisonment or either, according to the discretion of the court.
- (c) *Second degree murder*, with fine at the discretion of the court and imprisonment for life.

DISTRICT OF COLUMBIA. *Dist. of Col. Code (1929), p. 42, Sec. 33.*

Procuring Miscarriage.

Whoever, with intent to procure the miscarriage of any woman, prescribes or administers to her any medicine, drug or substance whatever, or with like intent uses any instrument or means, *unless when necessary to preserve her life or health, and under the direction of a licensed practitioner of medicine*, shall be imprisoned for not more than five years, or if the woman or child dies in consequence of such act, by imprisonment for not less than three nor more than twenty years.

- (a) If the child dies, imprisonment for from 3 to 20 years. If the child does not die, imprisonment for not more than 5 years.
- (b) Common Law in force, with a fine of not more than \$1,000 or imprisonment for not more than 5 years, or both.
- (c) Imprisonment for from 3 to 20 years.

GEORGIA. *Ga. Code (1928), p. 1919.**Sec. 81. Use of Medicine, Assault with Intent to Murder.**Sec. 82. Abortion—Punishment.*

Sec. 81. Any person who shall administer to any woman, pregnant with a child, any medicine, drug, or substance whatever, or shall use or employ any instrument or other means, with intent thereby to destroy said child, *unless the same shall have been necessary to preserve the life of such mother, or shall have been advised by two physicians to be necessary for such purpose*, shall, in case the death of child or mother be thereby produced, be guilty of assault with intent to murder.

Sec. 82. Any person who shall willfully administer to any pregnant woman any medicine, drug, or substance, or anything whatever, or shall employ any instrument or other means whatever, with intent thereby to produce the miscarriage or abortion of any such woman, *unless the same shall have been necessary to preserve the life of such woman, or shall have been advised by two physicians to be necessary for that purpose*, shall be guilty of a misdemeanor.

- (a) If the child does not die, or had not quickened, fine of not more than \$1,000 or imprisonment for not more than 12 months or both. If the child had quickened and dies, imprisonment for from 2 to 10 years.
- (b) None for woman.
- (c) Assault with intent to murder with imprisonment for from 2 to 10 years.
- (d) Sec. 81 is interpreted as applying only if the child had quickened.

FLORIDA. *Fla. Comp. Laws (1927), Sec. 7579.*

Abortion—Punishment.

Whoever, with intent to procure miscarriage of any woman *unlawfully* administers to her or advises or prescribes for her, or causes to be taken by her, any poison, drug, medicine or other noxious thing, or *unlawfully* uses any instrument or other means whatever with the like intent, or with like intent aids or assists therein, shall, if the woman does not die in consequence thereof, be punished by imprisonment in the state prison not exceeding seven years, or by fine not exceeding one thousand dollars.

- (a) Fine of not more than \$1,000 or imprisonment for not more than 7 years.
- (b) Common Law in force with a fine of not more than \$500 or imprisonment for one year or both.
- (c) *Third degree murder*, with imprisonment for not more than 20 years.
- (d) No explicit exception for physicians.

IDAHO. *Idaho Code (1932), Sec. 17-1810.*

Procurement of Abortion.

Every person who provides, supplies, or administers to any pregnant woman, or procures any such woman to take any medicine or drug, or substance, or uses or employs any instrument or other means whatever, with intent thereby to procure the miscarriage of such woman, *unless the same is necessary to preserve her life*, is punishable by imprisonment in the state prison not less than two nor more than five years.

- (a) Imprisonment for from 2 to 5 years.
- (b) Imprisonment for from 1 to 5 years.
- (c) Imprisonment for from 10 years to life.

ILLINOIS. *Ill. Rev. Code (Cahill, 1933), C. 38, Sec. 15.*

Abortion, producing.

Whoever, by means of any instrument, medicine, drug, or other means whatever, causes any woman, pregnant with child to abort or miscarry, or attempts to procure or produce an abortion or miscarriage, *unless the same was done as necessary to the preservation of the mother's life*, shall be imprisoned in the penitentiary not less than one year nor more than ten years; or if the death of the mother results therefrom, the person procuring or causing the abortion or miscarriage shall be *guilty of murder*.

- (a) Imprisonment for from 1 to 10 years.
- (b) Common Law in force, with a fine of not more than \$500 or imprisonment for not more than 1 year.
- (c) *Murder*, punished by death or imprisonment for not less than 14 years.
- (d) Convictions for manslaughter, as well as for murder, are sustained under this statute.

INDIANA. *Ind. Stat. (Burns, 1926), Sec. 2435.*

Attempt to Procure Miscarriage.

Whoever prescribes or administers to any pregnant woman or to any woman whom he supposes to be pregnant, any drug, medicine or substance whatever, with intent thereby to procure the miscarriage of such woman, or, with like intent, uses or suggests, directs or advises the use of any instrument or means whatever, *unless such miscarriage is necessary to preserve her life*, shall, on conviction, if the woman miscarries or dies in consequence thereof, be fined not less than one hundred dollars nor more than one thousand dollars, and be imprisoned in the state prison not less than three years nor more than fourteen years.

- (a) Fine of from \$100 to \$1,000 and imprisonment for from 3 to 14 years.
- (b) Fine of from \$10 to \$500 and imprisonment for from 30 days to 1 year.
- (c) Fine of from \$100 to \$1,000 and imprisonment for from 3 to 14 years.

IOWA. *Iowa Code (1927), Sec. 12973.*

Attempt to Produce Abortion—Administration of Drugs—Use of Instruments.

If any person, with intent to produce the miscarriage of any woman, willfully administers to her any drug or substance whatever, or, with such intent, uses any instrument or other means whatever, *unless such miscarriage shall be necessary to save her life*, he shall be imprisoned in the penitentiary for a term not exceeding five years, and be fined in a sum not exceeding one thousand dollars.

- (a) Fine of not more than \$1,000 and imprisonment for not more than 5 years.
- (b) None for woman.
- (c) *Second degree murder*, with imprisonment for not less than 10 years.

KANSAS. *Kan. Rev. Stat. (1923).**Sec. 21410. Manslaughter in the Second Degree.**Sec. 21437. Abortion or Miscarriage.*

Sec. 21410. Every person who shall administer to any woman pregnant with a quick child any medicine, drug, or substance whatever, or shall use or employ any instrument or other means with intent thereby to destroy such child, *unless the same shall have been advised by a physician to be necessary to preserve the life of such mother, or shall have been advised by a physician to be necessary for that purpose*, if the death of such child or mother thereof ensue from the means employed, shall be *guilty of manslaughter* in the second degree.

Sec. 21437. Every physician or other person who shall willfully administer to any pregnant woman any medicine, drug, or substance whatsoever, or shall use or employ any instrument or means whatsoever, with intent thereby to procure abortion or the miscarriage of any such woman, *unless the same shall have been necessary to preserve the life of such woman, or shall have been advised by a physician to be necessary for that purpose*, shall, upon conviction, be adjudged *guilty of a misdemeanor*, and punished by imprisonment in the county jail not exceeding one year, or by fine not exceeding five hundred dollars, or by both such fine and imprisonment.

(a) If child had not quickened or if child does not die, fine of not more than \$500 or imprisonment for not more than 1 year, or both. If child had quickened and dies, imprisonment for from 3 to 5 years.

(b) None for woman.

(c) *Second degree manslaughter*, with imprisonment for from 3 to 5 years.

KENTUCKY. *Ken. Stat. (Carroll, 1930), Sec. 1219 a-1, a-2.*

Abortion—Penalty—Felony.

Sec. 1219 a-1. It shall be unlawful for any person to prescribe or administer to any pregnant woman, or to any woman whom he has reason to believe pregnant, at any time during the period of gestation, any drug, medicine, or substance whatsoever, with the intent thereby to procure miscarriage of such woman, or with like intent, to use any instrument or means whatsoever; *unless such miscarriage is necessary to preserve her life*; and any person so offending, shall be punished by a fine of not less than five hundred dollars, nor more than one thousand dollars, and imprisoned in the state prison for not less than one nor more than ten years.

Sec. 1219 a-2. If by reason of any of the acts described in Section 1219 a-1 hereof, the miscarriage of such woman is produced, and she does miscarry, causing the death of the unborn child, whether before or after quickening time, the person so offending shall be *guilty of a felony*, and confined in the penitentiary for not less than two nor more than twenty-one years.

(a) If child does not die, fine of from \$500 to \$1,000, and imprisonment for from 1 to 10 years. If child dies, imprisonment for from 2 to 21 years.

(b) Common Law in force.

(c) *Murder or manslaughter*, depending upon the degree of danger attending the act. Punishment for murder, death or life imprisonment. Punishment for manslaughter, imprisonment for from 2 to 21 years.

LOUISIANA. *La. Rev. Stat. (Marr, 1915), Sec. 1611.*

Abortion.

Whoever shall *feloniously* administer or cause to be administered, any drug, potion or any other thing to any woman for the purpose of procuring a premature delivery, or whoever shall administer, or cause to be administered, to any woman pregnant with child, any drug, potion or any other thing for the purpose of procuring abortion or a premature delivery, or whoever by any means whatsoever shall *feloniously* procure abortion or premature delivery, shall be imprisoned at hard labor for not less than one nor more than ten years.

- (a) Imprisonment for from 1 to 10 years.
- (b) None for woman.
- (c) *Murder or manslaughter*, depending upon the degree of danger attending the act. Punishment for murder, death. Punishment for manslaughter, fine of not more than \$2,000 and imprisonment for not more than 20 years.
- (d) No explicit exception made for physicians.

MAINE. *Me. Rev. Stat. (1930), C. 135, Sec. 9.*

Procuring or Attempting to Procure Abortion or Miscarriage—Penalties.

Whoever administers to any woman pregnant with child, whether such child is quick or not, any medicine, drug or other substance, or uses any instrument or other means, *unless the same was done as necessary for the preservation of the mother's life*, shall be punished, if done with intent to destroy such child and thereby it was destroyed before birth, by a fine of not more than one thousand dollars, or by imprisonment for not more than five years; but if done with intent to procure the miscarriage of such woman, by a fine of not more than one thousand dollars and by imprisonment for less than one year.

- (a) If child does not die, fine of not more than \$1,000 and imprisonment for not more than 1 year. If child dies, fine of not more than \$1,000 or imprisonment for not more than 5 years.
- (b) Common Law in force, with a fine of not more than \$500 or imprisonment for not more than 1 year.
- (c) *Murder*, with imprisonment for life.
- (d) The proviso regarding necessity for the preservation of the mother's life is held to create a test of actual necessity; not a test of the good faith of the accused.

MARYLAND. *Md. Code (Bagby, 1924), Art. 27, Sec. 3.*

Any person who shall knowingly use or cause to be used any means whatever for that purpose (causing the miscarriage or abortion of any woman pregnant with child, at any period of her pregnancy) shall be punished by imprisonment in the penitentiary for not less than three years, or by a fine of not less than five hundred dollars nor more than one thousand dollars, or by both in the discretion of the court; . . . *provided, however, that nothing contained herein shall be construed so as to prohibit . . . the production of abortion by a regular practitioner of medicine when, after consulting with one or more respectable physicians, he shall be satisfied that the foetus is dead, or that no other method will secure the safety of the mother.*

- (a) Fine of from \$500 to \$1,000, or imprisonment for not less than 3 years, or both.
- (b) Nothing is found as to whether Common Law offenses are punishable in Maryland.
- (c) *Manslaughter*, with fine of not more than \$500 or imprisonment for not more than 10 years, or fine and imprisonment for not more than 2 years.

MASSACHUSETTS. *Mass. Gen. Laws (1932), p. 3182, Sec. 19.*

Unlawful Attempt, etc., to Procure Miscarriage.

Whoever, with intent to procure the miscarriage of a woman, *unlawfully* administers to her, or advises or prescribes for her, or causes any poison, drug, medicine or other noxious thing to be taken by her, or with like intent *unlawfully* uses any instrument or other means whatever, or with like intent aids or assists therein, shall, if she dies in consequence thereof, be punished by imprisonment in the state prison for not less than five nor more than twenty years; and if she does not die in consequence thereof, by imprisonment in the state prison for not more than seven years, and by a fine of not more than two thousand dollars.

- (a) Fine of not more than \$2,000 and imprisonment for not more than 7 years.
- (b) Common Law in force.
- (c) Imprisonment for from 5 to 20 years.
- (d) No explicit exception made for physicians.

MICHIGAN. *Mich. Public Acts (1931), p. 626, Sec. 14.*

Administering Drugs, etc., with Intent to Procure Miscarriage.

Any person who shall willfully administer to any pregnant woman any medicine, drug, substance or thing whatever, or shall employ any instrument or other means whatever, with intent thereby to procure the miscarriage of any such woman, *unless the same shall have been necessary to preserve the life of such woman*, shall be guilty of a felony, and in case the death of such pregnant woman be thereby produced, the offense shall be deemed *manslaughter*.

- (a) Fine of not more than \$2,000 or imprisonment for not more than 4 years, or both.
- (b) Common Law in force, with fine of not more than \$2,000 or imprisonment for not more than 5 years, or both.
- (c) *Manslaughter*, with fine of not more than \$1,000, or imprisonment for not more than 15 years, or both.

MINNESOTA. *Minn. Stat. (Mason, 1927).**Sec. 10076. Killing of Unborn Child or Mother.**Sec. 10175. Abortion—How Punished.*

Sec. 10076. Every person who shall . . . provide, supply, or administer to a woman, whether pregnant or not, or who shall prescribe for, advise, or procure a woman to take any medicine, drug or substance, or who shall use or employ, or cause to be used or employed, any instrument or other means, with intent thereby to procure the miscarriage of a woman, *unless the same is necessary to preserve her life*, and the death of the woman, or that of any quick child of which she is pregnant is thereby produced, shall be *guilty of manslaughter* in the first degree.

Sec. 10175. Every person who, with intent thereby to procure the miscarriage of a woman, *unless the same is necessary to preserve her life, or that of the child with which she is pregnant*, shall—

1. Prescribe, supply, or administer to a woman, whether pregnant or not, or advise or cause her to take any medicine, drug or substance; or

2. Shall use, or cause to be used, any instrument or other means—

Shall be *guilty of abortion*, and punished by imprisonment in the state prison for not more than four years, or in a county jail for not more than one year.

- (a) If child had not quickened or does not die, imprisonment for from 1 to 4 years. If child had quickened and dies, imprisonment for from 5 to 20 years.
- (b) If child had not quickened, imprisonment for from 1 to 4 years. If child had quickened, fine of not more than \$1,000 or imprisonment for from 1 to 15 years, or both.
- (c) *First degree manslaughter*, with imprisonment for from 5 to 20 years.

MISSISSIPPI. *Miss. Code (1930), Sec. 993.*

Homicide—Giving Medicine to Pregnant Woman and Thereby Killing Child.

Every person who shall administer to any woman pregnant with a quick child any medicine, drug or substance whatever, or shall use or employ any instrument or other means, with intent thereby to destroy said child, and shall thereby destroy it, shall be *guilty of manslaughter, unless the same shall have been advised by a physician to be necessary for such purpose.*

- (a) None if child had not quickened. If child had quickened, fine of not less than \$500 or imprisonment for one year, or both, or imprisonment for from 2 to 20 years.
- (b) Common Law in force, with a fine of not more than \$500 or imprisonment for 6 months, or both.
- (c) If the child had not quickened, *murder* (death or life imprisonment) or *manslaughter* (fine of not less than \$500 or imprisonment for one year, or both, or imprisonment for from 2 to 20 years), depending upon the degree of danger attending the act. If child had quickened, *manslaughter*.
- (d) The confused state of statutes and decisions in this jurisdiction renders impossible a concise and accurate statement of the law.*

*For discussion of this law see p. 433 of this text.

MISSOURI. *Mo. Stat. (1930), p. 2797, Sec. 3991.***Manslaughter—Producing Miscarriage.**

Any person who, with intent to produce or promote a miscarriage or abortion, advises, gives, sells or administers to a woman (whether actually pregnant or not) or who, with such intent, procures or causes her to take any drug, medicine, or article, or uses upon her, or advises to or for her the use of any instrument or other method or device to produce a miscarriage or abortion (*unless the same is necessary to preserve her life or that of an unborn child, or if such person is not a duly licensed physician, unless the said act has been advised by a duly licensed physician to be necessary for such a purpose*), shall in event of the death of said woman, or any quick child, whereof she may be pregnant, being thereby occasioned, upon conviction be adjudged *guilty of manslaughter*, and punished accordingly; and in case no such death ensue, such person shall be *guilty of the felony of abortion*, and upon conviction be punished by imprisonment in the penitentiary not less than three years nor more than five years, or by imprisonment in jail not exceeding one year, or by fine not exceeding one thousand dollars, or by both such fine and imprisonment.

- (a) If child had not quickened, or does not die, fine of not more than \$1,000, or imprisonment in the penitentiary for from 3 to 5 years, or in the county jail for not more than 1 year, or both fine and imprisonment. If the child had quickened and dies, imprisonment in the penitentiary for from 2 to 10 years, or imprisonment in the county jail for not less than 6 months, or a fine of not less than \$500, or both a fine of not less than \$100 and imprisonment in the county jail for not less than 3 months.
- (b) Common Law in force, with fine of not more than \$100 or imprisonment for not more than 2 months, or both.
- (c) *Manslaughter*, with imprisonment in the penitentiary for from 2 to 10 years, or imprisonment in the county jail for not more than 6 months, or fine of not less than \$100 and imprisonment in the county jail for not less than 3 months.

MONTANA. *Mont. Rev. Code (Choate, 1921), Sec. 1102.***Administering Drugs, etc., with Intent to Produce Miscarriage.**

Every person who provides, supplies, or administers to any pregnant woman, or procures any such woman to take any medicine, drug, or substance, or uses or employs any instrument or other means whatever, with intent to procure the miscarriage of such woman, *unless the same is necessary to preserve her life*, is punishable by imprisonment in the state prison not less than two nor more than five years.

- (a) Imprisonment for from 2 to 5 years.
- (a) Imprisonment for from 1 to 5 years.
- (c) *Second degree murder*, with imprisonment for not less than 10 years.

NEBRASKA. *Nebr. Comp. Stat. (1929).*

Sec. 28-404. "Foeticide," Definition, Penalty.

Sec. 28-405. "Abortion," Penalty.

Sec. 28-404. Any physician or other person who shall administer, or advise to be administered, to any pregnant woman with a vitalized embryo, or foetus, at any stage of utero gestation, any medicine, drug, or substance whatever, or who shall use or employ, or advise to be used or employed, any instrument or other means with intent thereby to destroy such vitalized embryo or foetus, *unless the same shall have been necessary to preserve the life of the mother, or shall have been advised by two physicians to be necessary for such purpose*, shall, in case of the death of such vitalized embryo, or foetus, or mother, in consequence thereof, be imprisoned in the penitentiary not less than one year nor more than ten years.

Sec. 28-405. Any physician, or other person who shall willfully administer to any pregnant woman any medicine, drug, substance, or thing whatever, or shall use any instrument or other means whatever, with intent thereby to procure the miscarriage of such woman, *unless the same shall have been necessary to preserve the life of such woman, or shall have been advised by two physicians to be necessary for that purpose*, shall be punished by imprisonment in the county jail not more than one year or by fine not exceeding five hundred dollars, or by both.

- (a) If child does not die, fine of not more than \$500 or imprisonment for 1 year, or both. If child dies, imprisonment for from 1 to 10 years.
- (b) None for woman.
- (c) Imprisonment for from 1 to 10 years.
- (d) "At any stage of utero gestation" is held to mean "at any stage of pregnancy."

NEVADA. *Nev. Comp. Laws (Hillyer, 1929), Sec. 10129.*

Abortion Defined.

Every person who, with intent thereby to produce the miscarriage of a woman, *unless the same is necessary to preserve her life or that of the child whereof she is pregnant*, shall—

1. Prescribe, supply or administer to a woman, whether pregnant or not, or advise or cause her to take any medicine, drug or substance; or

2. Use, or cause to be used, any instrument or other means; shall be *guilty of abortion*, and punished by imprisonment in the state prison for not more than five years, or in the county jail for not more than one year.

- (a) Imprisonment for not more than 5 years.
- (b) If child had quickened and dies, imprisonment for not more than 10 years. Otherwise, no offense.
- (c) *Second degree murder*, with imprisonment for from 10 years to life.

NEW HAMPSHIRE. *N. Hamp. Pub. Laws (1926), Vol. II, p. 1510.**Sec. 12. Attempt to Procure Miscarriage.**Sec. 13. Quick Child.*

Sec. 12. If any person shall willfully administer to a pregnant woman any medicine, drug, substance or thing whatever, or shall use or employ any instrument or means whatever, with intent thereby to procure the miscarriage of such woman, he shall be imprisoned not more than one year, or fined not more than one thousand dollars, or both.

Sec. 13. If any person shall administer to a woman pregnant with a quick child any medicine, drug or substance whatever, or shall use or employ any instrument or means whatever, with intent thereby to destroy the child, *unless, by reason of some malformation, or of difficult or protracted labor, it shall have been necessary, to preserve the life of the woman, or shall have been advised by two physicians to be necessary for that purpose*, he shall be fined not more than one thousand dollars and imprisoned not more than ten years.

- (a) If the child had not quickened, fine of not more than \$1,000, or imprisonment for not more than 1 year, or both. If child had quickened, fine of not more than \$1,000, and imprisonment for not more than 10 years.
- (b) Nothing is found as to whether Common Law offenses are punishable in New Hampshire.
- (c) *Second degree murder*, with imprisonment for life or for such period as the court may order.

NEW JERSEY. *N. J. Comp. Stat. (1910), p. 1784, Sec. 119.*

Causing Miscarriage—Punishment.

Any person who maliciously, or *without lawful justification*, with intent to cause or procure the miscarriage of a woman then pregnant with child, shall administer to her, prescribe for her or advise or direct her to take or swallow any poison, drug or medicine or noxious thing; or who maliciously or *without lawful justification*, shall use any instrument or means whatever, with the like intent shall be guilty of a *high misdemeanor*, and punished accordingly; and, if the woman or child die in consequence thereof, be punished by fine not exceeding five thousand dollars, or imprisonment at hard labor not exceeding fifteen years, or both.

- (a) If the child does not die, fine of not more than \$2,000, or imprisonment for not more than 7 years, or both. If child dies, fine of not more than \$5,000, or imprisonment for not more than 15 years, or both.
- (b) Common Law in force, with fine of not more than \$1,000, or imprisonment for not more than 3 years, or both.
- (c) Fine of not more than \$5,000, or imprisonment for not more than 15 years, or both.
- (d) No explicit exception made for physician.

NEW MEXICO. *N. Mex. Stat. (1929).**Sec. 35-309.* Abortion a Felony—Penalty.*Sec. 35-310.* Exception.

Sec. 35-309. Any person who shall administer to any pregnant woman any medicine, drug or substance whatever, or attempt by operation or any other method or means to produce an abortion or miscarriage upon such woman, shall be *guilty of a felony*, and upon conviction thereof shall be fined not more than two thousand dollars nor less than five hundred dollars, or imprisoned in the penitentiary for a period of not less than one nor more than five years, or by both such fine and imprisonment in the discretion of the court trying the case.

Sec. 35-310. . . . *Provided, however, an abortion may be produced when two physicians licensed to practice in the state of New Mexico, in consultation, deem it necessary to preserve the life of the woman, or to prevent serious and permanent bodily injury.*

- (a) Fine of from \$500 to \$2,000, or imprisonment for from 1 to 5 years, or both.
- (b) Common Law in force, with fine of not more than \$200 or imprisonment for not more than 3 months, or both.
- (c) *Second degree murder*, with imprisonment for not less than 3 years.

NEW YORK. *N. Y. Pen. Law.**Sec. 80.* Definition and Punishment of Abortion.*Sec. 1050.* Manslaughter in First Degree.

Sec. 80. A person who, with intent thereby to procure the miscarriage of a woman, *unless the same is necessary to preserve the life of the woman or of the child with which she is pregnant*, either:

1. Prescribes, supplies or administers to a woman, whether pregnant or not, or advises or causes a woman to take any medicine, drug or substance; or

2. Uses or causes to be used any instrument or other means, is *guilty of abortion*, and is punishable by imprisonment in a state prison for not more than four years, or in a county jail for not more than one year.

Sec. 1050. A person who provides, supplies, or administers to a woman, whether pregnant or not, or who prescribes for, or advises or procures a woman to take any medicine, drug, or substance, or who uses or employs, or causes to be used or employed, any instrument or other means, with intent thereby to procure the miscarriage of a woman, *unless the same is necessary to preserve her life*, in case the death of the woman, or if any quick child of which she is pregnant, is thereby produced, is *guilty of manslaughter in the first degree*.

- (a) If child had not quickened, or does not die, imprisonment for not more than 4 years. If child had quickened, and dies, imprisonment for not more than 10 years.
- (b) Imprisonment for not more than 4 years.
- (c) *First degree manslaughter*, with imprisonment for not more than 10 years.

NORTH CAROLINA. *N. C. Code (1931).*

Sec. 4226. Using Drugs or Instrument to Destroy Unborn Child.

Sec. 4227. Using Drugs or Instrument to Produce Miscarriage or Injure Pregnant Woman.

Sec. 4226. If any person shall willfully administer to any woman, either pregnant or quick with child, or prescribe for any such woman, advise or procure any such woman to take any medicine, drug or other substance whatever, or shall use or employ any instrument or other means with intent thereby to destroy such child, *unless the same shall be necessary to preserve the life of the mother*, he shall be guilty of a felony, and shall be imprisoned in the state prison for not less than one year nor more than ten years, and be fined in the discretion of the court.

Sec. 4227. If any person shall administer to any pregnant woman, or prescribe for any such woman, or advise and procure such woman, to take any medicine, drug, or anything whatsoever, with intent thereby to produce the miscarriage of such woman or to injure or destroy said woman, or shall use any instrument or application for any of the above purposes, he shall be guilty of a felony, and shall be imprisoned in the jail or the state prison for not less than one year nor more than five years and shall be fined at the discretion of the court.

(a) If induced with intent to destroy the child, imprisonment for from 1 to 10 years, and fine in the discretion of the court. Otherwise imprisonment for from 1 to 5 years and fine in the discretion of the court.

(b) Common Law in force.

(c) Imprisonment for from 2 to 30 years.

(d) It has been held with respect to provisions similar to Sections 4226 and 4227 that the sole difference in the offenses enumerated is the intent of the defendant.

NORTH DAKOTA. *N. D. Comp. Laws (1913).*

Sec. 9490. Abortion by Administering Drugs. Instruments.

Sec. 9604. Procuring an Abortion.

Sec. 9490. Every person who administers to any woman pregnant with a quick child, or who prescribes for such woman, or advises or procures any such woman to take any medicine, drug or substance whatever or who uses or employs any instruments or other means with intent thereby to destroy such child, *unless the same shall have been necessary to preserve the life of such mother*, is guilty, in case the death of the child or the mother is thereby produced, of manslaughter in the first degree.

Sec. 9604. Every person who administers to any pregnant woman or who prescribes for any such woman, or advises or procures any such woman to take any medicine, drug or substance, or uses or employs any instrument or other means whatever, with intent thereby to procure the miscarriage of such woman, *unless the same is necessary to preserve her life*, is punishable by imprisonment in the penitentiary not less than one and not exceeding three years, or in a county jail not exceeding one year.

(a) If child had not quickened, or does not die, imprisonment for not more than 3 years. If the child had quickened and dies, imprisonment for from 5 to 15 years.

(b) Fine of \$1,000, or imprisonment for not more than 1 year, or both.

(c) First degree manslaughter, with imprisonment for from 5 to 15 years.

(d) A conviction of murder for the death of a woman has been sustained. Section 9490 was not mentioned.

OHIO. *Ohio Gen. Code (Page, 1926), Sec. 12412.*

Attempting to Procure Abortion if Woman Dies or Miscarries.

Whoever, with intent to procure the miscarriage of a woman, prescribes or administers to her a medicine, drug, or substance, or with like intent, uses an instrument or other means, *unless such miscarriage is necessary to preserve her life, or is advised by two physicians to be necessary for that purpose*, if the woman either miscarries or dies in consequence thereof, shall be imprisoned in the penitentiary not less than one year nor more than seven years.

- (a) Imprisonment for from 1 to 7 years.
- (b) None for woman.
- (c) Imprisonment for from 1 to 7 years.

OKLAHOMA. *Okla. Stat. (1931).**Sec. 1834. Procuring an Abortion.**Sec. 2226. Procuring Destruction of Unborn Child.*

Sec. 1834. Every person who administers to any pregnant woman, or who prescribes for any such woman, or, advises or procures any such woman to take any medicine, drug or substance, or uses or employs any instrument, or other means whatever, with intent thereby to secure the miscarriage of such woman, *unless the same is necessary to preserve her life*, is punishable by imprisonment in the penitentiary not exceeding three years, or in a county jail not exceeding one year.

Sec. 2226. Every person who administers to any woman pregnant with a quick child, or who prescribes for such woman, or advises or procures any such woman to take any medicine, drug or substance whatever, or who uses or employs any instrument or other means with intent thereby to destroy such child, *unless the same shall have been necessary to preserve the life of such mother*, is *guilty*, in case the death of the child or the mother is thereby produced, of *manslaughter in the first degree*.

- (a) If child had not quickened or does not die, imprisonment for not more than 3 years. If child had quickened and dies, imprisonment for not less than 4 years.
- (b) Fine of not more than \$1,000, or imprisonment for 1 year, or both.
- (c) *First degree manslaughter*, with imprisonment for not less than 4 years.

OREGON. *Ore. Code (1930), Sec. 14-208.*

Killing by Procuring Abortion—Manslaughter.

If any person shall administer to any woman pregnant with a child any medicine, drug or substance whatever, or shall use or employ any instrument or other means, with intent thereby to destroy such child, *unless the same shall be necessary to preserve the life of such mother*, such person shall, in case the death of such child or mother be thereby produced, be deemed *guilty of manslaughter*.

- (a) None if child does not die. If child dies, imprisonment for from 1 to 15 years, and a fine of not more than \$5,000.
- (b) None for woman.
- (c) *Manslaughter*, with imprisonment for from 1 to 15 years, and a fine of not more than \$5,000.

PENNSYLVANIA. *Penn. Stat. (Purdon, 1930), Title 18.**Sec. 2071.* Abortion Followed by Death.*Sec. 2072.* Procuring or Attempting to Procure Abortion.

Sec. 2071. If any person shall *unlawfully* administer to any woman, pregnant or quick with child, or supposed and believed to be pregnant or quick with child, any drug, poison or other substance whatsoever, or shall *unlawfully* use any instrument or other means whatsoever, with the intent to procure the miscarriage of such woman, and such woman, or any child with which she may be quick shall die in consequence of either of said unlawful acts, the person so offending shall be *guilty of felony*, and shall be sentenced to pay a fine not exceeding five hundred dollars, and to undergo an imprisonment by separate or solitary confinement at labor, not exceeding seven years.

Sec. 2072. If any person, with intent to procure the miscarriage of any woman, shall *unlawfully* administer to her any poison, drug or substance whatsoever, or shall *unlawfully* use any instrument, or other means whatsoever, with the like intent, such person shall be *guilty of felony*, and being thereof convicted shall be sentenced to pay a fine not exceeding \$500 (five hundred dollars), and undergo an imprisonment, by separate or solitary confinement at labor, not exceeding three years.

(a) If the child had not quickened, or does not die, fine of not more than \$500 and imprisonment for not more than 3 years. If child had quickened and dies, fine of not more than \$500 and imprisonment for not more than 7 years.

(b) Common Law in force.

(c) Fine of not more than \$500 and imprisonment for not more than 7 years.

(d) No explicit exception made for physicians.

RHODE ISLAND. *R. I. Gen. Laws (1923), Sec. 6035, Para. 23.*

Every person who, with the intent to procure the miscarriage of any pregnant woman, or woman supposed by such person to be pregnant, *unless the same be necessary to preserve her life*, shall administer to her or cause to be taken by her any poison or other noxious thing, or shall use any instrument or other means whatsoever or shall aid, assist or counsel any person so intending to procure a miscarriage, shall, if the woman die in consequence thereof, be imprisoned not exceeding twenty years nor less than five years, and if she do not die in consequence thereof, shall be imprisoned not exceeding seven years nor less than one year.

(a) Imprisonment for from 1 to 7 years.

(b) Common Law in force, with a fine of not more than \$5,000 or imprisonment for not more than 10 years.

(c) Imprisonment for from 5 to 20 years.

SOUTH CAROLINA. *S. C. Code (1932).*

Sec. 1112. Punishment for Administering Substance to Cause Miscarriage, Abortion or Premature Labor Which Results in Death.

Sec. 1113. Punishment for Certain Means or Advice to Women to Cause Abortion, etc.

Sec. 1112. Any person who shall administer to any woman with child, or prescribe for any such woman, or suggest to or advise or procure her to take any medicine, substance, drug or thing whatever, or who shall use or employ, or advise the use or employment of any instrument or other means of force whatever, with intent thereby to cause or procure the miscarriage or abortion or premature labor of any such woman, *unless the same shall have been necessary to preserve her life, or the life of such child*, shall, in case the death of such child or such woman results in whole or in part therefrom, be deemed *guilty of a felony*, and, upon conviction thereof, shall be punished by imprisonment in the penitentiary for a term not more than twenty years nor less than five years.

- (a) If child does not die, fine of not more than \$5,000 or imprisonment for not more than 5 years, or both. If child dies, imprisonment for from 5 to 20 years.
- (b) Fine of not more than \$1,000 or imprisonment for not more than 2 years, or both.
- (c) Imprisonment for from 5 to 20 years.

Sec. 1113. Any person who shall administer to any woman with child, or prescribe or procure or provide for any such woman, or advise or procure any such woman to take any medicine, drug, substance or thing whatever, or shall use or employ, or advise the use or employment of any instrument or other means of force whatever, with intent thereby to cause or produce the miscarriage or abortion or premature labor of any such woman, shall, upon conviction thereof, be punished by imprisonment in the penitentiary for a term not more than five years, or by fine not more than five thousand dollars, or by such fine and imprisonment both, at the discretion of the court. . . .

SOUTH DAKOTA. *S. D. Comp. Laws (1929).**Sec. 4022.* Procuring Destruction of Unborn Child.*Sec. 4116.* Procuring an Abortion.

Sec. 4022. Every person who administers to any woman pregnant with a quick child, or who prescribes for such woman, or advises or procures any such woman to take any medicine, drug, or substance whatever, or advises or procures any such woman to use or employ, or to have used or employed any instrument or other means, with intent thereby to destroy such child, *unless the same shall have been necessary to preserve the life of such mother, is guilty, in case the death of the child or of the mother is thereby produced, of manslaughter in the first degree.*

Sec. 4116. Every person who administers to any pregnant woman, or who prescribes for any such woman, or advises or procures any such woman to take any medicine, drug or substance, or uses or employs any instrument or other means, with intent thereby to procure the miscarriage of such woman, *unless the same is necessary to preserve her life, is punishable by imprisonment in the state penitentiary not exceeding three years, or in a county jail not exceeding one year.*

- (a) If child had not quickened or does not die, imprisonment for not more than 3 years. If child had quickened and dies, imprisonment for not less than 4 years.
- (b) Fine of not more than \$1,000, or imprisonment for not more than one year, or both.
- (c) Imprisonment for not less than 4 years.

TENNESSEE. *Tenn. Code (1932).**Sec. 10791.* Criminal Abortion; Punishment.*Sec. 10792.* Attempt to Procure Criminal Miscarriage; Punishment.

Sec. 10791. Every person who shall administer to any woman pregnant with child, whether such child be quick or not, any medicine, drug, or substance whatever, or shall use or employ any instrument, or other means whatever, with intent to destroy such child, and shall thereby destroy such child before its birth, *unless the same shall have been done with a view to preserve the life of the mother, shall be punished by imprisonment in the penitentiary not less than one nor more than five years.*

Sec. 10792. Every person who shall administer any substance with the intention to procure the miscarriage of a woman or shall use or employ any instrument or other means with such intent, *unless the same shall have been done with a view to preserve the life of such woman, shall be punished by imprisonment in the penitentiary not less than one nor more than three years.*

- (a) If child does not die, imprisonment for from 1 to 3 years. If child dies, imprisonment for from 1 to 5 years.
- (b) Common Law in force, with fine of not more than \$6,000, or imprisonment for not more than 1 year, or both.
- (c) *Second degree murder*, with imprisonment for from 10 to 20 years.

TEXAS. *Tex. Stat. (Vernon, 1926), Rev. Code, Vol. II.**Sec. 1191. Abortion.**Sec. 1195. Destroying Unborn Child.**Sec. 1196. By Medical Advice.*

Sec. 1191. If any person shall designedly administer to a pregnant woman or knowingly procure to be administered with her consent any drug or medicine or shall use toward her any violence or means whatever, externally or internally applied, and thereby procure an abortion, he shall be confined in the penitentiary not less than two nor more than five years; if it be done without her consent, the punishment shall be doubled. By "abortion" is meant that the life of the foetus or embryo shall be destroyed in the woman's womb, or that a premature birth thereof be caused.

Sec. 1195. Whoever shall during parturition of the mother destroy the vitality or life in a child in a state of being born and before actual birth, which child would have otherwise been born alive, shall be confined in the penitentiary for life, or for not less than five years.

Sec. 1196. Nothing in this chapter applies to an abortion procured or attempted by medical advice for the purpose of saving the life of the mother.

- (a) Imprisonment for from 2 to 5 years, unless child is killed during childbirth, in which case imprisonment for from 5 years to life.
- (b) None for woman.
- (c) *Murder*, with imprisonment for from 5 years to life.

UTAH. *Utah Rev. Stat. (1933), Sec. 103-2-1.*
Abortion—Defined—Penalty.

Every person who provides, supplies or administers to any pregnant woman, or procures any such woman to take, any medicine, drug or substance, or uses or employs any instrument or other means whatever, with intent thereby to procure the miscarriage of such woman, *unless the same is necessary to preserve her life*, is punishable by imprisonment in the state prison not less than two nor more than ten years.

- (a) Imprisonment for from 2 to 10 years.
- (b) Imprisonment for from 1 to 5 years.
- (c) *Second degree murder*, with imprisonment for from 10 years to life.

VERMONT. *Vt. Public Laws (1933), Sec. 8608.*
Abortion—Penalty—Exception.

A person who willfully administers or advises or causes to be administered anything to a woman pregnant, or supposed by such person to be pregnant, or employs or causes to be employed any means with intent to procure the miscarriage of such woman, or assists or counsels therein, *unless the same is necessary to preserve her life*, shall, if the woman dies in consequence thereof, be imprisoned in the state prison not more than twenty years nor less than five years, and if she does not die in consequence thereof, shall be imprisoned in the state prison not more than ten years nor less than three years.

- (a) Imprisonment for from 3 to 10 years.
- (b) Common Law in force.
- (c) Imprisonment for from 5 to 20 years.

VIRGINIA. *Va. Code (1930), Sec. 4401.*

Attempt to Produce Abortion; . . . How Punished.

If any person administer to, or cause to be taken by a woman, any drug or other thing, or use any means with intent to destroy her unborn child, or to produce abortion or miscarriage, and thereby destroy such child or produce such abortion or miscarriage, he shall be confined in the penitentiary not less than three nor more than ten years. *No person, by reason of any act mentioned in the foregoing part of this section, shall be punishable where such act is done in good faith, with intention of saving the life of such woman or child. . . .*

- (a) Imprisonment for from 3 to 10 years.
- (b) Common Law in force.
- (c) *Second degree murder*, with imprisonment for from 5 to 20 years.

WASHINGTON. *Wash. Rev. Stat. (Pennington, 1932).**Sec. 2397.* Killing Unborn Quick Child by Administering Drugs.*Sec. 2448.* Abortion, Defined.

Sec. 2397. Every person who shall provide, supply or administer to a woman whether pregnant or not, or shall prescribe for or advise or procure a woman to take any medicine, drug or substance, or shall use or employ, or cause to be used or employed any instrument or other means, with intent thereby to procure the miscarriage of a woman, *unless the same is necessary to preserve her life*, in case the death of the woman or of any quick child of which she is pregnant is thereby produced, shall be *guilty of manslaughter*.

Sec. 2448. Every person who, with intent thereby to produce the miscarriage of a woman, *unless the same is necessary to preserve her life or that of the child whereof she is pregnant*, shall—

1. Prescribe, supply or administer to a woman, whether pregnant or not, or advise or cause her to take any medicine, drug or substance; or

2. Use or cause to be used, any instrument or other means, Shall be *guilty of abortion*, and punished by imprisonment in the state penitentiary for not more than five years, or in the county jail for not more than one year.

- (a) If child had not quickened, or does not die, imprisonment for not more than 5 years. If child had quickened and dies, fine of not more than \$1,000 or imprisonment for not more than 20 years, or both.
- (b) If child had not quickened, or does not die, imprisonment for not more than 5 years. If child had quickened and dies, fine of not more than \$1,000 or imprisonment for not more than 20 years, or both.
- (c) *Manslaughter*, with fine of not more than \$1,000 or imprisonment for not more than 20 years, or both.

WEST VIRGINIA. *W. Va. Code (1931), p. 1459, Sec. 8.*

Abortion.

Any person who shall administer to, or cause to be taken by a woman, any drug or other thing, or use any means with intent to destroy her unborn child, or to produce abortion or miscarriage, and shall thereby destroy such child or produce such abortion or miscarriage, shall be confined in a penitentiary not less than three nor more than ten years; and if such woman die by reason of such abortion performed upon her, such person shall be *guilty of murder*. No person by reason of any act mentioned in this section shall be punishable where such act is done in good faith, with the intention of saving the life of such woman or child.

- (a) Imprisonment for not more than 10 years.
- (b) Common Law in force.
- (c) *Second degree murder*, with imprisonment for from 5 to 10 years.

WISCONSIN. *Wisc. Stat. (1933).*

Sec. 340.16. Manslaughter, Second Degree.

Sec. 351.22. Producing Miscarriage.

Sec. 340.16. Any person who shall administer to any woman pregnant with a child any medicine, drug or substance whatever, or shall use or employ any instrument or other means with intent thereby to destroy such child, *unless the same shall have been necessary to preserve the life of such mother or shall have been advised by two physicians to be necessary for such purpose*, shall in case the death of such child or of such mother be thereby produced, be deemed *guilty of manslaughter* in the second degree.

Sec. 351.22. Any person who shall administer to any pregnant woman, or prescribe for such woman, or advise or procure any such woman to take any medicine, drug or substance or thing whatever, or shall use or employ any instrument or other means whatever, or advise or procure the same to be used, with intent thereby to procure the miscarriage of any such woman, shall be punished by imprisonment in the county jail not more than one year nor less than 6 months, or by fine not exceeding five hundred dollars nor less than two hundred and fifty dollars, or by both such fine and imprisonment in the discretion of the court.

- (a) If child does not die, fine of from \$250 to \$500, or imprisonment for from 6 months to 1 year, or both. If child dies, imprisonment for from 4 to 7 years.
- (b) Fine of not more than \$100 or imprisonment for from 1 to 6 months.
- (c) *Second degree manslaughter*, with imprisonment for from 4 to 7 years.

WYOMING. *Wyo. Rev. Stat. (1931), Sec. 32-222.***Attempted Miscarriage.**

Whoever prescribes or administers to any pregnant woman, or to any woman whom he supposes to be pregnant, any drug, medicine, or substance whatever, with intent thereby to procure a miscarriage of such woman; or with like intent uses any instrument or means whatever, *unless such miscarriage is necessary to preserve her life*, shall if the woman miscarries or dies in consequence thereof, be imprisoned in the penitentiary not more than fourteen years.

- (a) Imprisonment for not more than 14 years.
- (b) Fine of not more than \$500 and imprisonment for not more than 6 months.
- (c) Imprisonment for not more than 14 years.

TERRITORIAL POSSESSIONS**ALASKA.** *Alaska Comp. Laws (1913), Sec. 1888.***Administering Medicine, etc., to Pregnant Women.**

That if any person shall administer to any woman pregnant with a child any medicine, drug, or substance whatever, or shall use any instrument or other means, with intent thereby to destroy said child, *unless the same shall be necessary to preserve the life of such mother*, such person shall, in case the death of such child or mother be thereby produced, be deemed *guilty of manslaughter*, and shall be punished accordingly.

- (a) None if child does not die. If child dies, imprisonment for from 1 to 20 years.
- (b) Common Law in force, with a fine of not more than \$500 or imprisonment for not more than 1 year.
- (c) *Manslaughter*, with imprisonment for from 1 to 20 years.
- (d) Statute interpreted as applying even if the child had not quickened before the abortion.

HAWAII. *Hawaii Rev. Laws (1925).**Sec. 4454. Abortion—Punishment.**Sec. 4455. Abortion to Save Life Justified.*

Sec. 4454. Whoever maliciously, *without lawful justification*, administers, or causes or procures or causes to be administered, any poisonous noxious thing to a woman when with child, in order to produce her miscarriage, or maliciously uses any instrument or other means with like intent, shall, if the woman be then quick with child, be punished by a fine not exceeding one thousand dollars, and imprisonment at hard labor for not more than five years; and if she be then not quick with child, shall be punished by a fine not exceeding five hundred dollars, and imprisonment at hard labor not more than two years.

- (a) If child had not quickened, fine of not more than \$500 and imprisonment for not more than 2 years. If child had quickened, fine of not more than \$1,000 and imprisonment for not more than 5 years.
- (b) None for woman.
- (c) *Second degree murder*, with imprisonment for from 20 years to life.

Sec. 4455. Where means of causing abortion are used for the purpose of saving the life of the woman, the surgeon or other person using such means is lawfully justified.

PUERTO RICO. *Puerto Rico Comp. Rev. Stat. and Codes (1911), Sec. 5708.*
Abortion.

Every person who provides, supplies, or administers to any pregnant woman, or procures any such woman to take any medicine, drug or substance, or uses or employs any instrument or other means whatever, with intent thereby to procure the miscarriage of such woman, *unless the same is necessary to preserve her life*, is punishable by imprisonment in the penitentiary not less than two nor more than five years.

- (a) Imprisonment for from 2 to 5 years.
- (b) Imprisonment for from 1 to 5 years.
- (c) *Second degree murder*, with imprisonment for not less than ten years.
- (d) Statute prohibits the dissemination of information concerning abortion or contraception.

VIRGIN ISLANDS. *Virgin Is. Code (1920), Ch. 6, Sec. 9.*

Every person who provides, supplies or administers to any pregnant woman, or procures any such woman to take any medicine, drug or substance, or uses or employs any instrument or other means whatever, with intent thereby to procure the miscarriage of such woman, *unless the same is necessary to preserve her life*, is punishable by imprisonment in the penitentiary not exceeding five years.

- (a) Imprisonment for not more than 5 years.
- (b) None for woman.
- (c) *Second degree murder*, with imprisonment for not less than ten years.

MEMORANDUM ON ABORTION LAW IN PHILIPPINES

Philippine Islands Rev. Penal Code (1933) Vol. II. Articles 256-259 inclusive, provide an extremely complex system of penalties for abortion. Generally speaking, the penalties are graduated upward in the following fashion, beginning with the offense for which the punishment is least severe:

1. Abortion by a woman to save her honor.
2. Abortion by a woman for some other purpose. (Married women.)
3. Abortion by a woman's parents to save her honor.
4. Abortion by an outsider. (Including the responsible man.)
5. Abortion by a physician or midwife.

Although very interesting, I do not believe that a chart should be made of these laws because of the space such a chart would require, because of the relative unimportance of the laws, and because my conclusion as to punishments would be only guesswork. For instance, it prescribed that a person causing an abortion (not the woman herself, or her parents, or a doctor or a midwife) shall be subject to "the penalty of *prison correccional* (sp.?) in its medium and maximum periods." Then is listed:

Minimum: From 2 yrs. 4 mos. 21 days to 3 yrs. 6 mos. and 20 days.
Medium: From 3 yrs. 6 mos. 21 days to 4 yrs. 9 mos. and 10 days.
Maximum: From 4 yrs. 9 mos. 11 days to 6 yrs.

It is inadvisable to set out the provisions themselves, without an attempted explanation, because of innumerable cross references. In some cases reference must be made to a general penalty chart, itself several pages long.

There are no provisions made for operations necessary to preserve the life of the mother.

APPENDIX B—SOURCE TABLES

SOURCE TABLE A.
 ABORTIONS BY TYPE OF ABORTION AND AGENT OF TERMINATION ACCORDING TO EACH ORDER OF PREGNANCY
 (Rearranged From M. E. Kopp: Birth Control in Practice, Source Table XXII)

ORDER OF PREGNANCY	(1) TOTAL PREG- NAN- CIES	(2) ABORTIONS: BY TYPE				(3) BY AGENT OF INDUCTION				(4) PERCENTAGE PREGNANCIES ABORTED BY TYPE OF ABORTION				(5) PERCENTAGE OF INDUCTIONS BY AGENT:*			
		TOTAL	SPON- TA- NEOUS	THER- APEU- TIC	IN- DUCED	PHYSI- CIAN	MID- WIFE	SELF	UN- KNOWN	TOTAL	SPON- TA- NEOUS	THER- APEU- TIC	IN- DUCED	PHYSI- CIAN	MID- WIFE	SELF	UN- KNOWN
Total	38,985	11,172	3,165	340	7,667	4,378	1,125	1,863	301	29	8	1	20	57	15	24	4
First	9,583	1,000	527	44	429	292	46	79	12	10	6	1	4	68	11	19	2
Second	8,101	1,585	543	71	971	621	123	207	20	20	7	1	12	64	13	21	2
Third	6,271	1,955	550	80	1,325	830	175	293	27	31	9	1	21	64	13	22	1
Fourth	4,593	1,736	427	48	1,261	745	192	301	23	38	9	1	28	59	15	24	2
Fifth	3,242	1,333	302	32	999	579	156	251	13	41	9	1	31	58	16	25	1
Sixth	2,273	1,054	262	23	769	426	125	209	9	46	12	1	34	56	16	27	1
Seventh	1,579	712	173	14	525	300	79	135	11	45	11	1	33	57	15	26	2
Eighth	1,071	519	134	9	376	197	70	106	3	48	13	1	35	52	19	28	1
Ninth	709	348	84	1	263	138	52	70	3	49	12	0.1	37	53	20	26	1
Tenth	482	239	55	5	179	87	35	57	—	50	12	1	37	48	20	32	—
Eleventh	327	172	41	5	126	57	19	50	—	53	13	2	39	45	15	40	—
Twelfth	231	135	31	1	103	42	19	42	—	58	13	0.4	45	41	18	41	—
Thirteenth	157	101	21	4	76	26	16	32	2	64	13	3	48	34	21	43	2
Fourteenth	98	60	10	1	49	19	11	19	—	61	10	1	50	39	22	39	—
Fifteenth and Over	268	223	5	2	216	19	7	12	178	84	2	1	81	9	3	6	83

*Author gives these figures in terms of per cent of total pregnancies induced by agent.

SOURCE TABLE B.

NUMBER OF ABORTIONS REPORTED BY APPLICANTS FOR BIRTH CONTROL ADVICE
ACCORDING TO THE RELIGIOUS AFFILIATION OF THE WIFE

(Modified from M. E. Kopp: Birth Control in Practice, Source Table III)

NUMBER OF ABORTIONS	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	NUMBER OF WOMEN					PERCENTAGE DISTRIBUTION				
	TOTAL	JEW- ISH	PROT- ES- TANT	CATH- OLIC	OTHER OR NONE	TOTAL	JEW- ISH	PROT- ES- TANT	CATH- OLIC	OTHER OR NONE
TOTAL PREG- NANT	9,583	4,019	2,827	2,543	194	100	42	30	26	2
TOTAL WITH ANY ABORTIONS	5,010	2,191	1,399	1,303	117	100	44	28	26	2
One -----	2,364	1,041	712	553	58	47	47	51	43	48
Two -----	1,216	541	302	349	24	24	25	22	27	20
Three -----	638	285	163	174	16	13	13	12	13	13
Four -----	332	143	91	92	6	7	7	7	7	5
Five -----	181	77	48	54	2	3	4	3	4	2
Six -----	104	41	31	27	5	2	2	2	2	4
Seven -----	48	17	15	15	1	1	1	1	1	1
Eight -----	45	15	10	18	2	1	1	1	1	2
Nine -----	17	8	4	4	1	0.3	0.3	0.3	0.3	1
Ten and More--	65	23	23	17	2	1	1	2	1	2

SOURCE TABLE C.

MATERNAL MORTALITY FOLLOWING CHILDBIRTH AND ABORTION (SWITZERLAND)
 From Monthly Epidemiological Report of the Health Section of the Secretariat of
 the League of Nations. Vol. 9. R. E. 140, p. 288

(1) YEAR	(2) NUMBER OF BIRTHS	(3) DEATHS FOLLOWING CHILDBIRTH	(4) RATE PER 1,000 LIVE-BIRTHS	(5) DEATHS FOLLOWING ABORTION	(6) RATE PER 1,000 STILLBIRTHS
1901	97,028	230	2.37	20	5.54
1902	96,481	180	1.87	16	4.56
1903	93,824	211	2.25	26	7.89
1904	94,867	209	2.20	48	13.98
1905	94,653	211	2.23	42	12.34
1906	95,595	148	1.55	43	12.74
1907	94,508	193	2.04	68	21.33
1908	96,245	169	1.76	58	17.99
1909	94,112	170	1.81	68	21.36
1910	93,514	133	1.42	49	15.53
1911	91,320	162	1.77	83	28.97
1912	92,196	159	1.72	59	19.83
1913	89,757	142	1.58	55	19.33
1914	87,330	124	1.42	64	22.87
1915	75,545	114	1.51	60	25.15
1916	73,660	119	1.62	60	26.97
1917	72,065	125	1.73	79	38.35
1918	72,658	126	1.73	83	37.28
1919	72,125	115	1.59	81	38.94
1920	81,190	154	1.90	81	33.29
1921	80,808	169	2.09	81	34.25
1922	76,290	138	1.81	54	24.04
1923	75,551	105	1.39	63	29.40
1924	73,508	79	1.07	41	19.94
1925	72,570	106	1.46	39	20.11
1926	72,118	88	1.22	54	29.27
1927	69,533	81	1.16	35	20.00
1928	69,594	83	1.19	40	23.01
1929	69,006	83	—	45	—

Source Table D.

AGE AT DEATH OF WOMEN WHO DIED FOLLOWING ABORTION OF EACH SPECIFIED
TYPE AMONG WOMEN DYING FROM PUERPERAL CAUSES

(Table 64 from Maternal Mortality in Fifteen States
Children's Bureau Publication No. 223, 1934, p. 111)

WOMEN DYING FROM PUERPERAL CAUSES														
AGE PERIOD	FOLLOWING ABORTION OF EACH SPECIFIC TYPE													
	TOTAL		TOTAL		SPONTANEOUS		THERAPEUTIC		INDUCED		NOT FOLLOWING ABORTION		NOT REPORTED WHETHER FOLLOWING ABORTION	
	NUMBER	PER CENT DISTRIBUTION	NUMBER	PER CENT DISTRIBUTION	NUMBER	PER CENT DISTRIBUTION	NUMBER	PER CENT DISTRIBUTION	NUMBER	PER CENT DISTRIBUTION	TYPE NOT REPORTED	NUMBER		PER CENT DISTRIBUTION
Total	7,380		1,825		589		205		794		237	5,521		34
Age period re-ported	7,350	100	1,816	100	585	100	204	100	792	100	235	5,502	100	32
Under 15 yrs.	25	(1)	3	(1)	1	(1)			1	(1)	1	92	(1)	3
15 yrs., under 20	855	12	179	10	43	7	17	8	92	12	27	673	12	7
20 yrs., under 25	1,545	21	392	22	110	19	54	26	174	22	54	1,146	21	8
25 yrs., under 30	1,537	21	435	24	126	22	43	21	204	26	62	1,094	20	5
30 yrs., under 35	1,412	19	388	21	140	24	41	20	161	20	46	1,019	19	5
35 yrs., under 40	1,312	18	295	16	99	17	31	15	130	16	35	1,012	18	5
40 yrs. and over	664	9	124	7	66	11	18	9	30	4	10	536	10	4
Age period not re-ported	30		9		4		1		2		2	19		2

(1) Less than 1 per cent.

APPENDIX C

GLOSSARY OF TERMS

Need for Definition of Terms.—Obstetricians and embryologists in the past have employed such terms as abortion, premature birth, and duration of pregnancy with little uniformity. A more exact definition of these and related terms is therefore urgently needed. The National Conference on Nomenclature of Disease has given this subject extended consideration, but thus far has reached no definite conclusions. Giving due weight to the arguments brought forward by members of this conference, I have attempted in this Glossary to construe the meaning of the more common terms employed in the discussion of abortion. Naturally there will be some difference of opinion in matters of this kind, but I have tried to express as far as possible the preferred terminology.

ABORTION: The detachment or expulsion, or a combination of both, of the pre-viable ovum. (For definition of *pre-viable*, see proper head.)

Afebrile: An abortion in which there has been no rise of temperature, due to the abortion, higher than 38° C. (100.4° F.) for longer than twenty-four hours.

Attempted: Any case in which procedures have been employed to bring on an abortion, even though the patient may not actually have been pregnant.

Cervical: An abortion in which the ovisac has been retained within the cervical canal for a long period of time, usually several weeks or more.

Criminal: Abortion produced or attempted by patient, or other person, contrary to the statutes of the particular state or country in which the act takes place; abortion without sanction of the law.

Early: Abortion that occurs before the fetus has attained the thirteenth week of development.

Febrile: Abortion in which there has been a rise of temperature, due to the abortion, higher than 38° C. (100.4° F.) for longer than twenty-four hours.

Habitual: Tendency to repeated abortion without intentional interference.

Induced: Intentional termination of pregnancy by abortion.

Inevitable: Stage in the interruption of a pre-viable pregnancy at which the termination by abortion can no longer be avoided.

Late: Abortion that occurs after the fetus has attained the thirteenth week of development.

Legalized: An induced abortion authorized under certain conditions by the laws of the country in which it is performed.

Missed: Retention of the ovisac for longer than two months after the death of the fetus until it is expelled or removed from the uterus.

Septic: An abortion in which the presence of fever, associated with leucocytosis and other signs of pelvic inflammation, justifies the assumption of a uterine infection.

Spontaneous: Termination of pregnancy before viability without intentional interference.

Therapeutic: Interruption of pregnancy before viability in order to conserve the life or health of the mother.

Threatened: Disturbance of a pregnancy before viability, characterized usually by uterine contractions or bleeding, or both, that might terminate in an abortion.

Tubal: Detachment, partial or complete, of an ovum implanted in the Fallopian tube, associated with death of the embryo or fetus.

Uterine: Extraction or expulsion of the pre-viable ovisac implanted in the uterus.

ASCHHEIM-ZONDEK TEST: Laboratory test in which the woman's urine is injected into infantile mice or rats to determine the diagnosis of pregnancy.

AGE OF EMBRYO: See Duration of Pregnancy.

BACTERIEMIA: Blood-stream infection of septic origin, characterized by deposits of infectious material in various organs or tissues of the body forming an abscess or localized exudate.

BLIGHTED OVUM: An ovum which, through some inherent defect of the sex cells before impregnation, or through faulty implantation or nutrition after impregnation, fails to develop beyond a very early stage and dies.

BLOOD MOLE: A blighted ovum which is detached from the uterine wall and is retained in the uterine cavity, surrounded by an extravasation of coagulated blood.

BREUS MOLE: A blighted ovum, associated with early hydramnios, characterized by numerous pedunculated or sessile hematomata and by prolonged intra-uterine retention for many months.

CARNEOUS MOLE: See Blood Mole.

CONCEPTION: Date of fruitful coitus; also used as synonym for fertilization.

DURATION OF PREGNANCY: Considerable difficulty of definition arises because of the tendency to figure onset of pregnancy from the date of last menstruation, whereas the date of conception is usually about two weeks after the first day of the last menstrual period. Most writers agree that the terminology should be similar to that used in stating the age of an individual. Just as a child, between its first and second birthday is in its second year, and after its second birthday is two years old, so a woman who has skipped *one menstrual period* may be said to be in the *second month* of her pregnancy, and at the *conclusion* of this *second month* may be termed "*two months pregnant*" or "*two months along*" (in the usual language of the dispensary patient). Statistics on isolated coitus indicate a coital age of 269 days at birth, a menstrual age of 281 days.

On the other hand, the *development of the child* from an embryological standpoint should date from *conception* and can better be expressed in *weeks of development*. Thus, at the end of the *second month of pregnancy* the ovum may be said to have attained its *sixth week of development*.

EMBRYO: The impregnated ovum from the end of the second to the end of the fifth week of its development.

FETUS: Term applied to the child from the end of the fifth week of its development until its birth at the normal termination of pregnancy.

FRIEDMAN TEST: Similar to the Aschheim-Zondek test except that mature oestrous (isolated) rabbits are employed instead of mice. The test is positive if ovulation is found to have occurred within 24-48 hours.

HEMATOMA MOLE: See Breus Mole.

IMPREGNATION: Entrance of sperm into ovum.

INTERRUPTION OF PREGNANCY: Euphemistic term, or synonym, used instead of "induced abortion," legal or illegal. It has a place, because in the lay mind the word "abortion" connotes criminal abortion and is long likely to carry this association.

MISCARRIAGE: Term applied by the laity to all abortions except those due to criminal intervention. Earlier medical usage limited the term to late abortions. In the present volume the word "miscarriage" has been avoided as far as possible because of this ambiguity, but in questioning patients "miscarriage" should be used in preference to "abortion," since the latter carries in the lay mind the implication of a criminal procedure.

MODUS ABORTUS: One-stage expulsion of the ovisac, with the fetus and placenta coming away together.

MODUS PARTUS: Two-stage expulsion of the ovisac, with the fetus expelled before the placenta, as in the mechanism of normal delivery.

MOLAR PREGNANCY: Abnormal pregnancy in which the embryo dies early in its development and becomes partly liquefied or mummified, while the placental tissues form a fleshy mass containing coagulated, partly fibrinous blood, or proliferating edematous villi.

MORAL IRRESPONSIBILITY: Referring to the indications for therapeutic abortion, moral irresponsibility implies that the patient was not, at the time of conception, in a condition to exert the necessary physical or mental control over her sexual conduct. This applies in cases of pregnancy following rape, or intercourse by girls of low mental development or of immature age. In many States the law establishes this age as below the sixteenth year.

OVUM: Term applied both to the unimpregnated sex cell of the ovary and to the same cell after its impregnation and during the first two weeks of its development.

PLACENTAL POLYP: Retained placental tissue still attached to the uterine wall with accumulated extravasations of fibrinated blood forming a pedunculated tumor projecting into the uterine cavity.

POSTABORTIVE ENDOMETRITIS: Subinvolution of the endometrium, associated with low-grade inflammation and incomplete absorption of decidual cells.

PREMATURE BIRTH: Expulsion of the child before the normal termination of pregnancy but after the period when the child has become viable.

PRE-VIABLE: That period of gestation during which the embryo or fetus is not yet capable of sustaining life, if expelled from the body of the mother.

While this period may be said to extend up to about the twenty-eighth week of fetal development, Stander claims that the duration of pregnancy as

usually calculated is too inexact, and prefers that the definition of pre-viability be based on objective findings, such as the weight and length of the fetus. He recommends that *any fetus under 1500 grams in weight and 35 centimeters in length* be considered *pre-viable*. Since in some cases such a fetus will survive, these limitations seem a little too high. It would seem preferable, therefore, to reduce the figures to *1250 grams in weight and 32 centimeters in length*. This would correspond to about the twenty-sixth week of development. Before this period interruptions of pregnancy should be termed *abortion*; after this period and up to the normal conclusion of pregnancy the term *premature birth* should be applied. Cases of infants under 1250 grams in weight that survive are at present extremely rare.

PYEMIA: (See Bacteriemia.)

QUICKENING: First movements of the child felt by the mother. The time when quickening is first experienced varies from the fourteenth to the twentieth week of gestation, depending on the sensitiveness of the woman to tactile or kinesthetic impressions, the vigor of the child's movements, and the experience of the woman through previous pregnancies.

REGISTERED HOSPITAL: Referring to a suggested statute for the control of criminal abortion, a registered hospital would indicate any institution licensed and registered by state or local authorities for the care of the sick.

REGULAR PRACTITIONER OF MEDICINE: Any physician licensed to practice medicine by the laws of the State in which he resides.

SEPTICEMIA: Blood-stream infection in which the septic organisms are repeatedly found circulating in the blood.

SEPTIC (OR INFECTIONAL, OR INFECTIVE) THROMBOPHLEBITIS: Blood-stream septic infection in which the organisms form clots in the veins at certain points with localized inflammation and partial or complete blocking of the lumen of the vessel.

STILLBORN CHILD: A viable child (i.e., over 1250 grams in weight or 32 centimeters in length) that dies without any spontaneous effort at respiration. We can distinguish between antepartum and intrapartum death. Stander classifies stillborn children that die antepartum as "dead-born."

WEEK OF DEVELOPMENT: (See Duration of Pregnancy.)

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